Thermophysical Properties of High Temperature Solid Materials

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Thermophysical Properties of High Temperature Solid Materials

VOLUME 6: INTERMETALLICS, CERMETS, POLYMERS, AND COMPOSITE SYSTEMS
Part I: Intermetallics

Thermophysical Properties Research Center
PURDUE UNIVERSITY

Y. S. Touloukian, EDITOR

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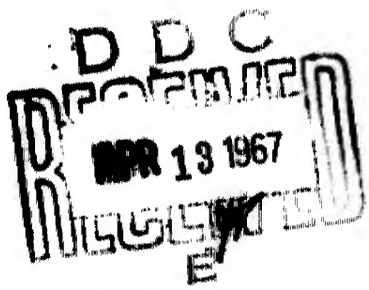

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PREFACE

The phenomenal growth of science and technology since the early forties has brought about a universal appreciation of the fact that present limitations in many technical developments are often a direct result of the paucity of knowledge on the properties of materials. Engineering developments in the years ahead will be closely linked to the research that is done today to contribute to a better understanding of the properties of matter, of which thermophysical properties constitute a major segment.

With a realization of the seriousness of this situation, a great deal of research effort has been made in recent years on the thermophysical properties of materials with the result that the volume of research literature has increased many fold. In spite of this fact, it is generally agreed that the present level of research on thermophysical properties still falls substantially short of existing needs and anticipated future demands. However, what is even more disturbing is the fact that engineering groups across the nation are using no more than a fraction of the information already available, either because it is in a form not directly useful to them or, often, because its existence is not generally known.

To partially remedy this situation concerning the thermophysical properties of high temperature materials, the Materials Laboratory of the U.S. Air Force at Wright-Patterson Air Force Base sponsored a project in 1957 to bring together a large portion of the then available data in a single work for easy reference. From this compilation, performed by the Armour Research Foundation, a four-volume work entitled *Handbook of Thermophysical Properties of Solid Materials* emerged. It was first published in 1960 as WADC TR58-476; in 1961 it was issued as a hard-bound set by The Macmillan Company.

Because of the favorable reception given to this original work, the Materials Laboratory of the U.S. Air Force requested the Thermophysical Properties Research Center (TPRC), in 1964, to update and revise this reference work in order to increase its usefulness and to put it on a more current basis. The present six-volume work, entitled *Thermophysical Properties of High Temperature Solid Materials*, consists of nine books totaling more than 8,500 pages. It is the result of a two-year project by TPRC. This new encyclopedic reference work cannot be called a revised edition of the earlier publication since nearly every page has been changed through major additions, corrections, and re-evaluation. An effort was made to adhere to the basic format of the earlier work. However, the organization of the material and the index to materials have been completely redesigned for greater ease in locating the information desired.

Inevitably, not all of the properties covered have received the same degree of attention. The material on thermal radiative properties, thermal diffusivity, and specific heat has been totally revised and rewritten. Materials on the coefficient of thermal expansion and thermal conductivity have received major revisions, and those on electrical resistivity, density, and melting point have had moderate revisions. Finally, lesser revisions were made to data concerning vapor pressure and heats of transformation. The new information incorporated into the work covered research conducted primarily during the years 1957 to 1964, although some major references are included from 1965 and some from as far back as 1910.

In processing the large amount of new and old data incorporated in these volumes, it was necessary that some degree of selectivity be exercised both from the standpoint of the references cited and the data extracted from them. It is hoped, however, that no major source of information has been omitted. Whenever possible, an effort was made to suggest recommended values of the properties. In the plots, recommended values are indicated by curves. It should be clear, however, that the designation of "recommended values" in no way implies that a critical analysis has been performed in all cases, nor does it suggest that they repre-

sent definitive values. Because most of the materials covered are not well-defined engineering materials, and because there is often a great paucity of information, any critical evaluation of these data is most difficult—if not impossible.

With a full appreciation of these inherent difficulties it is nevertheless hoped that the present compendia will prove to be of great usefulness to engineers seeking information on thermophysical properties. In spite of the extreme care exercised in processing the data and proofing the manuscript, it is possible that some errors might have been inadvertently overlooked. Should any instance of such oversight be uncovered, the Editor would be most indebted if it is brought to his attention.

The fact that such an enormous undertaking could be accomplished in such a short time is attributable primarily to TPRC's unique resources in the area of thermophysical properties information. Grateful acknowledgment is made to the Electronic Properties Information Center for assistance in providing bibliographic searches on electrical resistivity and to the Air Force Materials Laboratory for general assistance in bibliographic information. Extensive personal inquiries were made to the authors of research papers and reports requesting clarification and original data. The enthusiastic response to these inquiries (in the majority of the cases) is also gratefully acknowledged. The Editor and the contributing staff wish to give a special note of thanks in acknowledging the valuable assistance and cooperation they received individually and collectively from TPRC's Scientific Documentation Division personnel and the supporting staff of graphics and technical typists without whose painstaking and skillful contributions this work would not have been possible.

This work was performed under Contract No. AF33(615)1642, sponsored by the Air Force Materials Laboratory, Research and Technology Division, Air Force Systems Command, Wright-Patterson Air Force Base, Ohio. The personnel directly affiliated with this program were Mr. D. A. Shinn, Chief, Materials Information Branch; Mr. E. Dugger, Technical Manager, Information Processing; and Mr. J. H. Charlesworth, engineer in charge of this project. Their understanding cooperation has contributed much to the success of the program.

It is sincerely hoped that *Thermophysical Properties of High Temperature Solid Materials* will constitute an even more valuable contribution to technology than its predecessor. This work should prove to be an invaluable source of information on an important group of properties of materials to every engineer, providing him with reliable information of a scope that would be impossible for any one individual to master. If we have been able to approach these goals, the results will be highly gratifying.

June 1966

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EXPLANATORY TEXT

I. SCOPE OF COVERAGE

Thermophysical Properties of High Temperature Solid Materials comprises six volumes. Volumes 2, 4, and 6 each consist of two parts because of the large amount of material covered. The general contents of the respective volumes are as follows:

Volume 1—Elements
Volume 2—Nonferrous Alloys
PART I—Nonferrous Binary Alloys
PART II—Nonferrous Multiple Alloys
Volume 3—Ferrous Alloys
Volume 4—Oxides and Their Solutions and Mixtures
PART I—Simple Oxygen Compounds and Their Mixtures
PART II—Solutions and Their Mixtures of Simple Oxygen Compounds, Including Glasses and Ceramic Materials
Volume 5—Nonoxides and Their Solutions and Mixtures, Including Miscellaneous Ceramic Materials
Volume 6—Intermetallics, Cermets, Polymers, and Composite Systems
PART I—Intermetallics
PART II—Cermets, Polymers, and Composite Systems

The specific properties covered in each volume are:

1. Density (ρ)
2. Melting Point (M. P.)
3. Heat of Fusion (Δh_f)
4. Heat of Vaporization (Δh_v)
5. Heat of Sublimation (Δh_s)
6. Electrical Resistivity (r)
7. Specific Heat at Constant Pressure (c_p)
8. Thermal Conductivity (k)
9. Thermal Diffusivity (α)
10. Thermal Linear Expansion ($\Delta L/L$)
11. Thermal Radiative Properties:
    Absorptance (α), Emittance (ϵ), Reflectance (ρ), and Transmittance (τ)
12. Vapor Pressure (p)

Generally, only materials with melting points above 800°K (approximately 1000°F) are included, except for materials within the categories of polymers, plastics, and composites. A detailed discussion of the material classification procedure is presented in the following sections. A Material Index for the entire work is included at the end of each volume.

II. TPRC CLASSIFICATION OF MATERIALS

Materials are classified into the eight categories listed below. Whenever applicable, the compositions are reported in weight percent of the constitutents. For purposes of material classification TPRC considers the following elements as nonmetallic: H, He, C, N, O, F, Ne, P, S, Cl, A, Br, Kr, I, Xe, At, and Rn.

1. *Elements*: For the purpose of classification an element is specified as follows:
   A. For metallic elements, the limit of impurities is <0.20 percent for each foreign constituent and <0.50 percent total impurities.
   B. For nonmetallic elements (i.e., carbon including graphite and diamond), the limit of impurities is ≤ 2.0 percent for each foreign constituent and ≤ 5.0 percent total impurities.
2. *Nonferrous Alloys*: This category is for alloys in which the major constituent is other than iron. For the purpose of classification, nonferrous alloys are specified as follows:
   A. Nonferrous Binary Alloys: The sum of the binary constituents is ≥ 99.50 percent and other constituents ≤ 0.20 percent each.
   B. Nonferrous Multiple Alloys: The sum of the first two constituents is <99.50 percent and/or any other constituent >0.20 percent. Alternatively, the major constituent is ≤ 99.50 percent and each of the other constituents <0.20 percent (or not given).
3. *Ferrous Alloys*: This category is for alloys in which iron is greater than or equal to any other constituent. For the purpose of classification, ferrous alloys are specified as follows:
   A. Carbon Steels: Carbon ≤ 2.0 percent and carbon $\geq$ any other alloying constituent.
      a. Group I: Every other alloying constituent is ≤ 0.20 percent except for Mn, P, S, Si, which may be ≤ 0.60 percent each.
      b. Group II: At least one other alloying constituent >0.20 percent and/or any of Mn, P, S, Si >0.60 percent.
   B. Cast Irons: Carbon >2.0 percent and carbon $\geq$ any other alloying constituent.
      a. Group I: Every other alloying constituent ≤ 0.20 percent except for Mn, P, S, Si, which may be ≤ 0.60 percent each.
      b. Group II: At least one other alloying constituent >0.20 percent and/or any of Mn, P, S, Si >0.60 percent.
   C. Alloy Steels (including alloy cast iron): The major alloying constituent is other than carbon.
      a. Group I: Every other alloying constituent ≤ 0.20 percent except for Mn, P, S, Si, which may be ≤ 0.60 percent each, and C ≤ 2.0 percent.*
      b. Group II: At least one other alloying constituent >0.20 percent and/or any of Mn, P, S, Si >0.60 percent.*
4. *Nonmetallic Compounds and Their Mixtures and Solutions*: Ceramic materials such as oxides, bromides, carbides, carbonates, nitrides, silicates, etc., are included in this category. For the purpose of classification, they are specified as follows:
   A. For simple compounds and their solutions, the limit of impurities is ≤ 2.0 percent for each foreign constituent and ≤ 5.0 percent total impurities.

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* Exception is made when Mn, P, S, or Si is the major alloying constituent. For instance, in the case of Fe + Mn + ΣX_i alloys the specifications corresponding to Groups I and II would be as follows:
  a. Group I: Every other alloying constituent ≤ 0.20 percent except for P, S, Si, which may be ≤ 0.60 percent each, and C ≤ 2.0 percent.
  b. Group II: At least one other alloying constituent >0.20 percent and/ any of P, S, Si >0.60 percent.
In the above example, Mn has a higher weight percentage than any of P, S, or Si but does not necessarily have a weight percentage higher than 0.60 percent. Thus, the limits of Mn percentage may be written:
Fe $\geq$ Mn $>$ P, S, Si and any other alloying constituent and Mn ≥ 0.20.
The same guideline is applied to ferrous alloys containing P, S, or Si as major alloying constituents.

B. For mixtures of simple compounds and their solutions, the major constituent is <95.0 percent, or any other constituent is >2.0 percent.

5. *Intermetallics*: An intermetallic is a metal-metal compound formed by metallic elements in a fixed simple atomic ratio. For the purpose of classification, specifications are the same as those for Class 4.
6. *Cermets*: Cermets are ceramic materials such as carbides, oxides, etc., fused with or bonded by one or more pure metals. However, there are also metal-metal cermets, metal-intermetallic cermets, etc., which are also included in this category.
7. *Polymers*: Polymers are chemical compounds or mixtures of compounds formed by polymerization and consisting essentially of repeating molecular structural units.
8. *Composite Systems*: A composite system may consist of materials in combination, with clearly defined boundaries existing between components of the system, or a homogeneous material having a distinct configuration.

For the reader's convenience, the classification scheme for Classes 1 through 4, described above, is summarized in the following table.

SUMMARY TABLE OF TPRC CLASSIFICATION OF MATERIALS

Classification			Limits of Composition (weight percent)			
			X_1	$X_1 + X_2$	X_2	X_3
1. ELEMENTS	A. METALLIC		>99.50	--	<0.20	<0.20
	B. NONMETALLIC		≥95.0	--	≤2.0	≤2.0
2. NONFERROUS ALLOYS (X_1 > Fe)	A. BINARY ALLOYS		--	≥99.50	≥0.20	≤0.20
	B. MULTIPLE ALLOYS		--	≥99.50	>0.20	>0.20
			--	<99.50	≥0.20	≤0.20
			--	<99.50	>0.20	>0.20
			≤99.50	--	<0.20	<0.20
			X_1	X_2	X_3	Mn, P or Si
3. FERROUS ALLOYS (X_1 = Fe ≥ X_2)	A. CARBON STEELS	GROUP I	Fe	C ≤2.0	≤0.20	≤0.60
		GROUP II	Fe	C ≤2.0	≤0.20	>0.60
			Fe	C ≤2.0	>0.20	≤0.60
			Fe	C ≤2.0	>0.20	>0.60
	B. CAST IRONS	GROUP I	Fe	C >2.0	≤0.20	≤0.60
		GROUP II	Fe	C >2.0	≤0.20	>0.60
			Fe	C >2.0	>0.20	≤0.60
			Fe	C >2.0	>0.20	>0.60
	C. ALLOYS* STEELS	GROUP I	Fe	≠C	≤0.20 and C ≤2.0	≤0.60
		GROUP II	Fe	≠C	≤0.20	>0.60
			Fe	≠C	>0.20	≤0.60
			Fe	≠C	>0.20	>0.60
4. NONMETALLIC COMPOUNDS AND THEIR MIXTURES AND SOLUTIONS			X_1	X_2		
	A. SIMPLE COMPOUNDS AND THEIR SOLUTIONS		≥95.0	≤2.0		
	B. MIXTURES OF SIMPLE COMPOUNDS AND THEIR SOLUTIONS		<95.0	≤2.0		
			≥95.0	>2.0		
			<95.0	>2.0		

NOMENCLATURE:

X_1 = Major Constituent

X_2 = Second Highest Constituent

X_3 = Third Highest Constituent

Where: $X_1 \geq X_2 \geq X_3 \geq X_4 \geq \cdots\cdots$

*In case Mn, P, S, or Si represents X_2 this particular element is dropped from the last column.

III. PRESENTATION OF DATA

Each of the six volumes consists of seven sections arranged in the following order:

1. Preface
2. Table of Contents
3. Explanatory Text
4. Conversion Factors
5. Body of Data
6. References
7. Material Index.

In the following paragraphs a detailed description of Sections 5, 6, and 7 is given. The contents of the first four sections are self-explanatory.

BODY OF DATA

Data on each material are presented in graphical or tabular form for selected sets of measurements, and are accompanied by a Reference Information Table with corresponding specifications and remarks. The first five properties listed in Section I of this Explanatory Text are considered as *point values* and are grouped together in a single table in the same manner as the graphs for the other remaining properties. Furthermore, for a given material group, where several properties are reported, data are arranged in accordance with the order of the property list given in Section I of this text.

Graphic Presentation

Data extracted from various references on a given material and property are shown on a single graph by means of distinct plotting symbols, which are identified in the Reference Information Table on the page following the graph. Each set of symbols indicates the data of a given investigator, but does not necessarily imply actual measured points. In numerous instances authors present only smoothed values, either in graphical or tabular form, and it is frequently impossible to distinguish interpolated or smoothed values from actual observed data.

In reporting data on thermal linear expansion, investigators sometimes give a single average value of this property for a considerable temperature range. In such instances it is assumed that a linear relationship is implied. All data on thermal linear expansion were reduced to a datum of 293°K (20°C); i.e., $(\Delta L/L) = 0$ at 293°K (20°C). This point is identified by a cross (+) on each graph.

The definition of $(\Delta L/L)$ used in this work is

$$(\Delta L/L) = \frac{L_T - L_{293}}{L_{293}} \times 100$$

where L_T = length of specimen at temperature T.

L_{293} = length of specimen at 293°K (20°C).

To compute the "coefficient" of thermal linear expansion β from 293°K to any temperature T, the following relation may be used.*

$$\beta = \frac{1}{100\,(T - 293)} \frac{\Delta L}{L}, \text{ in } K^{-1}$$

* It is necessary to divide the right-hand side of this equation by 100 because the graphical presentation of $(\Delta L/L)$ is in percent expansion from 293°K.

In some instances the coefficient of thermal linear expansion is reported in tabular form.

Curves drawn through the plotted points are the "most probable" curves based on the data shown. As additional information becomes available in the future, these recommendations may well be modified.

Point Value Table

Data extracted from various references are identified by distinct symbols in the same manner as data points on a graph. "Most probable" values are given either at the top of the table or are indicated in a footnote. These selections are usually made solely on the basis of the data presented. Sometimes these point values are also reported as a function of temperature or composition, in which case they are shown in graphical form and placed immediately following the tabular values.

Reference Information Table

A table giving the reference information associated with each set of data obtained in the graph immediately follows the graph. The table contains the following information:

1. Symbol. The plotting symbols are identical with and correspond to those used in the graph.
2. Reference. References are identified by hyphenated numbers which serve to locate the bibliographic citation in the section of References at the end of each volume. The initial two digits indicate the year of publication and the last digits identify the specific reference within the given year. In those instances where a reference does not carry a date, the letter symbol ND is used in place of the year of publication. Undated references are listed at the end of the list of References.
3. Temperature Range. Range covered by the data in a given paper or report.
4. Reported Error. The author's estimated accuracy (or precision).
5. Sample Specification. This column contains all pertinent available information about the test sample. This information consists of the following:
   a. Commercial trade name, chemical formula, etc., followed by manufacturer's name, if it is necessary for correct identification.
   b. Composition of the sample, expressed in weight percent. Unless otherwise stated, the percent sign is omitted.
   c. Physical characteristics of the material, such as a single crystal, polycrystalline, density, crystal structures, etc.
   d. Specimen designation by the author is given in brackets at the end of the citation.
6. Remarks. This column contains information on:
   a. Special process used in fabrication of the sample, such as being sintered, chill-cast, etc.
   b. Sample history, such as cold-worked, hot-pressed, annealed, etc.
   c. Conditions under which the specimen was investigated, environment, etc.
   d. Other pertinent remarks.

REFERENCES

The section on Reference gives complete bibliographic citations for all the references from which data were extracted. They are arranged chronologically by year of publication, and in arbitary sequence within any given year.

For the preparation of the references, the following order and convention is used.

Periodicals

1. Author(s) name: Last name first, followed by initials.
2. Journal name: Standard TPRC journal name abbreviations are used.
3. Series, volume, and number.

a. If the series is represented by a letter, it is underlined together with the volume number.
b. If the series is represented by a number, then only the numeral representing the volume is underlined.
c. The numeral for the issue number is shown in parentheses.

4. Pages: Indicate the beginning and ending pages.

Reports

1. Author(s) name is given in the same form as for periodicals.
2. The name of the responsible organization, if any.
3. The name of sponsor.
4. Report, bulletin, or circular designation.
5. Number.
6. Part.
7. Pages (same as for periodicals).
8. AD and PB numbers or equivalents.

Books

The bibliographic citation for books lists: author(s), title, volume, edition, publisher, and page(s).

In general, private communications are not listed as references. However, if TPRC did obtain additional substantive information from an author through private communication, and if this information was used, the remark "additional data obtained from author(s)" is added at the end of the reference citation.

MATERIAL INDEX

The Material Index lists all the materials included in this work by their proper trade or commercial names arranged in alphabetical order and, for materials designated by number codes, the listing is in increasing numerical order. Location of information on a particular property for a particular material is specified by the volume number and page numbers indicated within the appropriate property column of the index. The page number always indicates the starting page of the graphs or point value tables. Chemical formulas are given in parentheses following the proper names of materials which can be chemically identified. However, for materials within a general group, e.g., different oxides of cerium, the entries are only by chemical formulas listed under the material group designation, such as "cerium oxides." Whenever applicable, an effort is made to list commercial materials under their several accepted names. In the case of broad classes of materials, such as steels, glasses, etc., the materials are listed under their common names as well as under the heading of their general class when the designation is merely a letter and number code.

Simpler inorganic compounds (e.g., aluminum oxide, tantalum boride) are named according to the convention given in the *Handbook of Chemistry and Physics* (The Chemical Rubber Co., 45th edition, 1964, and—if not available there—the 43rd edition, 1962). Other inorganic compounds are generally named in accordance with the convention given in the *Chemical Abstracts* by giving the more electropositive part of the name first and the more electronegative part second. For nonferrous and ferrous alloys, only the first two components are listed and ΣX_i is added to designate multiple alloys. An exception is made, however, for chromium-nickel and nickel-chromium ferrous alloys, in which cases, all three major constituents are listed. For other inorganic compounds and their mixtures and solutions, all components with weight percent greater than 2 percent are listed. Finally, for cermets, the name of the ceramic part is given first and the metal part second, each in their respective alphabetical order regardless of their weight percentages, with the exception of beryllium cermet (e.g., Beryllium YB-9052), in which case the name of the metal part is given first.

CONVERSION FACTORS

NOTE: In preparing the conversion factors, the following basic definitions were used:

$$1 \text{ in.} = 2.54 \text{ cm}^*$$

$$1 \text{ lb.} = 453.59237 \text{ g}^*$$

$$1 \text{ cal}_{Th} = 4.184 \text{ (exactly) Joule}^*$$

$$1 \text{ cal}_{IT} = 4.1868 \text{ (exactly) Joule}^*$$

$$1 \text{ Btu}_{IT}\text{lb}^{-1}\text{F}^{-1} = 1 \text{ cal}_{IT}\text{g}^{-1}\text{C}^{-1}\ddagger$$

The subscripts "Th" and "IT" denote "Thermochemical" and "International Steam Table" units, respectively.

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* *NBS Technical News Bulletin*, 47(10), 1963.

‡ Mueller, E. F., and Rossini, F. D., *Am. J. Physics*, 12(1). 4, 1944.

CONVERSION FACTORS FOR UNITS OF DENSITY

MULTIPLY by appropriate factor to OBTAIN →	g cm^{-3}	g $in.^{-3}$	kg m^{-3}	kg ft^{-3}	lb $in.^{-3}$	lb ft^{-3}
g cm^{-3}	1	1.63872×10	1.0×10^{3}	2.83170×10	3.61275×10^{-2}	6.24283×10
g $in.^{-3}$	6.10234×10^{-2}	1	6.10234×10	1.72800	2.20462×10^{-3}	3.80959
kg m^{-3}	1.0×10^{3}	1.63872×10^{-2}	1	2.83170×10^{-2}	3.61275×10^{-5}	6.24283×10^{-2}
kg ft^{-3}	3.51446×10^{-2}	5.78704×10^{-1}	3.53145×10	1	1.27582×10^{-3}	2.20462
lb $in.^{-3}$	2.76797×10	4.53592×10^{2}	2.76797×10^{4}	7.83808×10^{2}	1	1.72800×10^{3}
lb ft^{-3}	1.60184×10^{-2}	2.62496×10^{-1}	1.60184×10	4.53592×10^{-1}	5.78704×10^{-4}	1

CONVERSION FACTORS FOR UNITS OF LATENT HEAT

MULTIPLY ↓ by appropriate factor to OBTAIN →	$cal_{Th}g^{-1}$	$cal_{IT}g^{-1}$	W sec g^{-1}	$J_{Int}g^{-1}$	$Btu_{Th}lb^{-1}$	$Btu_{IT}lb^{-1}$
$cal_{Th}g^{-1}$	1	9.99331×10^{-1}	4.184	4.18331	1.8	1.79880
$cal_{IT}g^{-1}$	1.00067	1	4.1868	4.18611	1.80120	1.8
W sec g^{-1}	2.39006×10^{-1}	2.38846×10^{-1}	1	9.99835×10^{-1}	4.30210×10^{-1}	4.29923×10^{-1}
$J_{Int}g^{-1}$	2.39045×10^{-1}	2.38885×10^{-1}	1.00017	1	4.30281×10^{-1}	4.29994×10^{-1}
$Btu_{Th}lb^{-1}$	5.55556×10^{-1}	5.55184×10^{-1}	2.32444	2.32406	1	9.99331×10^{-1}
$Btu_{IT}lb^{-1}$	5.55627×10^{-1}	5.55556×10^{-1}	2.326	2.32562	1.00067	1

CONVERSION FACTORS FOR UNITS OF SPECIFIC HEAT

MULTIPLY by appropriate factor to OBTAIN →	$cal_{Th}\,g^{-1}C^{-1}$	$cal_{IT}\,g^{-1}C^{-1}$	W sec $g^{-1}K^{-1}$	$J_{Int}\,g^{-1}K^{-1}$	$Btu_{Th}\,lb^{-1}F^{-1}$	$Btu_{IT}\,lb^{-1}F^{-1}$
$cal_{Th}\,g^{-1}C^{-1}$	1	9.99331×10^{-1}	4.184	4.18331	1	9.99331×10^{-1}
$cal_{IT}\,g^{-1}C^{-1}$	1.00067	1	4.1868	4.18611	1.00067	1
W sec $g^{-1}K^{-1}$	2.390006×10^{-1}	2.38846×10^{-1}	1	9.99835×10^{-1}	2.39006×10^{-1}	2.38846×10^{-1}
$J_{Int}\,g^{-1}K^{-1}$	2.39045×10^{-1}	2.38885×10^{-1}	1.00017	1	2.39045×10^{-1}	2.38885×10^{-1}
$Btu_{Th}\,lb^{-1}F^{-1}$	1	9.99331×10^{-1}	4.184	4.18331	1	9.99331×10^{-1}
$Btu_{IT}\,lb^{-1}F^{-1}$	1.00067	1	4.1868	4.18611	1.00067	1

Note: To convert quantities per "gram" to "mol" basis multiply conversion factor by the molecular weight M.

CONVERSION FACTORS FOR UNITS OF THERMAL CONDUCTIVITY

MULTIPLY ↓ by appropriate factor to OBTAIN →	Btu_{IT} $ar^{-1}ft^{-1}$ F^{-1}	Btu_{IT} $in.\ hr^{-1}ft^{-2}F^{-1}$	cal_{IT} $sec^{-1}cm^{-1}$ C^{-1}	cal_{Th} $sec^{-1}cm^{-1}$ C^{-1}	$kcal_{Th}$ hr^{-1} m^{-1} C^{-1}	W cm^{-1} K^{-1}
Btu_{IT} $hr^{-1}ft^{-1}$ F^{-1}	1	1.2 x 10	4.13379×10^{-3}	4.13656×10^{-3}	1.48916	1.73073×10^{-2}
Btu_{IT} $in.\ hr^{-1}ft^{-2}$ F^{-1}	8.33333×10^{-2}	1	3.44482×10^{-4}	3.44713×10^{-4}	1.24097×10^{-1}	1.44228×10^{-3}
cal_{IT} $sec^{-1}cm^{-1}$ C^{-1}	2.41909×10^{2}	2.90291×10^{3}	1	1.00067	3.60241×10^{2}	4.1868
cal_{Th} $sec^{-1}cm^{-1}$ C^{-1}	2.41747×10^{2}	2.90096×10^{3}	9.99331×10^{-1}	1	3.6×10^{2}	4.184
$kcal_{Th}$ hr^{-1} m^{-1} C^{-1}	6.71520×10^{-1}	8.05824	2.77592×10^{-3}	2.77778×10^{-3}	1	1.16222×10^{-3}
W cm^{-1} K^{-1}	5.77789×10	6.93347×10^{2}	2.38846×10^{-1}	2.39006×10^{-1}	8.60421×10	1

CONVERSION FACTORS FOR UNITS OF THERMAL DIFFUSIVITY

MULTIPLY by appropriate factor to OBTAIN →	cm^2sec^{-1}	cm^2hr^{-1}	m^2hr^{-1}	$in.^2sec^{-1}$	ft^2sec^{-1}	ft^2hr^{-1}
cm^2sec^{-1}	1	3.60×10^3	3.60×10^{-1}	1.550×10^{-1}	1.07639×10^{-3}	3.87501
cm^2hr^{-1}	2.77778×10^{-4}	1	1.0×10^{-4}	4.30556×10^{-5}	2.98998×10^{-7}	1.07639×10^{-3}
m^2hr^{-1}	2.77778	1.0×10^4	1	4.30556	2.98998×10^{-3}	1.07639×10
$in.^2sec^{-1}$	6.45160	2.32258×10^4	2.32258	1	6.94444×10^{-3}	2.50×10
ft^2sec^{-1}	9.29030×10^2	3.34451×10^6	3.34451×10^2	1.440×10^2	1	3.60×10^3
ft^2hr^{-1}	2.58064×10^{-1}	9.29030×10^2	9.29030×10^{-2}	4.0×10^{-2}	2.77778×10^{-4}	1

CONVERSION FACTORS FOR UNITS OF VAPOR PRESSURE

MULTIPLY by appropriate factor to OBTAIN →	dyne cm^{-2}	atm	kg cm^{-2}	mm Hg	in. Hg	lb $in.^{-2}$
dyne cm^{-2}	1	9.8690×10^{-7}	1.01970×10^{-6}	7.5010×10^{-4}	2.9530×10^{-5}	1.45040×10^{-5}
atm	1.01330×10^{6}	1	1.03320	7.60×10^{2}	2.9920×10	1.46960×10
kg cm^{-2}	9.8070×10^{5}	9.6780×10^{-1}	1	7.3560×10^{2}	2.8960×10	1.42230×10
mm Hg	1.33320×10^{3}	1.31580×10^{-3}	1.35950×10^{-3}	1	3.9370×10^{-2}	1.93370×10^{-2}
in. Hg	3.3860×10^{4}	3.3420×10^{-2}	3.4530×10^{-2}	2.540×10	1	4.9120×10^{-1}
lb $in.^{-2}$	6.89470×10^{4}	6.80460×10^{-2}	7.0310×10^{-2}	5.1710×10	2.0360	1

BODY OF DATA

INTERMETALLICS, CERMETS, POLYMERS, AND COMPOSITE SYSTEMS

PART I

INTERMETALLICS

(A metal - metal compound formed by metallic elements in a fixed simple atomic ratio.)

NOTE: For purposes of classification, intermetallic compounds and their mixtures and alloys are specified as follows:

1. For simple compounds, the limit of impurities is ≤ 2.0 percent for each foreign constituents and ≤ 5.0 percent total impurities.
2. For their mixtures and alloys, the major constituent is <95.0 percent, or any other constituent is >2.0 percent.

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PROPERTIES OF CHROMIUM ALUMINIDES

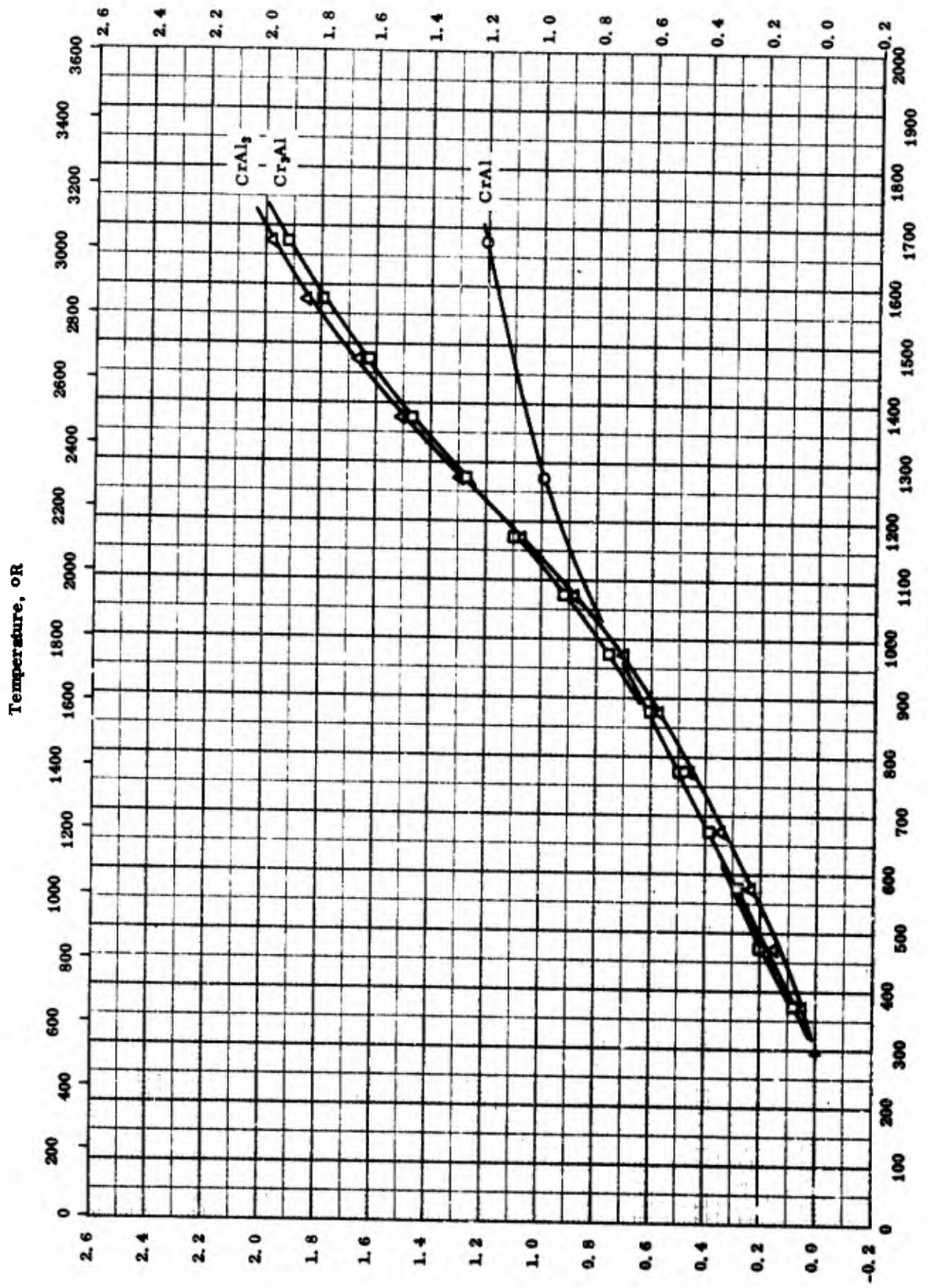
REPORTED VALUES

Melting Point	K	R
O Cr_3Al	> 1872	> 3370

PROPERTIES OF CHROMIUM ALUMINIDES

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
O	52-26 also 54-28	1872		Cr_2Al.	

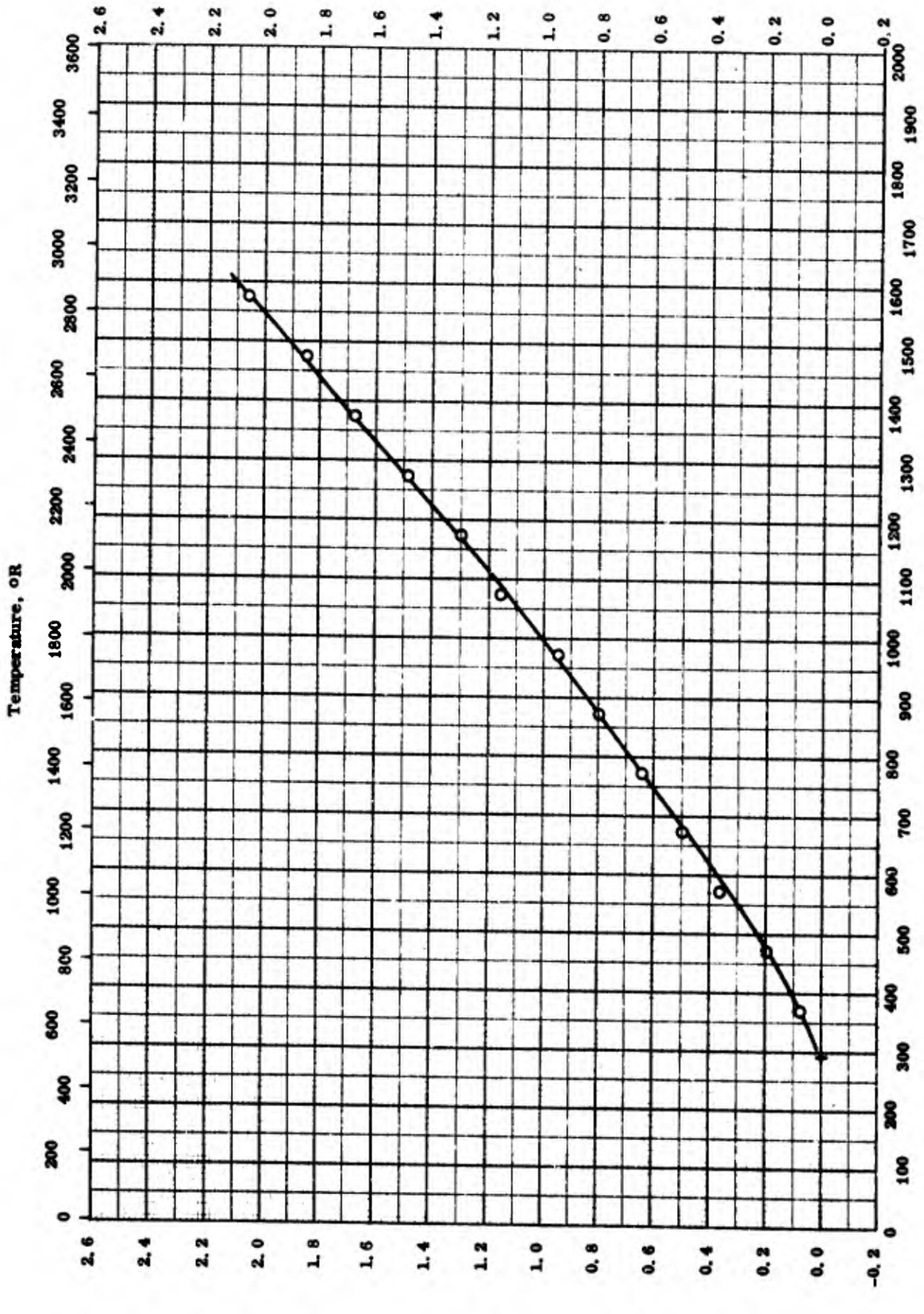


THERMAL LINEAR EXPANSION -- CHROMIUM ALUMINIDES

THERMAL LINEAR EXPANSION -- CHROMIUM ALUMINIDES

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
O	51-3	293-1673		CrAl.	Hot pressed.
△	55-18	293-1673		$CrAl_3$; prepared from Cr and Al powders of particle size less than 325 mesh.	Uniformly mixed, cold-pressed in graphite die, hot-pressed in a protective atmosphere, and then ground.
□	55-18	293-1673		Cr_2Al; same raw materials as above.	Same as above.



THERMAL LINEAR EXPANSION -- COBALT ALUMINIDE

THERMAL LINEAR EXPANSION -- COBALT ALUMINIDE

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
O	55-18	293-1573		CoAl; prepared from Co and Al powder of particle size less than 325 mesh.	Uniformly mixed, cold-pressed in graphite die, hot-pressed in a protective atmosphere, and then ground.

PROPERTIES OF MOLYBDENUM ALUMINIDES

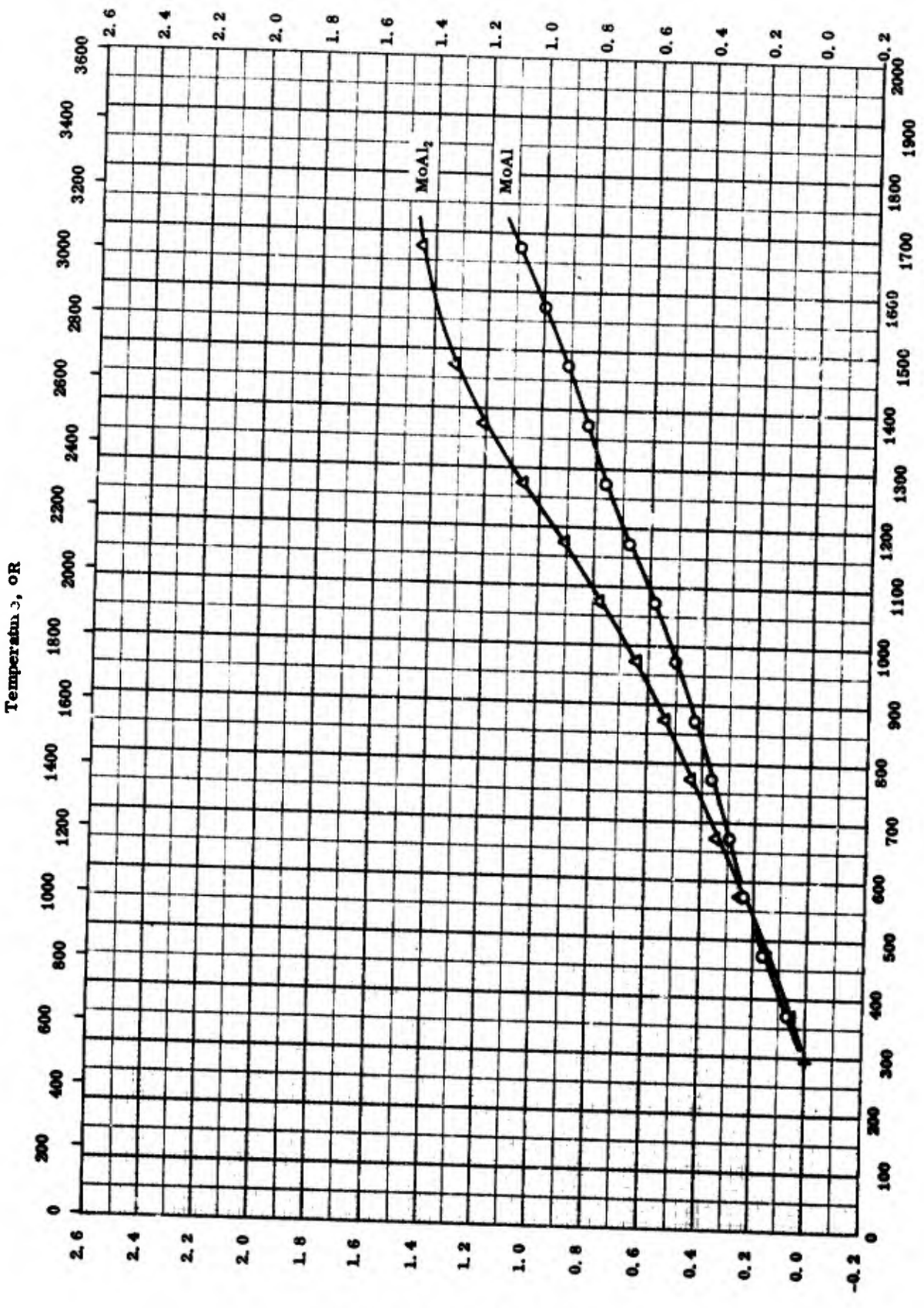
REPORTED VALUES

Melting Point	K	R
○ Mo_3Al; cubic	2422	4360
MoAl	1972	3550

PROPERTIES OF MOLYBDENUM ALUMINIDES

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
O	52-26	1972-2422		MoAl and cubic Mo_3Al.	

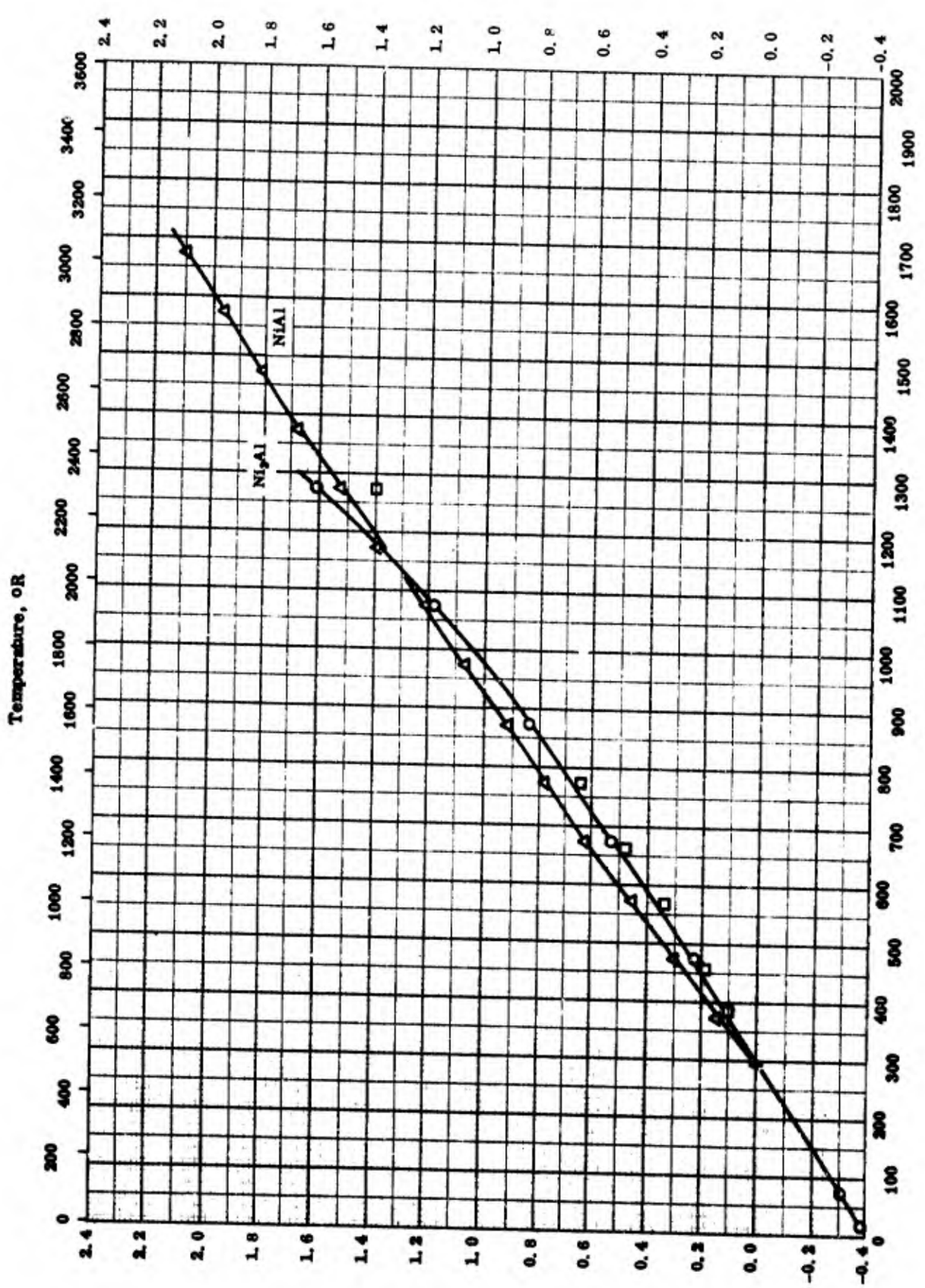


THERMAL LINEAR EXPANSION -- MOLYBDENUM ALUMINIDES

THERMAL LINEAR EXPANSION -- MOLYBDENUM ALUMINIDES

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
O	55-18	293-1673		MoAl; prepared from Al and Mo powders of particle size less than 325 mesh.	Uniformly mixed, cold-pressed in graphite die, then hot-pressed in a protective atmosphere, and then ground.
Δ	55-18	293-1673		$MoAl_2$; same raw materials as above.	Same as above.

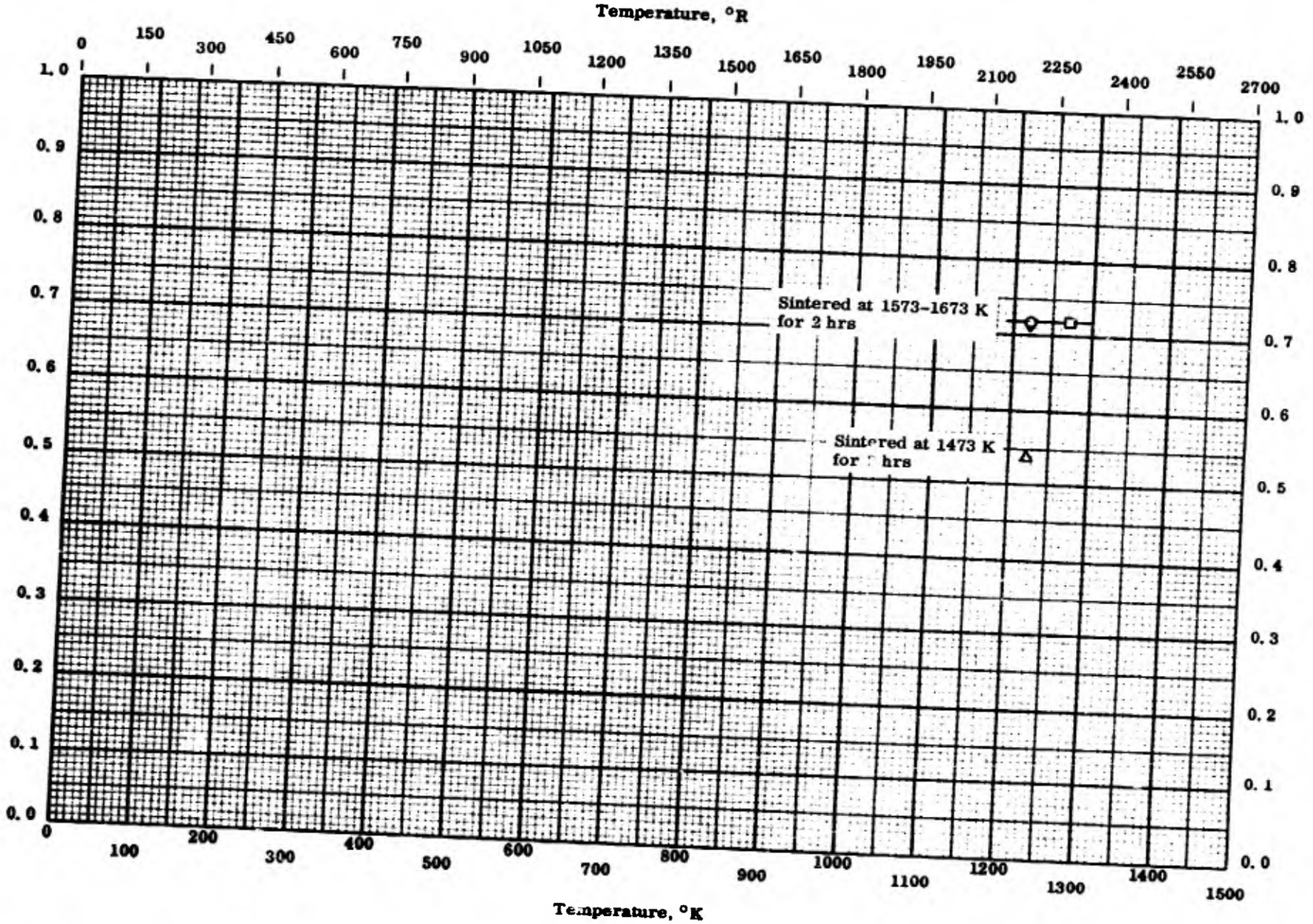


THERMAL LINEAR EXPANSION -- NICKEL ALUMINIDES

THERMAL LINEAR EXPANSION -- NICKEL ALUMINIDES

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
○	52-10	28-1273		Ni_3Al; Ni analysis: 0.034 C, 0.018 Fe, and 0.002 each Cu, Si; Al analysis: 0.005 each Fe, Cu and 0.001 Mg.	Annealed in vacuum four days at 1200 F; heating rate during test: 3 C min^{-1}.
□	52-11	293-1273		NiAl.	Prepared by pressing powders above 1350 C for 10 - 12 min.
△	55-18	293-1673		NiAl; prepared from Ni and Al powders of particle size less than 325 mesh.	Uniformly mixed, cold-pressed in graphite die, hot-pressed in a protective atmosphere, and then ground.



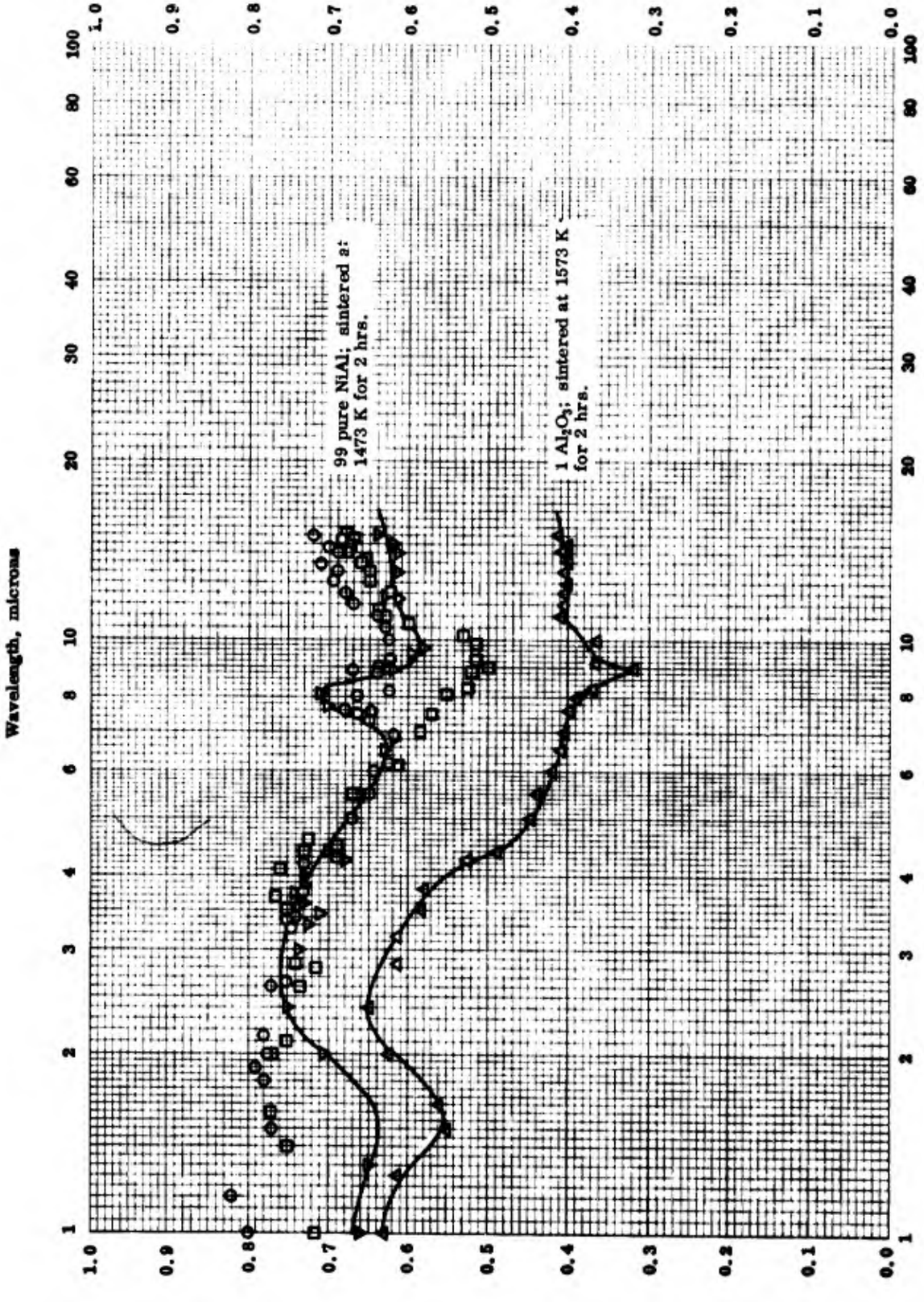
TPRC

NORMAL TOTAL EMITTANCE -- NICKEL ALUMINIDES

NORMAL TOTAL EMITTANCE -- NICKEL ALUMINIDES

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
○	63-16	1223	± 8	99 NiAl and 1 NiO; 0.047 in. thickness plate; density 4.91 g cm^{-3}.	Sintered at 1623 K for 2 hrs; measured in argon atm.; calculated from spectral data.
△	63-16	1223	± 8	99 NiAl and 1 Al_2O_3; 0.086 in. thickness plate; density 3.92 g cm^{-3}.	Same as above except sintered at 1573 K for 2 hrs.
□	63-16	1273	± 8	99 pure NiAl; 0.075 in. thickness plate; density 3.8 g cm^{-3}.	Same as above except sintered at 1673 K for 2 hrs.
▽	63-16	1223	± 8	99 pure Ni_3Al; 0.047 in. thickness plate; density 3.32 g cm^{-3}.	Same as above except sintered at 1473 K for 2 hrs.

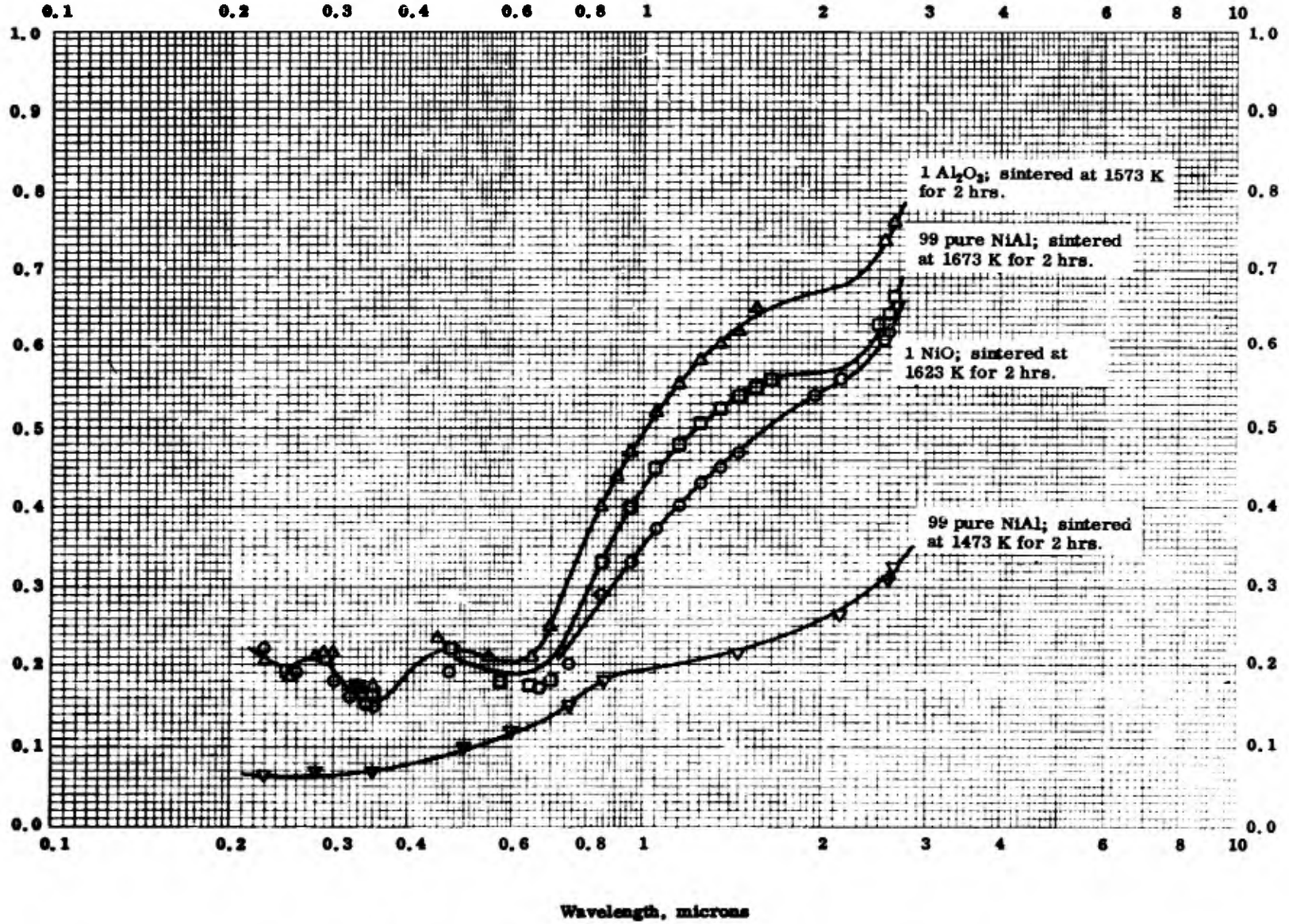


NORMAL SPECTRAL EMITTANCE -- NICKEL ALUMINIDES

NORMAL SPECTRAL EMITTANCE — NICKEL ALUMINIDES

REFERENCE INFORMATION

Symbol	Ref.	Temp. °K	Wavelength Range, μ	Rept. Error %	Sample Specifications	Remarks
○	63-16	1223	1-15		99 NiAl and 1 NiO; 0.047 in. thickness plate; density 4.91 g cm^{-3}.	Sintered at 1623 K for 2 hrs; measured in argon atm.; data taken from a curve.
△	63-16	1223	1-15		99 NiAl and 1 Al_2O_3; 0.086 in. thickness plate; density 3.92 g cm^{-3}.	Same as above except sintered at 1573 K for 2 hrs.
□	63-16	1273	1-15		99 pure NiAl; 0.075 in. thickness plate; density 3.8 g cm^{-3}.	Same as above except sintered at 1673 K for 2 hrs.
▽	63-16	1223	1-15		99 pure Ni_3Al; 0.047 in. thickness plate; density 3.32 g cm^{-3}.	Same as above except sintered at 1473 K for 2 hrs.



NORMAL SPECTRAL REFLECTANCE -- NICKEL ALUMINIDES

NORMAL SPECTRAL REFLECTANCE -- NICKEL ALUMINIDES

REFERENCE INFORMATION

Symbol	Ref.	Temp. °K	Wavelength Range, μ	Rept. Error %	Sample Specifications	Remarks
○	63-16	298	0.23-2.65	5	99 NiAl and 1 NiO; 0.047 in. thickness plate; density 4.91 g cm^{-3}.	Sintered at 1623 K for 2 hrs; data taken from a curve; normal incidence, hemispherical viewing; MgO as reference standard.
△	63-16	298	0.23-2.65	5	99 NiAl and 1 Al_2O_3; 0.086 in. thickness plate; density 3.92 g cm^{-3}.	Same as above except sintered at 1573 K for 2 hrs.
□	63-16	298	0.23-2.65	5	99 pure NiAl; 0.075 in. thickness plate; density 3.8 g cm^{-3}.	Same as above except sintered at 1673 K for 2 hrs.
▽	63-16	298	0.23-2.65	5	99 pure Ni_3Al; 0.047 in. thickness plate; density 3.32 g cm^{-3}.	Same as above except sintered at 1473 K for 2 hrs.

PROPERTIES OF NIOBIUM ALUMINIDES

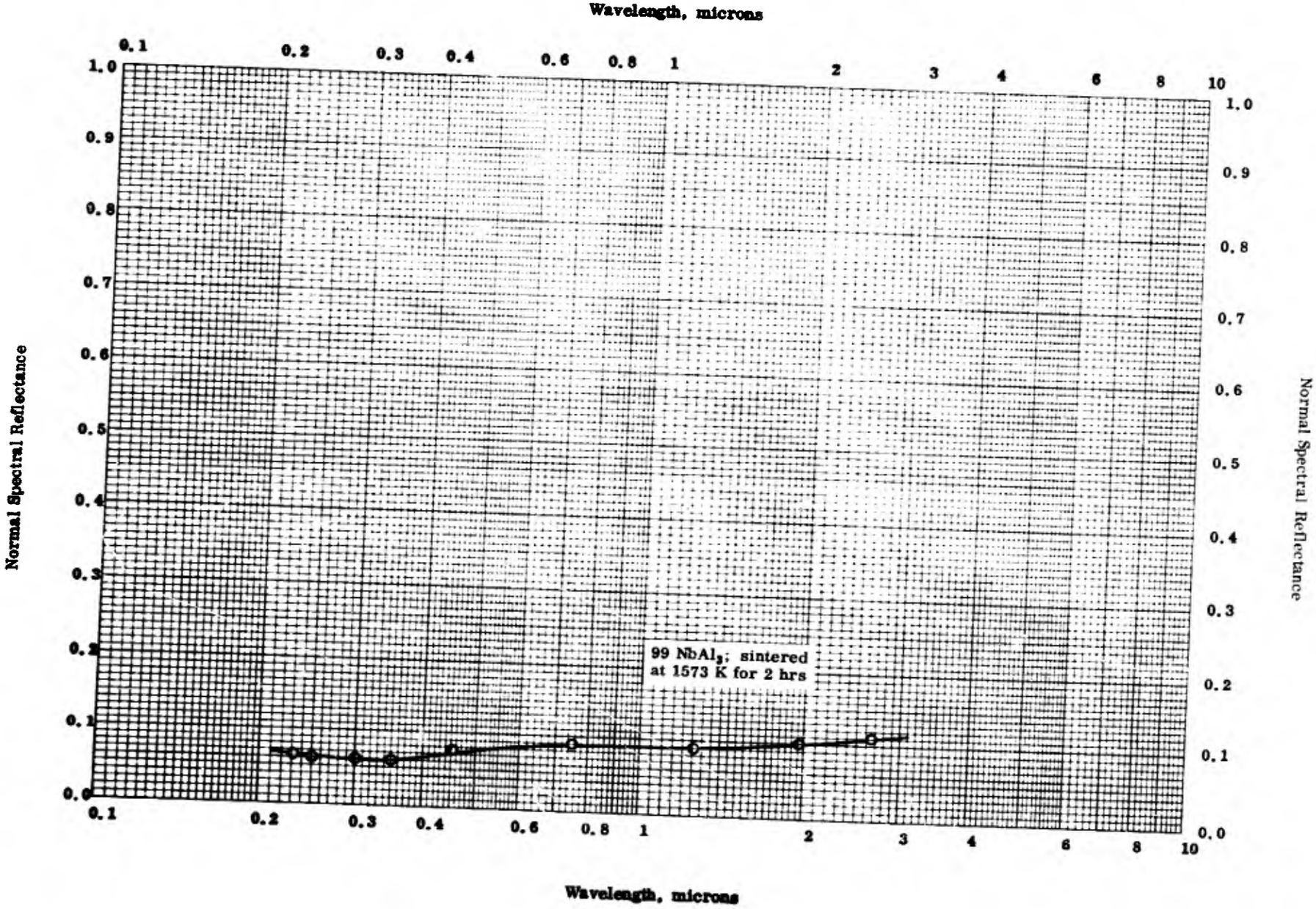
REPORTED VALUES

Melting Point	K	R
○ $NbAl_3$	1972 ± 28	3549 ± 50

PROPERTIES OF NIOBIUM ALUMINIDES

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
O	59-6	1944-2000		$NbAl_3$.	

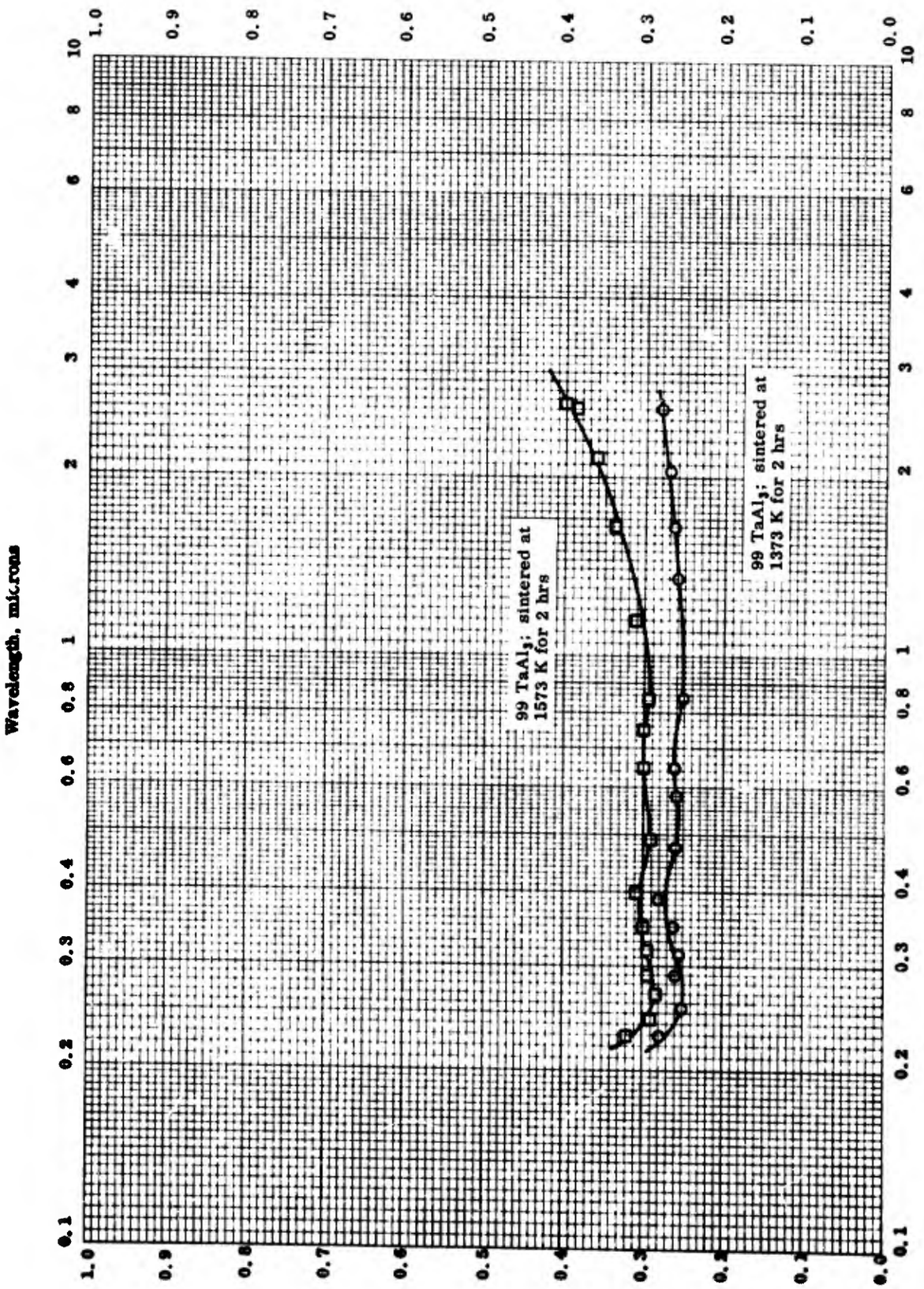


NORMAL SPECTRAL REFLECTANCE -- NIOBIUM ALUMINIDE

NORMAL SPECTRAL REFLECTANCE -- NIOBIUM ALUMINIDE

REFERENCE INFORMATION

Symbol	Ref.	Temp. ° K	Wavelength Range, μ	Rept. Error %	Sample Specifications	Remarks
O	63-16	298	0.23-2.65	5	99 pure $NbAl_3$; 0.062 in. thickness plate; density 2.74 g cm^{-3}.	Sintered at 1573 K for 2 hrs; data taken from a curve; normal incidence, hemispherical viewing; MgO as reference standard.



NORMAL SPECTRAL REFLECTANCE -- TANTALUM ALUMINIDE

NORMAL SPECTRAL REFLECTANCE -- TANTALUM ALUMINIDE

REFERENCE INFORMATION

Symbol	Ref.	Temp. ° K	Wavelength Range, μ	Rept. Error %	Sample Specifications	Remarks
○	63-16	298	0.23-2.65	5	99 pure $TaAl_3$; 0.052 in. thickness plate; density 4.53 g cm^{-3}.	Sintered at 1373 K for 2 hrs; data taken from a curve; normal incidence, hemispherical viewing; MgO as reference standard.
□	63-16	298	0.23-2.65	5	99 pure $TaAl_3$; 0.053 in. thickness plate; density 4.88 g cm^{-3}.	Same as above except sintered at 1573 K for 2 hrs.

PROPERTIES OF TITANIUM ALUMINIDES

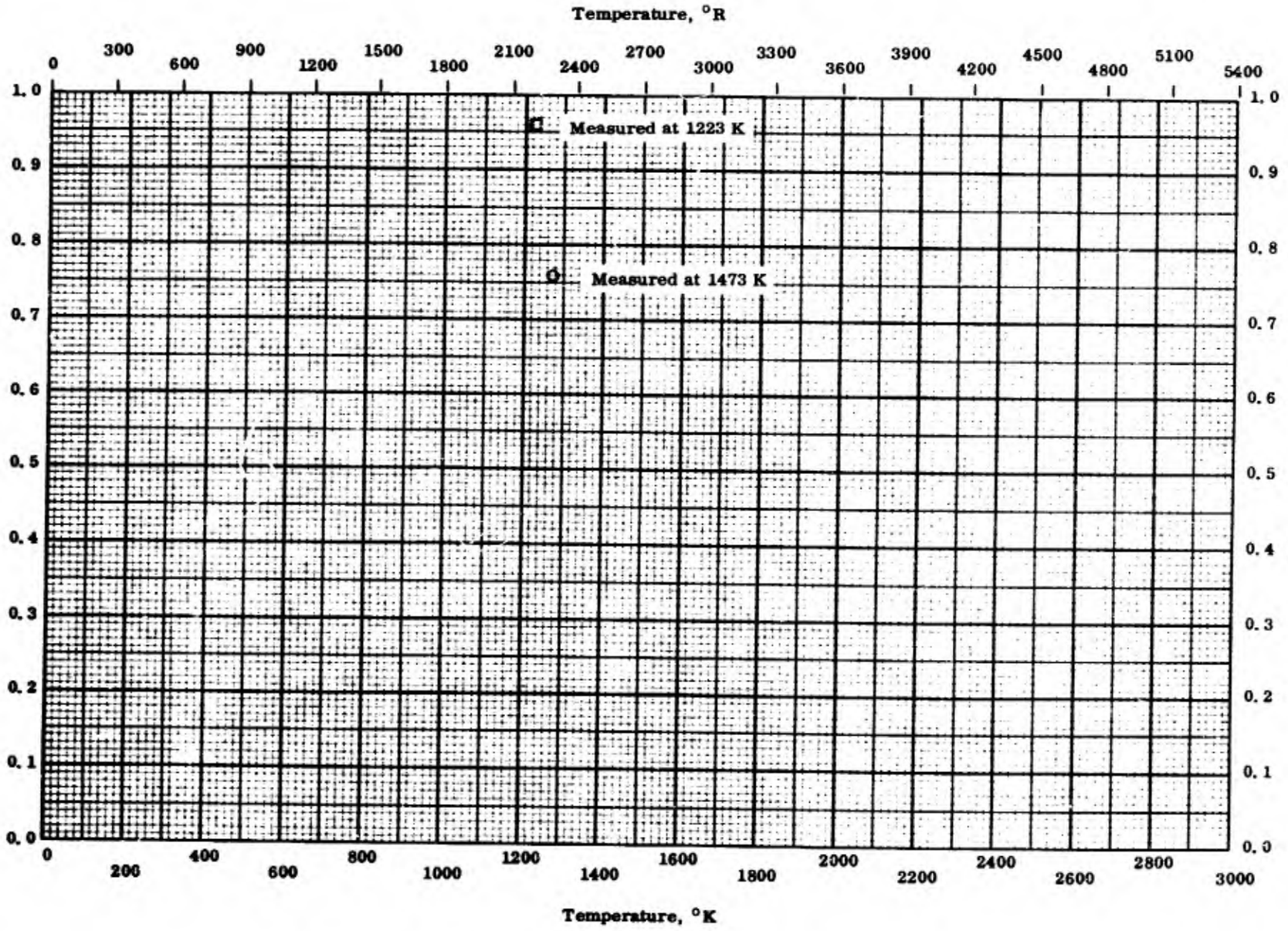
REPORTED VALUES

Density	$g\ cm^{-3}$	$lb\ ft^{-3}$
○ γ - Ti Al	4.0	250
Melting Point	**K**	**R**
□ TiAl; tetragonal	1773	3191

PROPERTIES OF TITANIUM ALUMINIDES

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
O	54-22	298		TiAl in γ phase.	Reacted Ti sponge and Al powder; vacuum homogonized; either hot pressed at 1350 - 1400 C or sintered at 1385 - 1435 C.
□	33-1	1733		TiAl.	

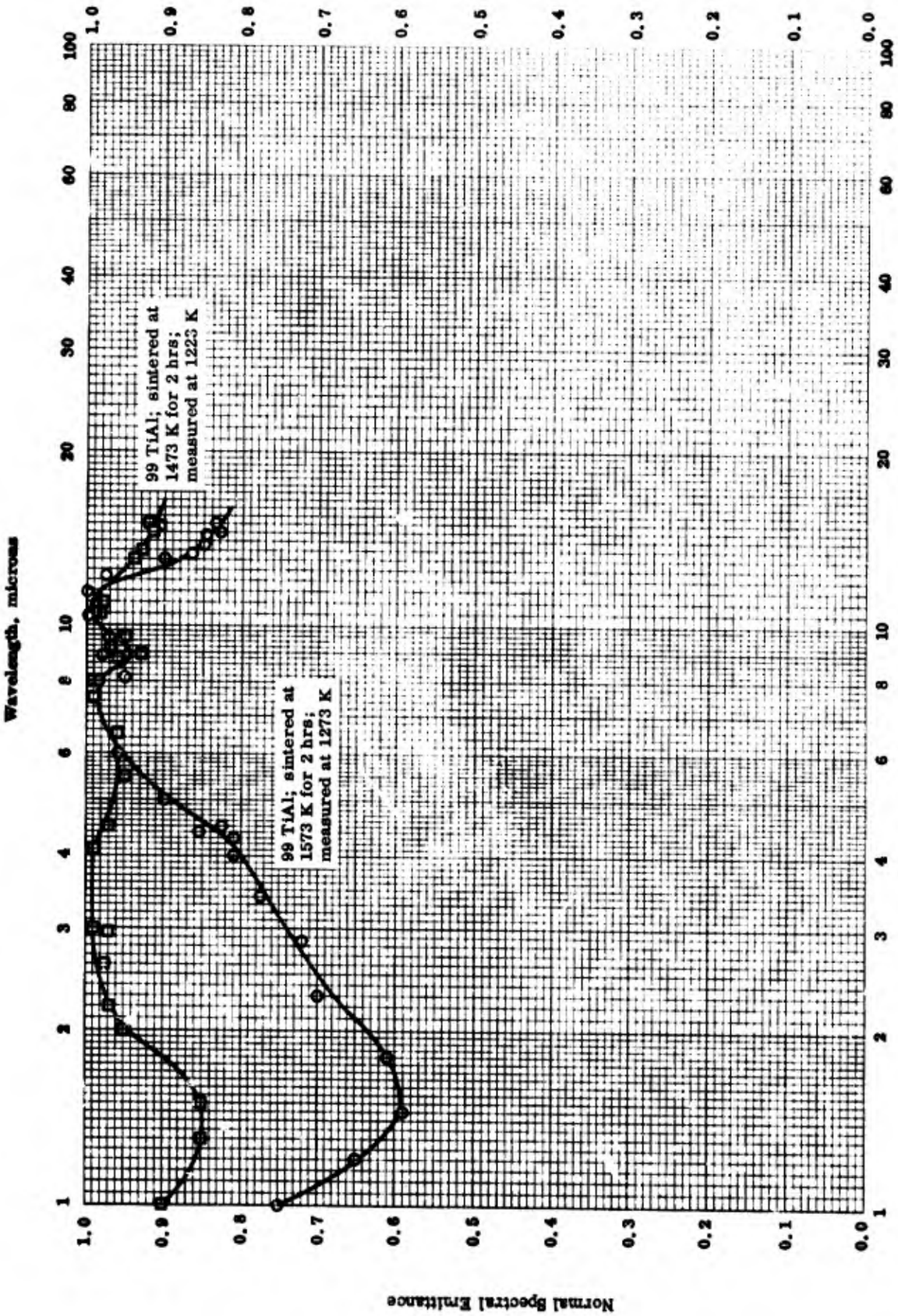


NORMAL TOTAL EMITTANCE -- TITANIUM ALUMINIDE

NORMAL TOTAL EMITTANCE -- TITANIUM ALUMINIDE

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
○	63-16	1273	±8	99 TiAl and 1 Al_2O_3; 0.061 in. thickness plate; density 2.46 g cm^{-3}.	Sintered at 1573 K for 2 hrs; measured in argon atmosphere; calculated from spectral data.
□	63-16	1223	±8	99 pure TiAl; 0.085 in. thickness plate; density 2.57 g cm^{-3}.	Same as above except sintered at 1473 K for 2 hrs.

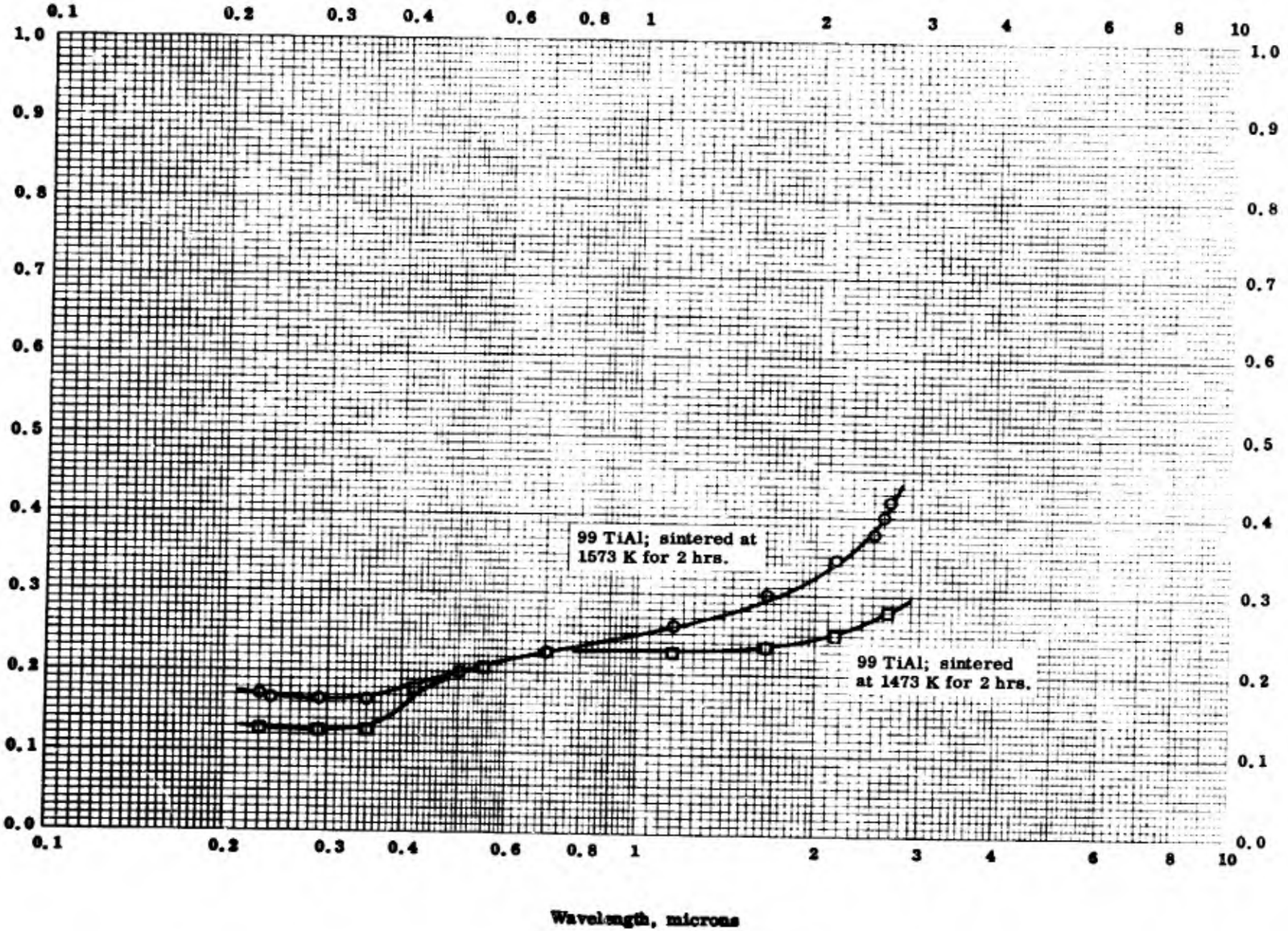


NORMAL SPECTRAL EMITTANCE -- TITANIUM ALUMINIDE

NORMAL SPECTRAL EMITTANCE -- TITANIUM ALUMINIDE

REFERENCE INFORMATION

Symbol	Ref.	Temp. °K	Wavelength Range μ	Rept. Error%	Sample Specifications	Remarks
○	63-16	1273	1-15		99 TiAl and 1 Al_2O_3; 0.061 in. thickness plate; density 2.46 g cm^{-3}.	Sintered at 1573 K for 2 hrs; measured in argon atm; data taken from a curve.
□	63-16	1223	1-15		99 pure TiAl; 0.085 in. thickness plate; density 2.57 g cm^{-3}.	Same as above except sintered at 1473 K for 2 hrs.



NORMAL SPECTRAL REFLECTANCE -- TITANIUM ALUMINIDE

NORMAL SPECTRAL REFLECTANCE -- TITANIUM ALUMINIDE

REFERENCE INFORMATION

Symbol	Ref.	Temp. °K	Wavelength Range μ	Rept. Error%	Sample Specifications	Remarks
O	63-16	298	0.23-2.65	5	99 TiAl and 1 Al_2O_3; 0.067 in. thickness plate; density 2.50 g cm^{-3}.	Sintered at 1573 K for 2 hrs; data taken from a curve; normal incidence, hemispherical viewing; MgO as reference standard.
□	63-16	298	0.23-2.65	5	99 pure TiAl; 0.085 in. thickness plate; density 2.57 g cm^{-3}.	Same as above except sintered at 1473 K for 2 hrs.

PROPERTIES OF URANIUM ALUMINIDES

REPORTED VALUES

Density		g cm^{-3}	lb ft^{-3}
○	$U Al_2$	8.14*	508*
□	$U Al_2$	8.38	523
	$U Al_3$	6.8*	420*
△	$U Al_2$	8.21	512
	$U Al_3$	6.4	400
▽	$U Al_4$	6.5*	406*
◇	$U Al_4$	5.7 ± 0.3	356 ± 20

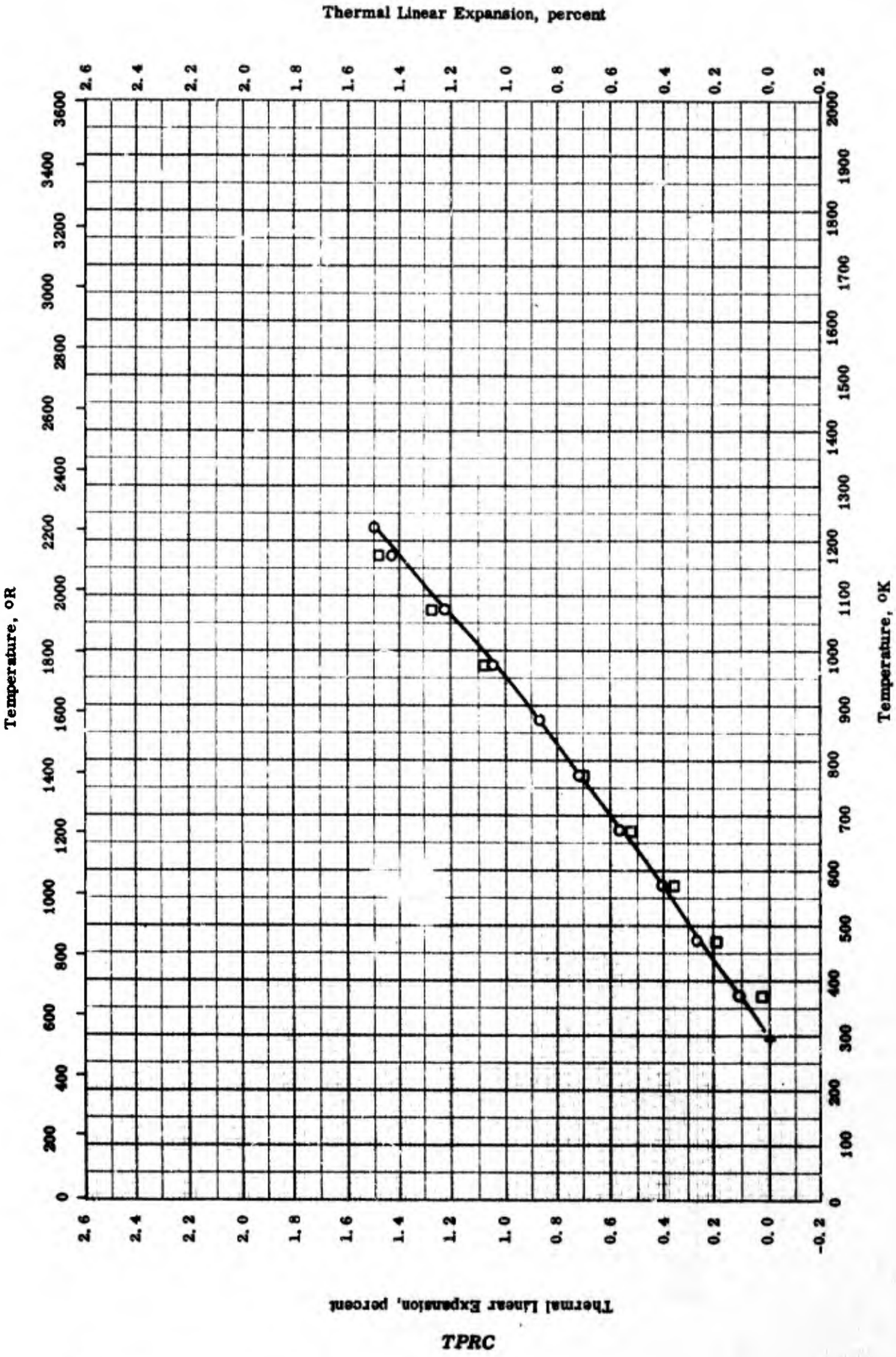
Melting Point		K	R
■	$U Al_2$	1860	3350
●	$U Al_3$	1620	2920

*Most probable value for this compound.

PROPERTIES OF URANIUM ALUMINIDES

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
○	57-19	298		$U Al_2$	Computed from x-ray measurements of lattice.
□	50-6	298		$U Al_2$ and $U Al_3$	Same as above.
■	50-6	1860		$U Al_2$	By break in time-temperature curve.
●	50-6	1620		$U Al_3$	Same as above.
△	50-6	298		$U Al_2$ and $U Al_3$	Method not given.
▽	50-9	298		$U Al_4$	Computed from x-ray measurements of lattice.
◇	50-9	298		$U Al_4$	Measured; difference between measured and the above is due to lattice defects.



THERMAL LINEAR EXPANSION -- URANIUM ALUMINIDE

THERMAL LINEAR EXPANSION -- URANIUM ALUMINIDE

REFERENCE INFORMATION

Sym bol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
○	57-19	293-1223		UAl_2; 0.20 W, 0.08 Fe, 0.02 Cu and < 0.01 each of any others.	Sintered; measured in vacuum of 5×10^{-5} mm Hg; heating.
□	57-19	293-1223		Same as above.	Cooling data of the above sample.

PROPERTIES OF ZIRCONIUM ALUMINIDES

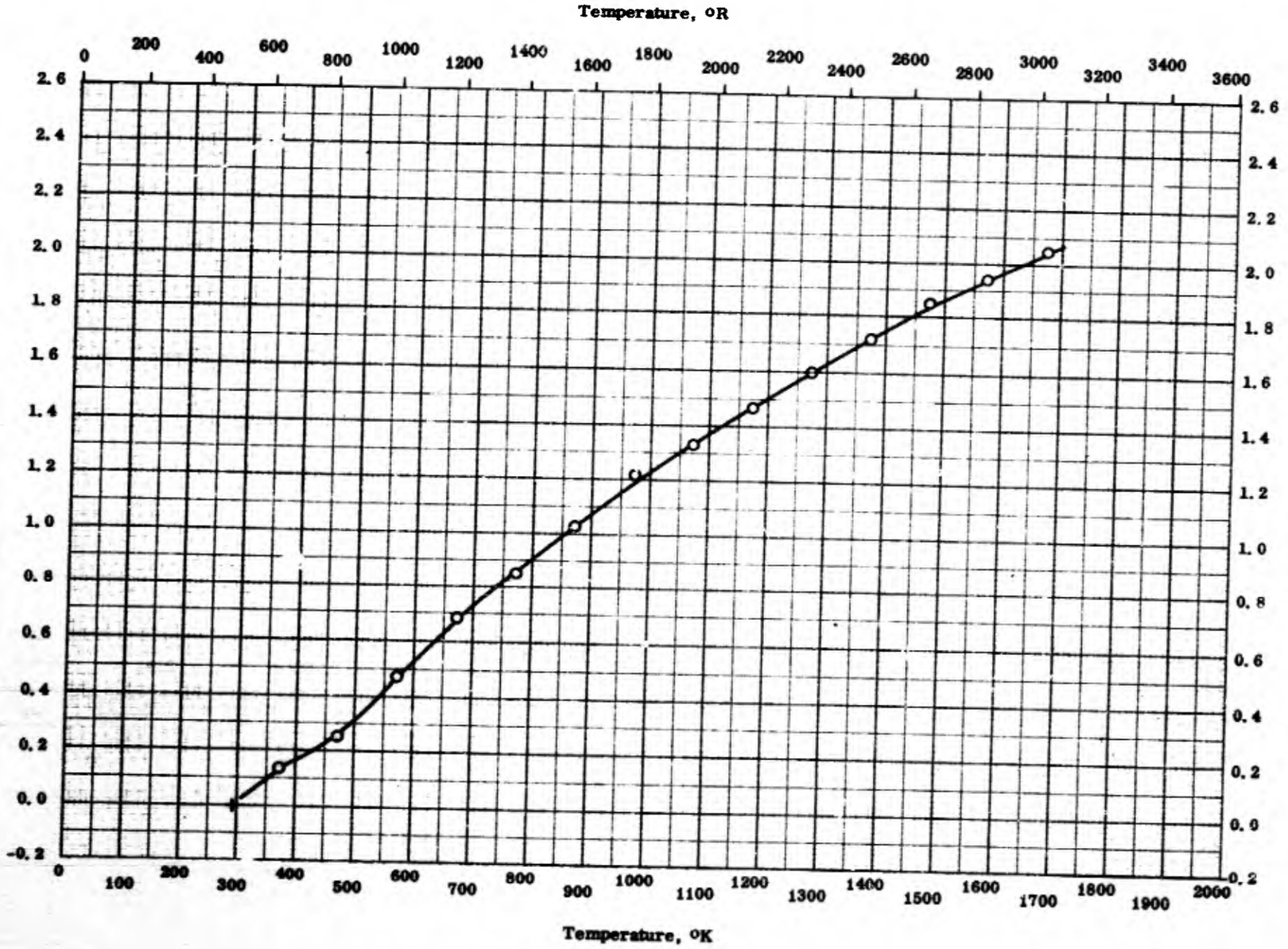
REPORTED VALUES

Melting Point	K	R
○ Zr_3Al_2	1756	3161
Zr_4Al_3	1806	3251
Zr_2Al_3	1872	3370
$ZrAl_2$	1917	3451
□ $ZrAl_3$; tetragonal	1856	3341

PROPERTIES OF ZIRCONIUM ALUMINIDES

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
○	53-30 also 54-32	1756-1917		Series of zirconium aluminides.	
□	54-32	1856		$ZrAl_3$; tetragonal.	



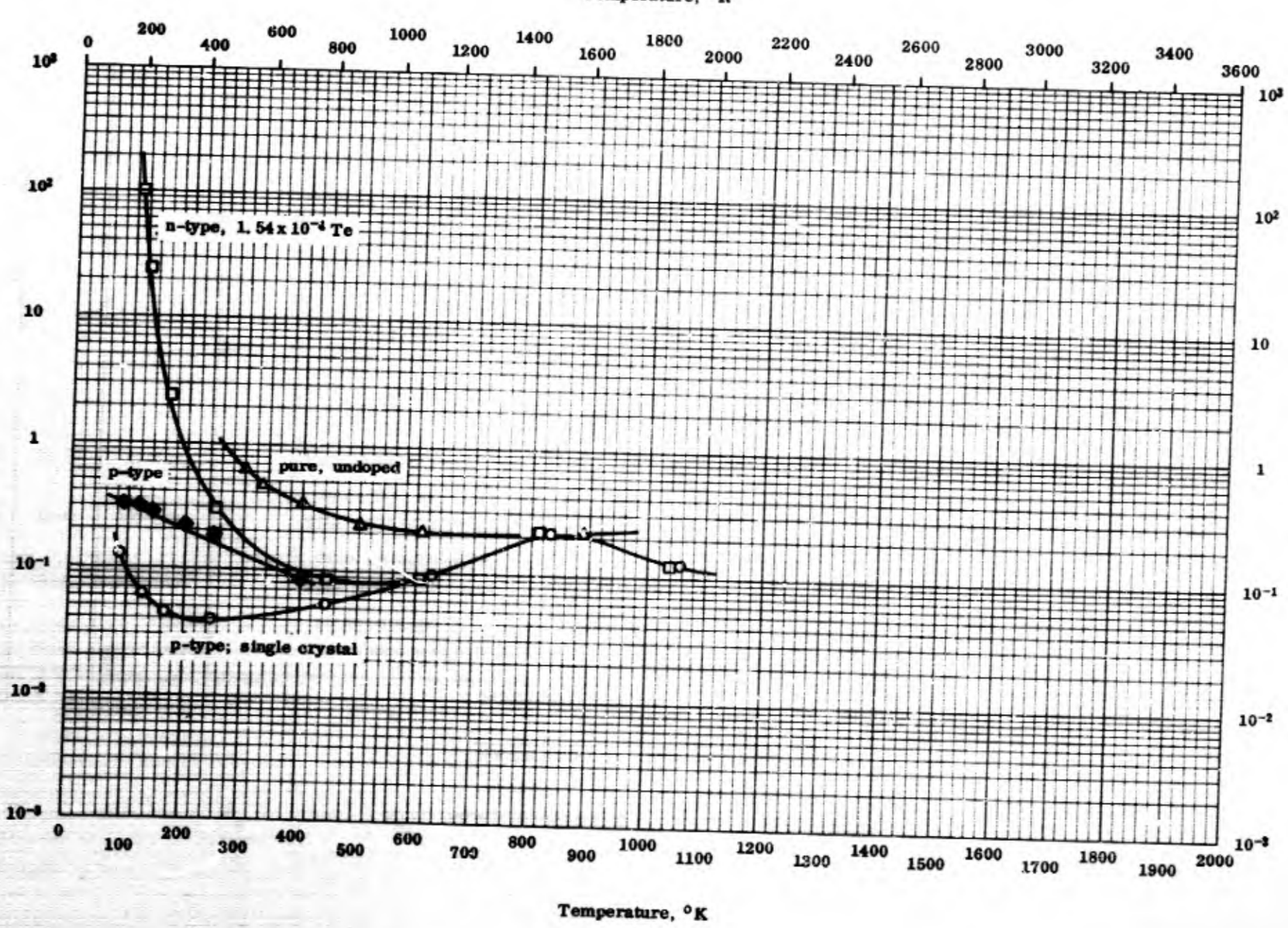
TPRC

THERMAL LINEAR EXPANSION -- ZIRCONIUM ALUMINIDE

PROPERTIES OF MISCELLANEOUS METAL ALUMINIDES

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
○	57-28	298		LaAl; 71.72 La and 28.28 Al.	Computed from x-ray measurement of lattice.
□	43-1	998-1751		Made from estimated 99 pure Pr.	Author considers possibility of sub-cooling and of sample contamination by crucibles or O_2; by visual observation.
△	43-1	973-1702		Prepared from 98 pure La with 1.02 Mg, 0.55 Fe, and 0.05 Sr.	Same as above.
▽	43-1	968-1733		Prepared from 98 pure Ce with 0.14 Mg, 0.14 Fe, and 0.02 Si.	Same as above.
◇	62-21	298		Rare earth metah aluminides.	
●	52-26	2000		As_2Al_3.	
■	63-34	1872		AsAl.	
▲	55-33	1911		Pd_3Al and β - PdAl of b.c.c. crystal.	
▼	55-33	1695-1922		30 and 35 atomic % of W.	
◆	53-24, 54-23, also 54-30	1945		V_5Al_8 in b.c.c. crystal.	



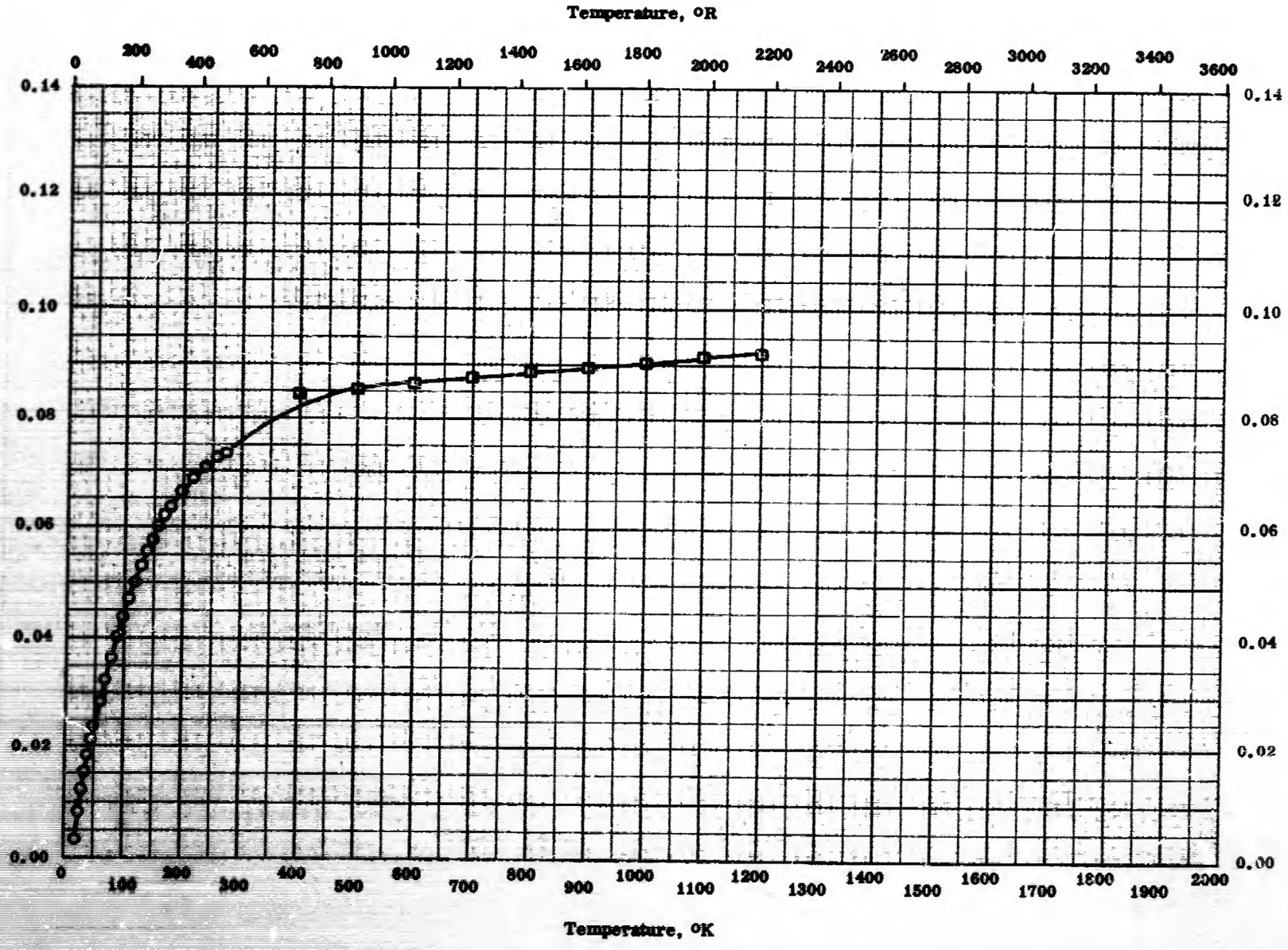
TPRC

ELECTRICAL RESISTIVITY -- ALUMINUM ANTIMONIDE

ELECTRICAL RESISTIVITY -- ALUMINUM ANTIMONIDE

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
○	54-8	83-1000		AlSb, single crystal p-type; prepared from 99.98 pure Al and 99.95 pure Sb.	
□	54-8	109-1000		AlSb, n-type containing 1.54×10^{-4}% Te; prepared from the same materials as above.	
△	57-17	303-833		AlSb, very pure, undoped; made from 99.99 pure Al and 99.99 pure Sb.	
◆	56-10	91-400		AlSb, p-type.	At 100 K, 1.3×10^{18} holes cm^{-3}, and at 200 K, 1.4×10^{18} holes cm^{-3}; Sb prepared by distillation and electrolysis of $SbCl_3$; Al prepared by zone fusion; fused with excess Sb to compensate for evaporation.



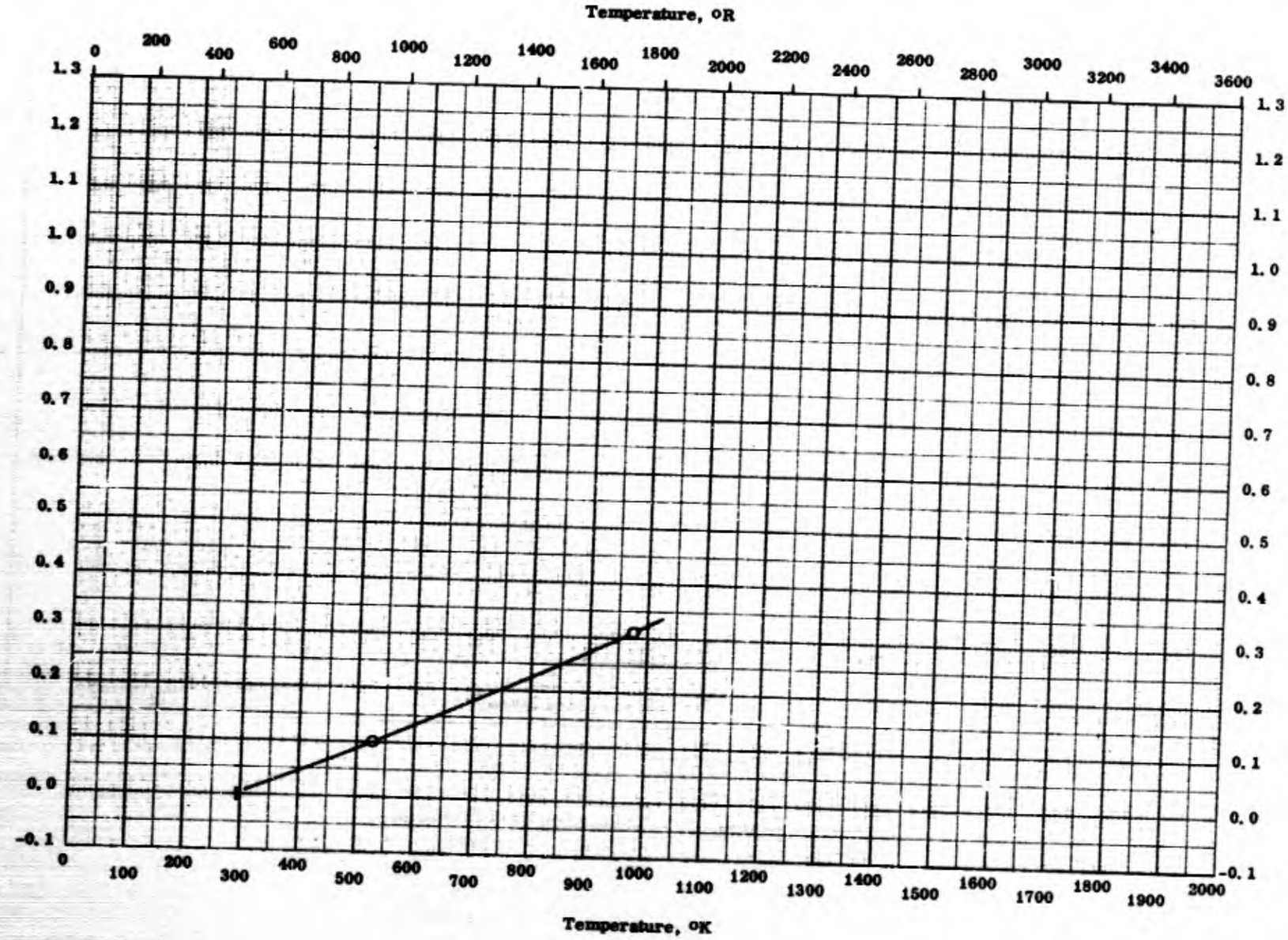
TPRC

SPECIFIC HEAT — ALUMINUM ANTIMONIDE

SPECIFIC HEAT -- ALUMINUM ANTIMONIDE

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
○	63-14	20-273	≤2.0	AlSb.	
□	63-15	400-1150		99.99 AlSb.	



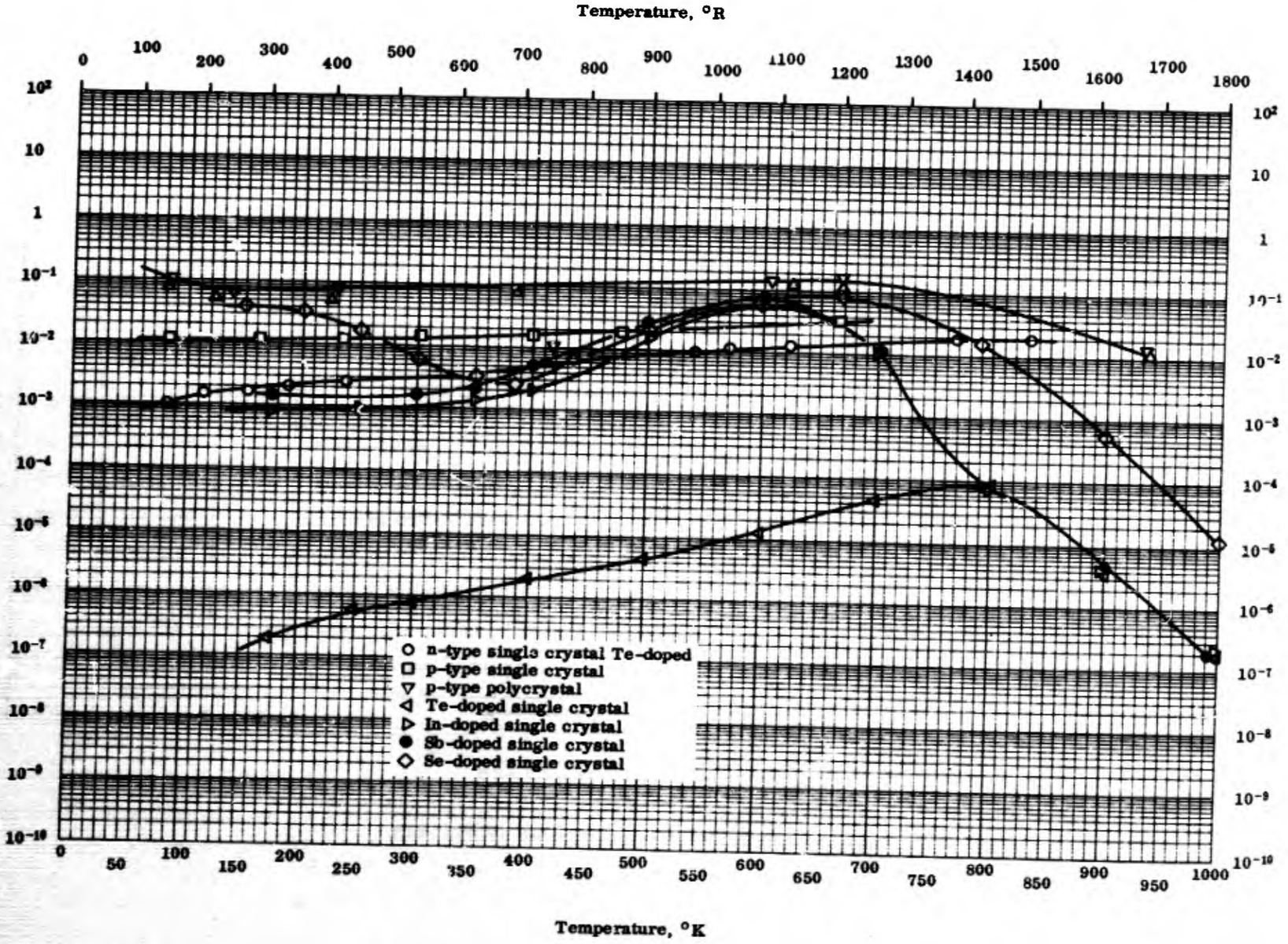
ZPRC

THERMAL LINEAR EXPANSION -- ALUMINUM ANTIMONIDE

THERMAL LINEAR EXPANSION -- ALUMINUM ANTIMONIDE

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
O	57-17	293-973		AlSb; made from 99.9 pure Sb and 99.99 pure Al.	



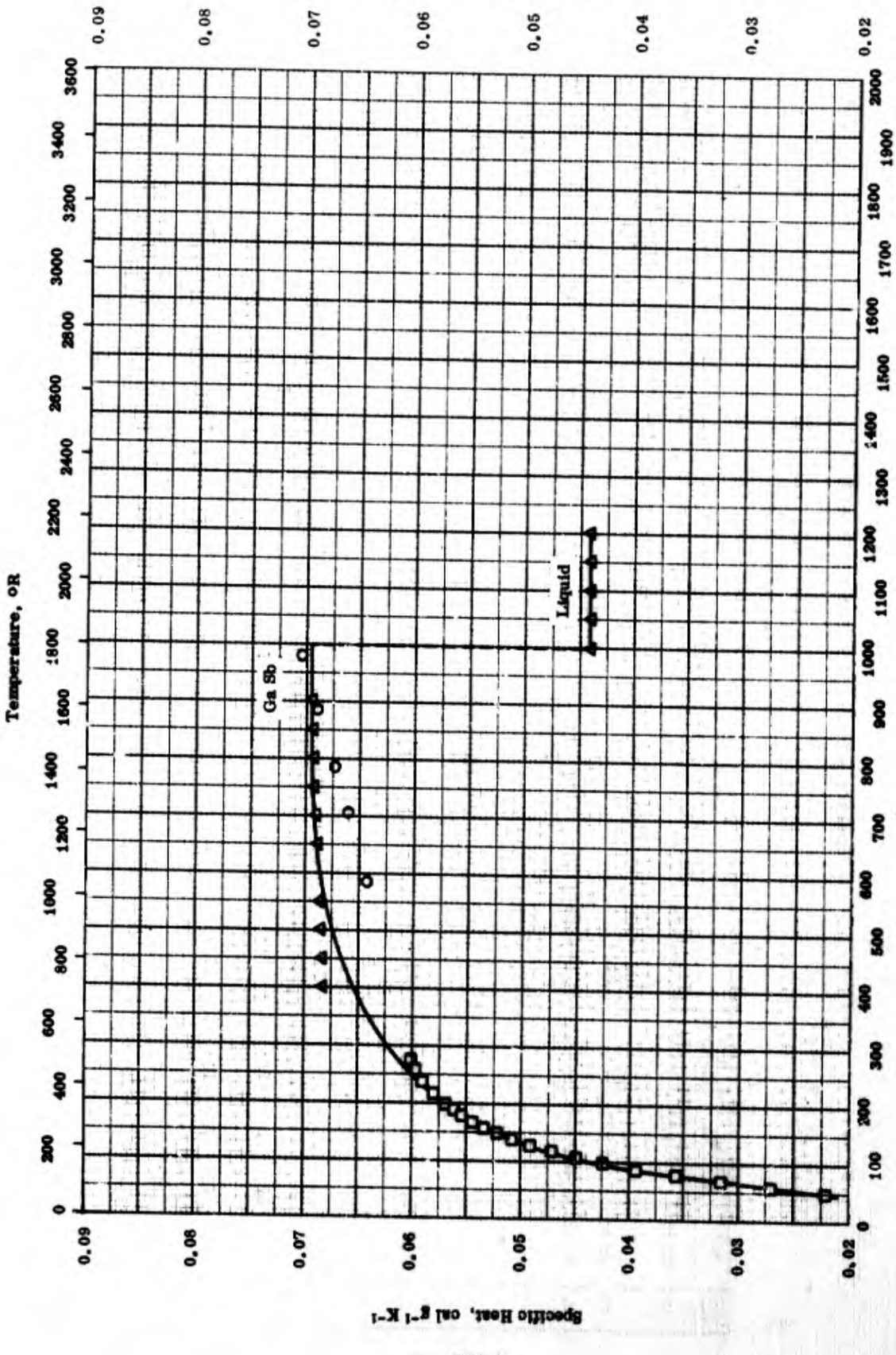
TPRC

ELECTRICAL RESISTIVITY -- GALLIUM ANTIMONIDE

ELECTRICAL RESISTIVITY -- GALLIUM ANTIMONIDE

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
○	55-13	83-833		Te-doped n-type single crystal.	
□	55-13	85-667		p-type single crystal.	
△	55-13	80-934		p-type single crystal.	
▽	55-13	86-934		p-type polycrystal.	
◁	60-19	175-1000		Te-doped single crystal.	
▷	60-19	175-1000		In-doped single crystal.	
●	60-19	175-1000		Sb-doped single crystal.	
◇	60-19	150-1000		Se-doped single crystal.	

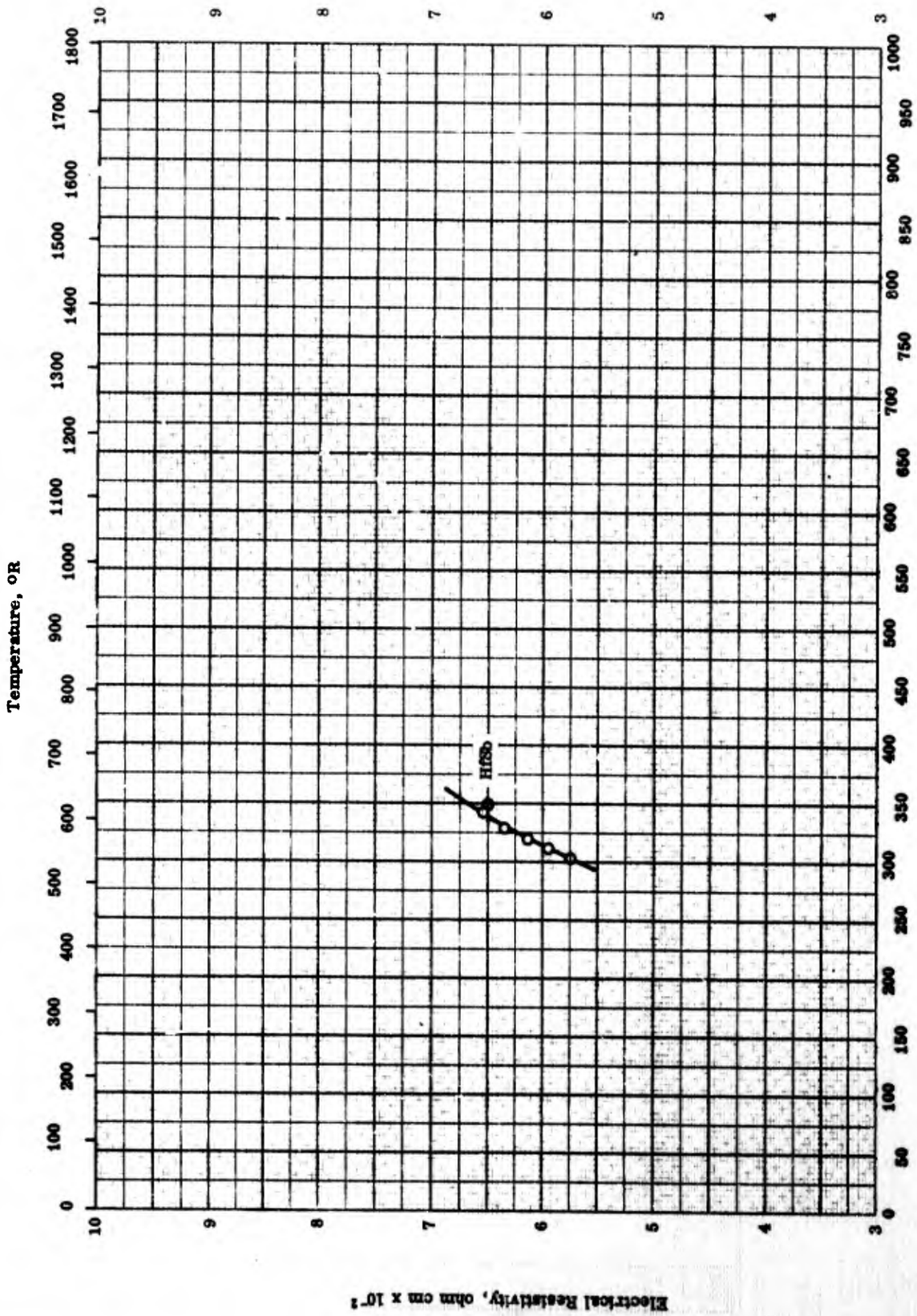


SPECIFIC HEAT — GALLIUM ANTIMONIDE

SPECIFIC HEAT -- GALLIUM ANTIMONIDE

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
○	61-23	586-980	≤0.2	99.99 GaSb.	Obtained by melting stoichiometric amounts of pure metals in evacuated quartz ampules.
□	63-14	12-273	≤2	GaSb.	
△	63-15	400-1200		99.99 GaSb.	



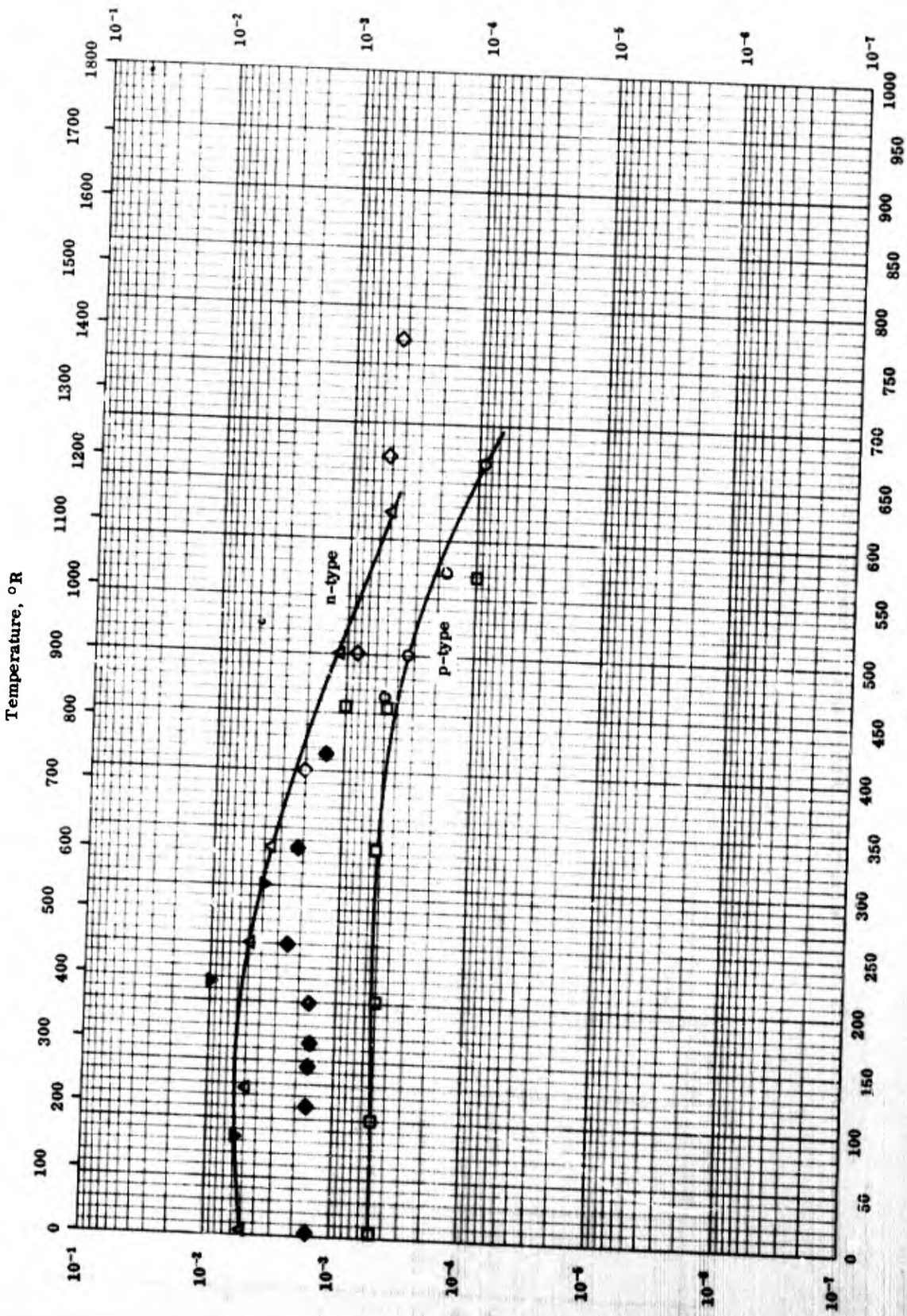
ELECTRICAL RESISTIVITY -- HAFNIUM ANTIMONIDE

Electrical Resistivity, ohm cm x 10^{-2}

ELECTRICAL RESISTIVITY — HAFNIUM ANTIMONIDE

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
O	61-17	303-349		HfSb; a new phase with excess Sb presented in structure.	Prepared by reacting the mixture of Hf and Sb in atomic ratio 1 to 4 at 1200 F for 173 hrs in a helium pressure of 5 microns.

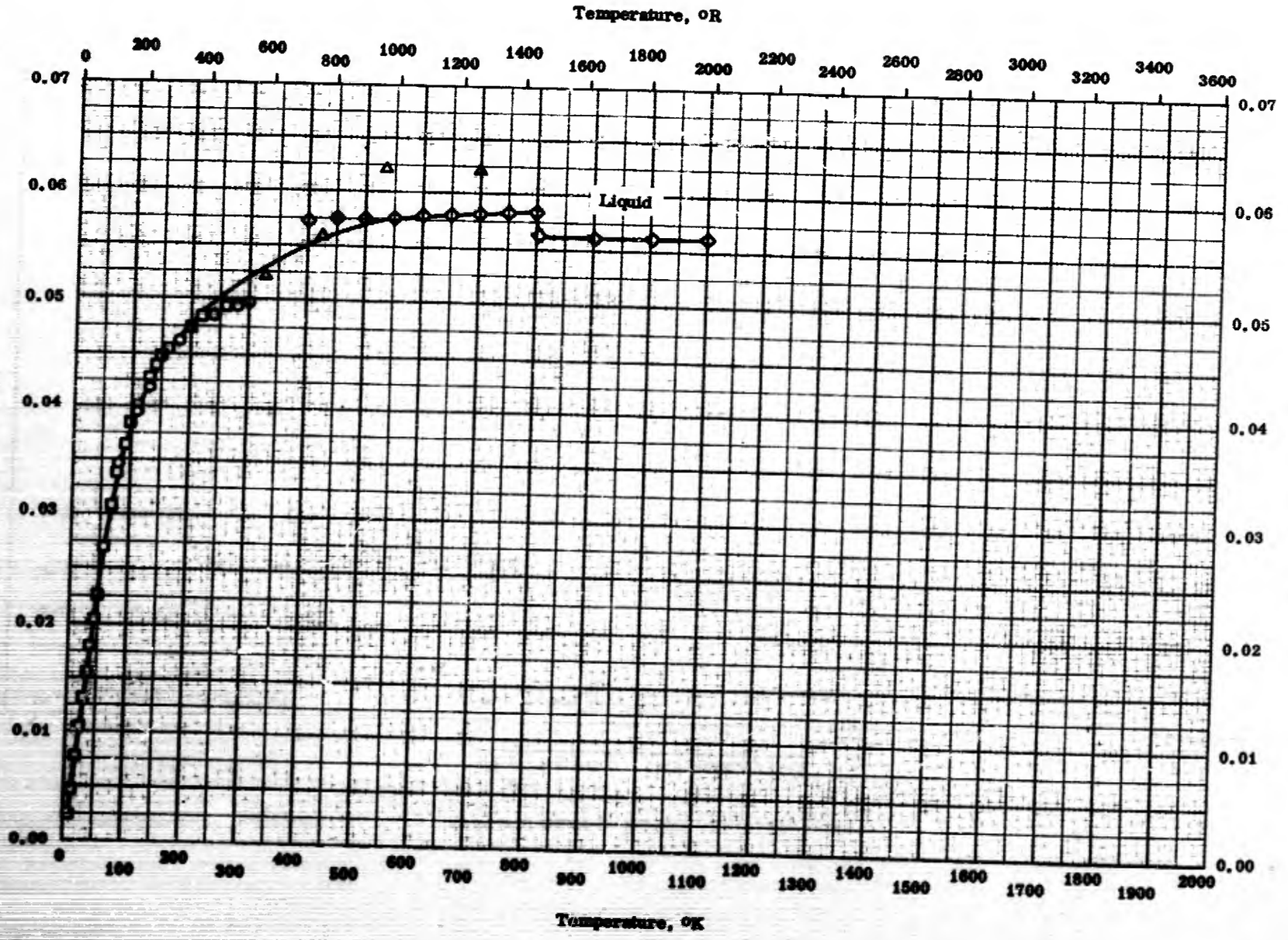


ELECTRICAL RESISTIVITY -- INDIUM ANTIMONIDE

ELECTRICAL RESISTIVITY — INDIUM ANTIMONIDE

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
○	53-9	465-667		InSb.	Prepared by melting spectroscopically pure In and Sb by high frequency current in graphite crucible under pressure in purified A atm.
□	55-12	1-625		InSb, p-type.	
△	55-12	1-625		InSb, n-type.	
◆	55-12	1-625		Same as above.	Stoichiometric composition after zone-refining.
▼	56-11	83-300		InSb single crystal, n-type.	Stoichiometric composition unrefined.
◇	60-11	400-700		InSb.	

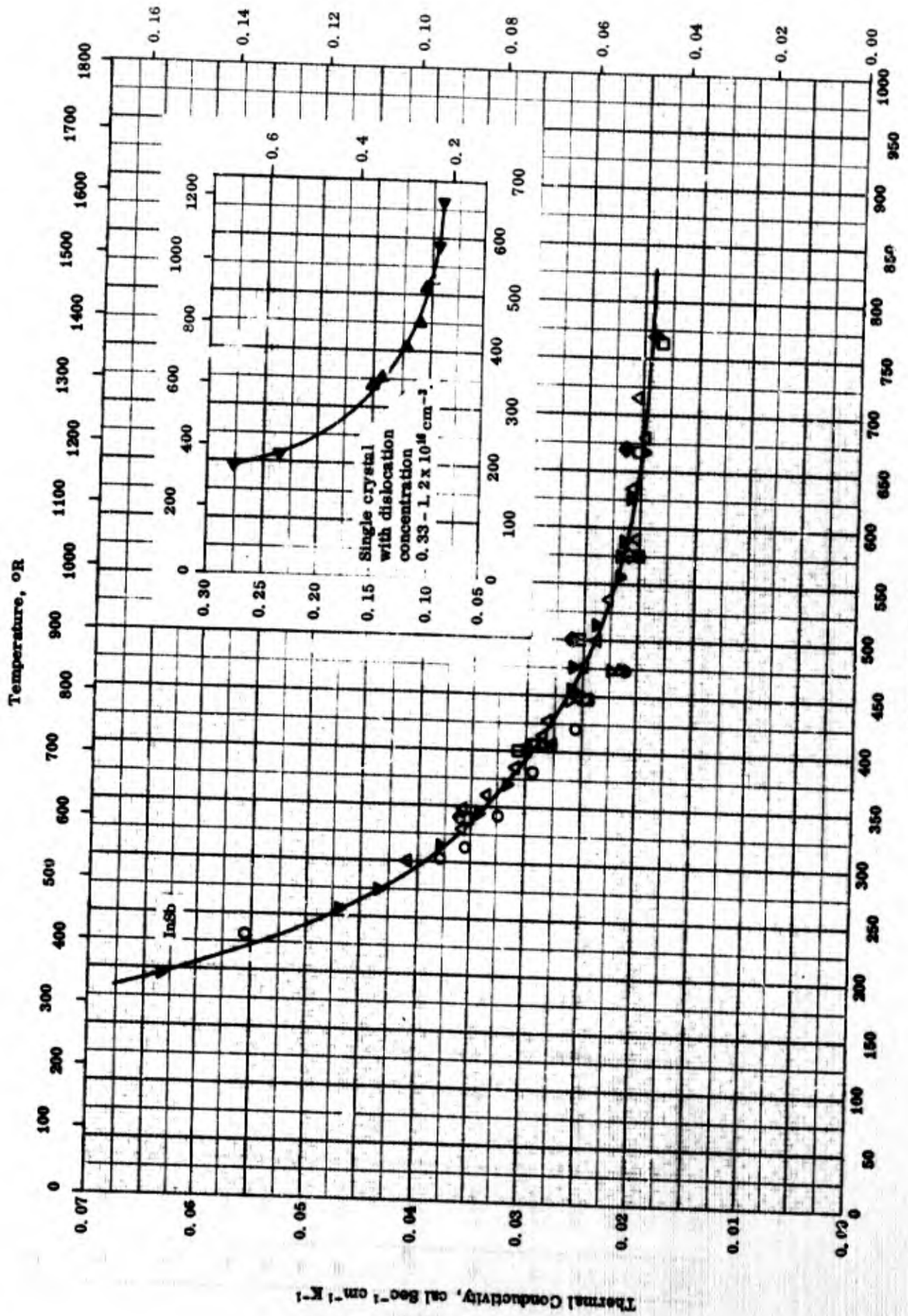


SPECIFIC HEAT -- INDIUM ANTIMONIDE

SPECIFIC HEAT -- INDIUM ANTIMONIDE

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
○	59-16	80-300	3-7	InSb.	
□	63-14	12-273	≤ 2	InSb.	
△	58-12	328-698		InSb; 51.44 Sb; 0.001 Fe, 0.001 Mg, 0.001 Pb, 0.001 Sn, 0.0001 Cu, and 0.0001 Si.	
◇	63-20	400-1100		99.99 InSb.	

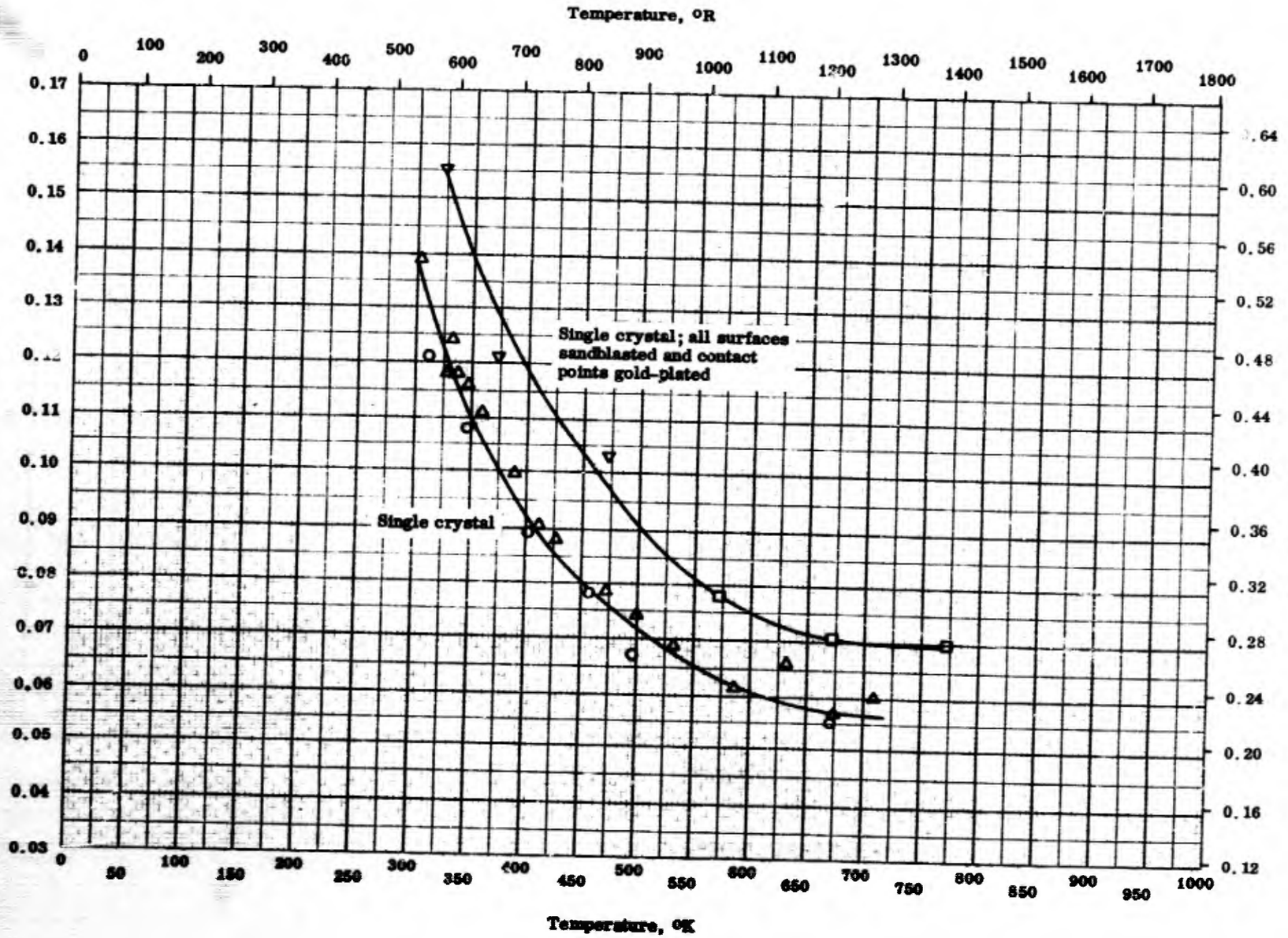


THERMAL CONDUCTIVITY -- INDIUM ANTIMONIDE

THERMAL CONDUCTIVITY — INDIUM ANTIMONIDE

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
○	59-1	232-446		InSb; single crystal with n= $3x10^{17}$ electrons cm^{-3}.	
□	58-2	339-763		InSb; polycrystal.	Zone-refined.
△	60-1	300-715		InSb; undoped single crystal. [Author design.: IS-194]	
▽	62-2	445-573	± 20	InSb; n-type single crystal with donor concentration 10^{16} cm^{-3}. [Author design.:S-1]	Measured in vacuum of 5×10^{-5} mm Hg.
◁	62-2	406-575	± 20	Same as above.	Same as above except measured at a magnetic induction of 1000 gauss.
△	62-2	405-575	± 20	Same as above.	Same as above except at 2000 gauss.
◇	62-2	406-575	± 20	Same as above.	Same as above except at 3000 gauss.
●	62-2	406-575	± 20	Same as above.	Same as above except at 5000 gauss.
■	62-2	448-575	± 20	Same as above.	Same as above except at 7000 gauss.
▲	62-2	406-575	± 20	Same as above.	Same as above except at 8000 gauss.
▼	59-5	196-667	± 4	InSb; p-type single crystal; dislocation concentration 1.6×10^{15} cm^{-3}.	Measured in a vacuum of less then 5×10^{-5} Torr.
◀	59-5	196-667	± 4	InSb; n-type single crystal; dislocation concentration 1.2×10^{16} cm^{-3}.	Same as above.
▶	59-5	339-526	± 4	InSb; p-type single crystal; dislocation concentration 3.3×10^{15} cm^{-3}.	Same as above.
◆	60-11	340-770		InSb.	

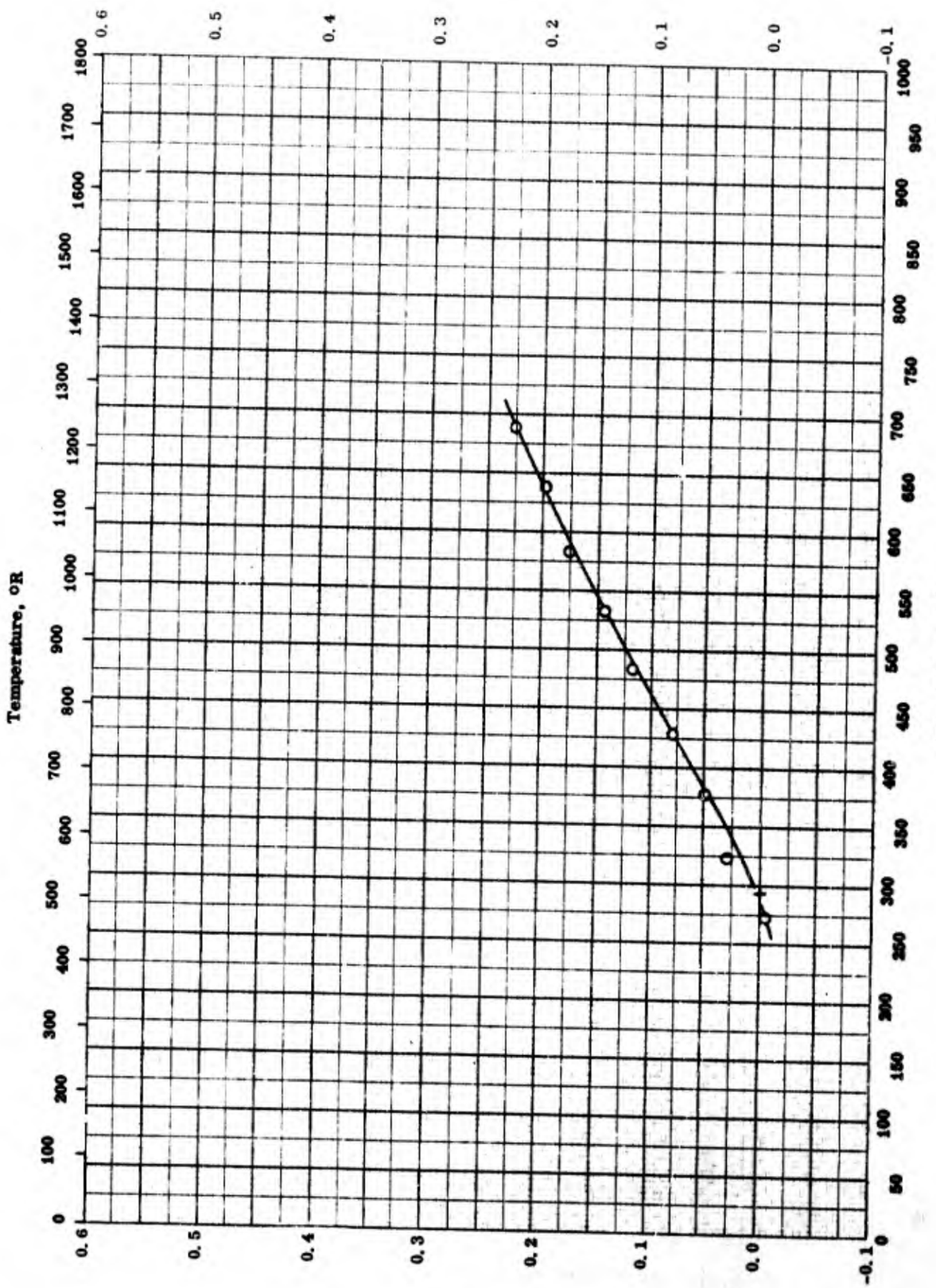


THERMAL DIFFUSIVITY — INDIUM ANTIMONIDE

THERMAL DIFFUSIVITY -- INDIUM ANTIMONIDE

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
○	60-1	312-672		Undoped single crystal; rectangular parallelepiped sample with sides 1 1/2 by 3/8 by 3/8 in. [Author's design. IS-142].	Cut to rectangular parallelepiped; measured by using chromel-alumel thermocouples.
△	60-1	303-710		Same as above. [Author's design. IS-194].	Measured by using tungsten probes welded to the sample.
▽	60-2	323-473		Intrinsic single crystal; rectangular parallelepiped of thickness 0. 143 cm.	Cut and lapped into shape; all surfaces sand-blasted and contact points gold-plated which alloyed into specimen by heating to 200 C for 5 min.
□	60-2	573-773		Same as above except 0. 119 cm thick.	The above sample lapped to 0. 119 cm thick after measurements were made up to 300 C.

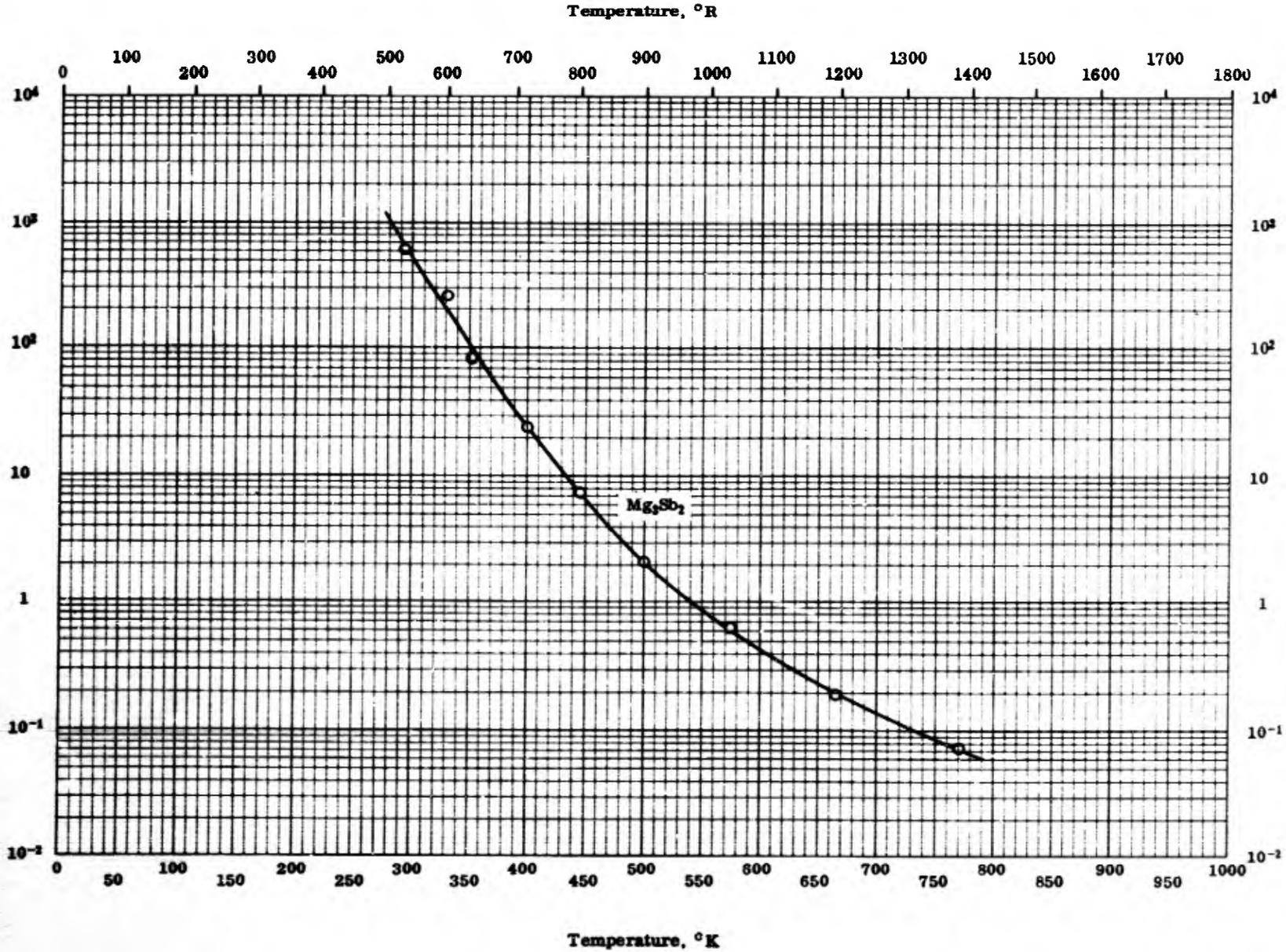


THERMAL LINEAR EXPANSION -- INDIUM ANTIMONIDE

THERMAL LINEAR EXPANSION -- INDIUM ANTIMONIDE

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
O	55-15	273-689		10^{17} - 10^{14} impurity centers cm^{-3}.	Powder; hand pressed into Al_2O_3 holder; tested in air.



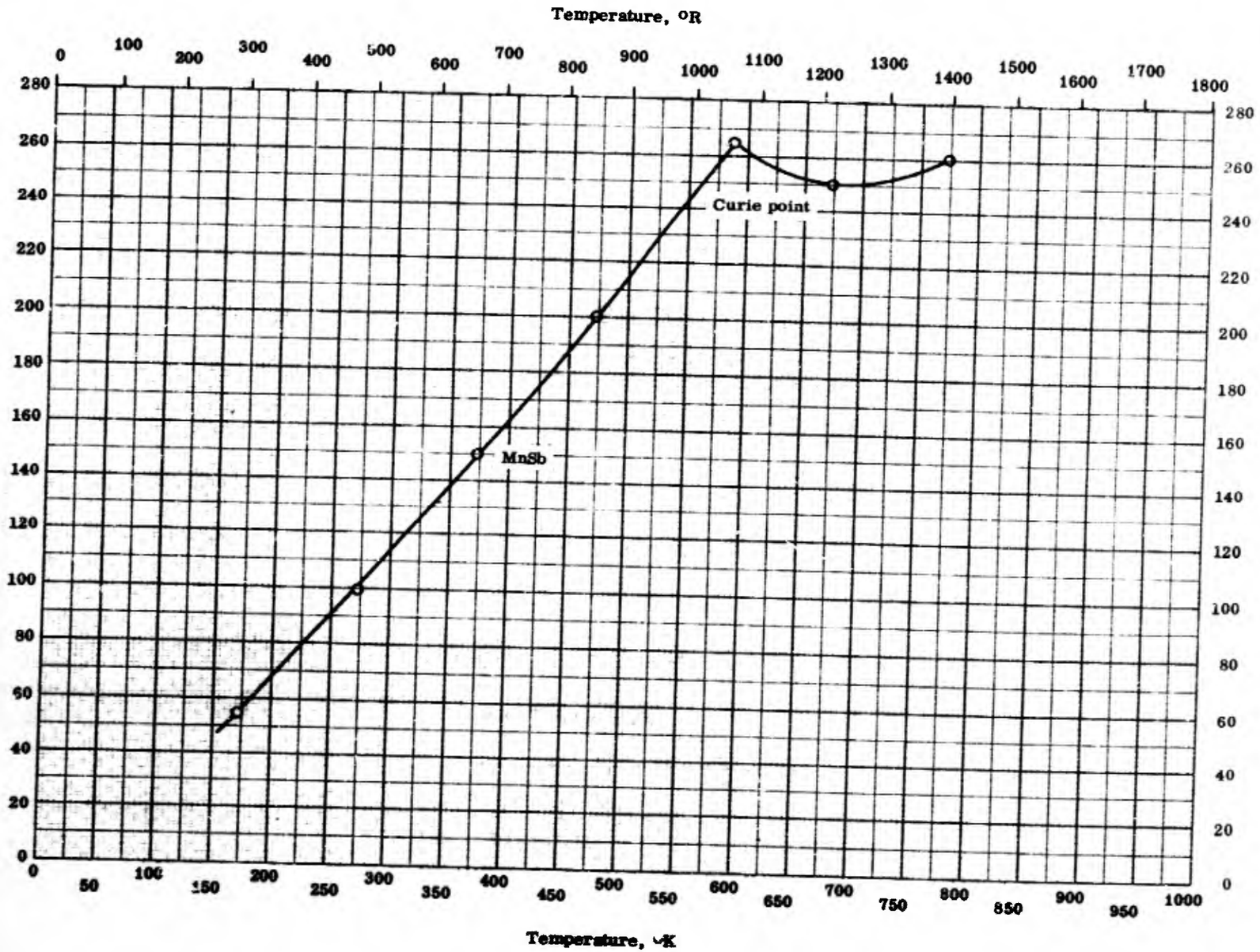
TPRC

ELECTRICAL RESISTIVITY -- MAGNESIUM ANTIMONIDE

ELECTRICAL RESISTIVITY -- MAGNESIUM ANTIMONIDE

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
O	53-9	333-769		Mg_3Sb_2.	Prepared by melting spectroscopically pure components in graphite crucible under purified high pressure argon by high frequency current.

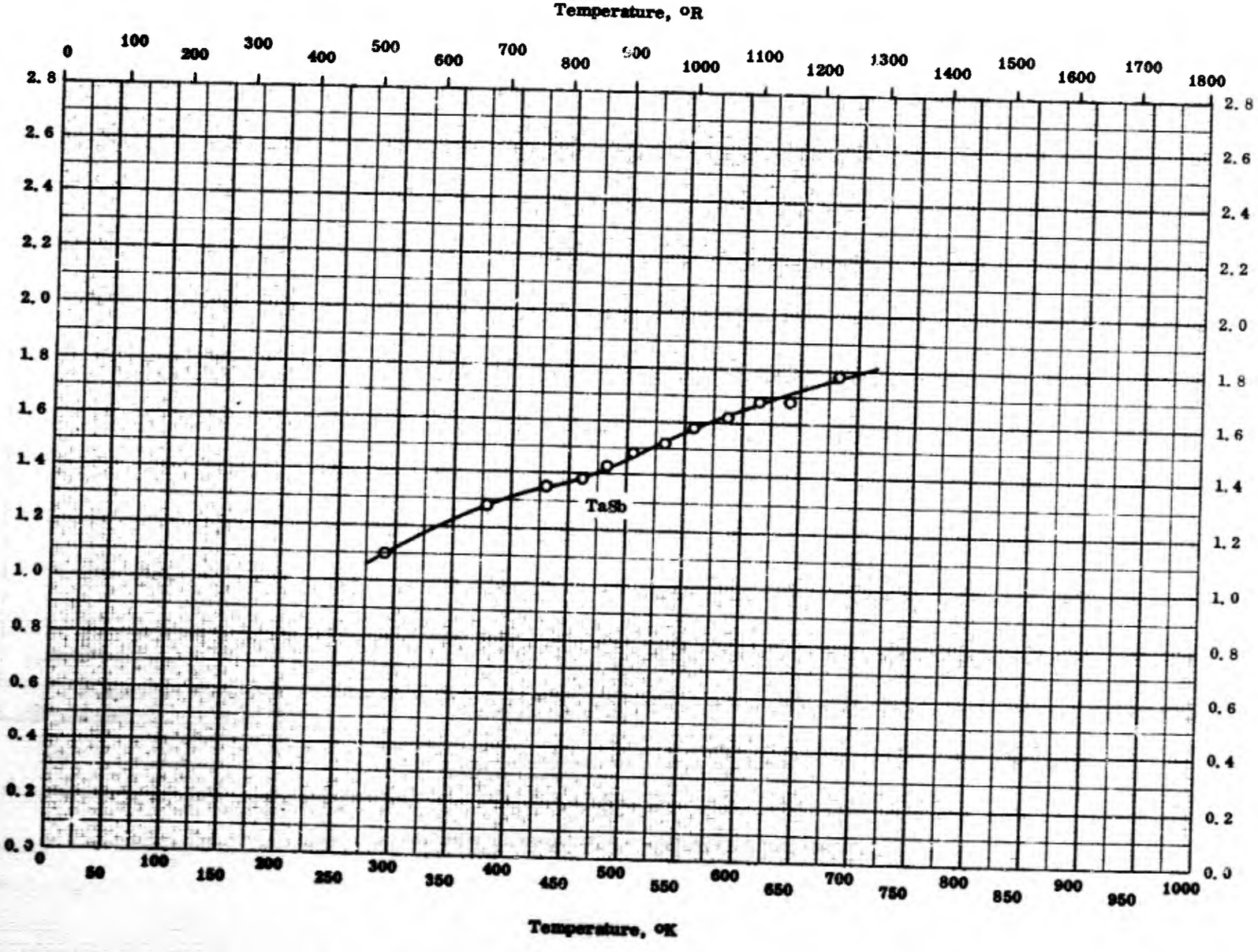


ELECTRICAL RESISTIVITY -- MANGANESE ANTIMONIDE

ELECTRICAL RESISTIVITY -- MANGANESE ANTIMONIDE

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
O	57-16	173-773		MnSb.	Powders mixed heated 24 hrs below MP, furnace cooled, powdered, pressed at 5 tons cm^{-2}, and heated 24 hrs below MP.



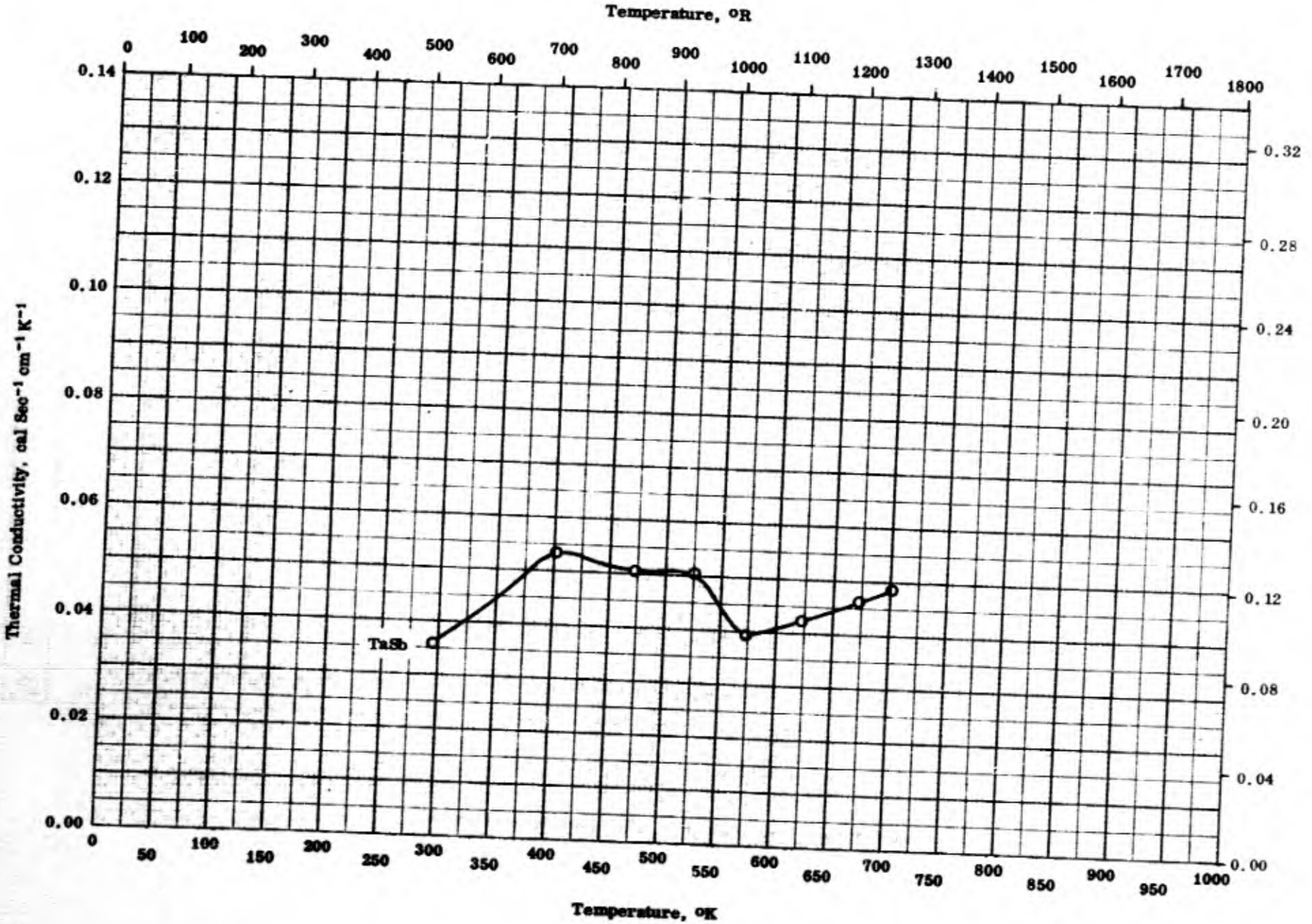
ELECTRICAL RESISTIVITY -- TANTALUM ANTIMONIDE

Electrical Resistivity, ohm cm x 10⁴

ELECTRICAL RESISTIVITY - TANTALUM ANTIMONIDE

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
O	61-11	291-682		TaSb.	Prepared by reacting mixture of Ta and Sb in a ratio 1 to 4 at 1800 F and then distilled to remove excess Sb; finally hot-pressed for 1 hr at 800 F.



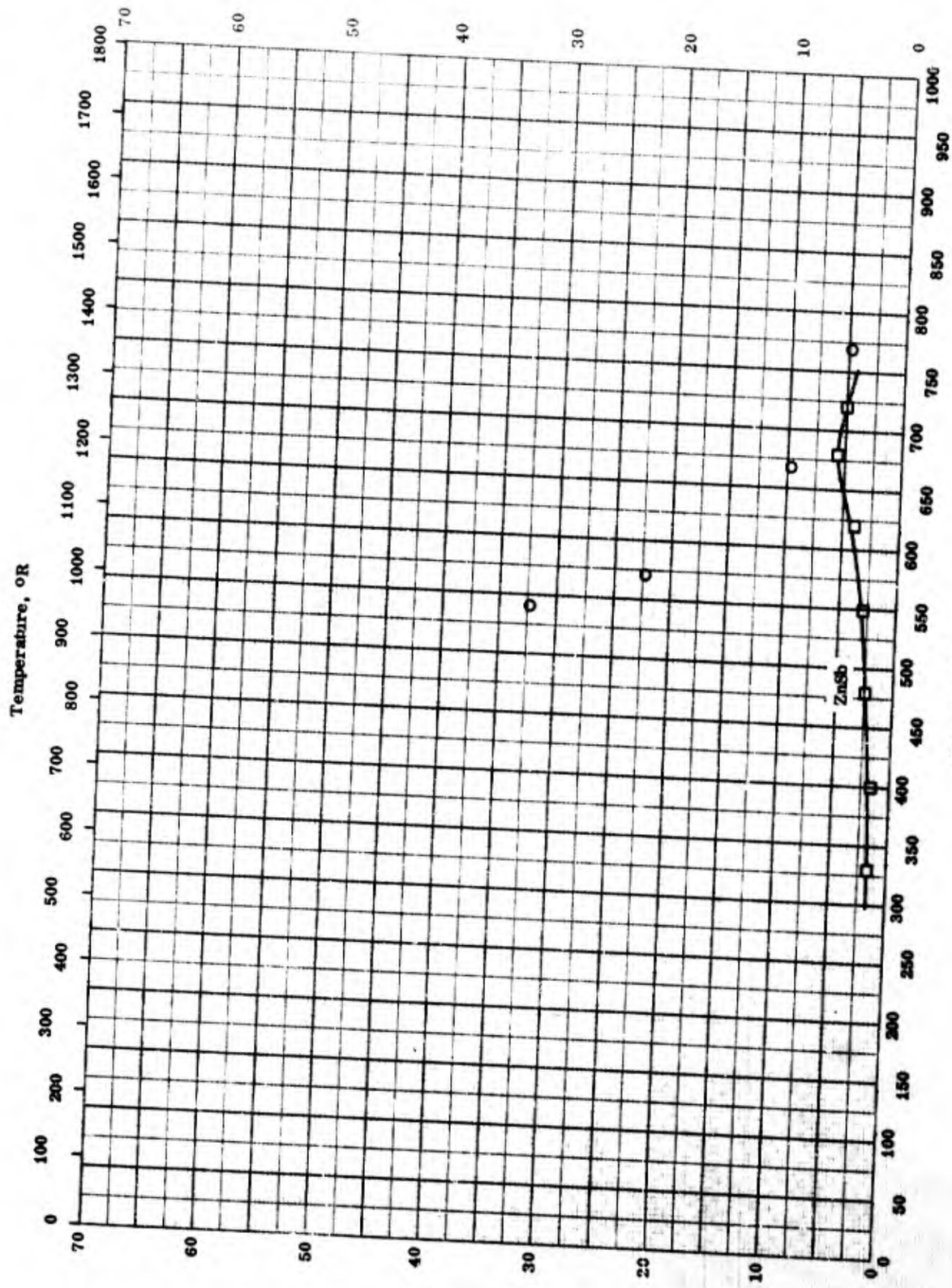
TPRC

THERMAL CONDUCTIVITY -- TANTALUM ANTIMONIDE

THERMAL CONDUCTIVITY -- TANTALUM ANTIMONIDE

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
O	61-11	296-701		TaSb.	Prepared by reacting mixture of Ta and Sb in a ratio 1 to 4 at 1800 F and then distilled to remove excess Sb; finally hot-pressed for 1 hr at 800 F.



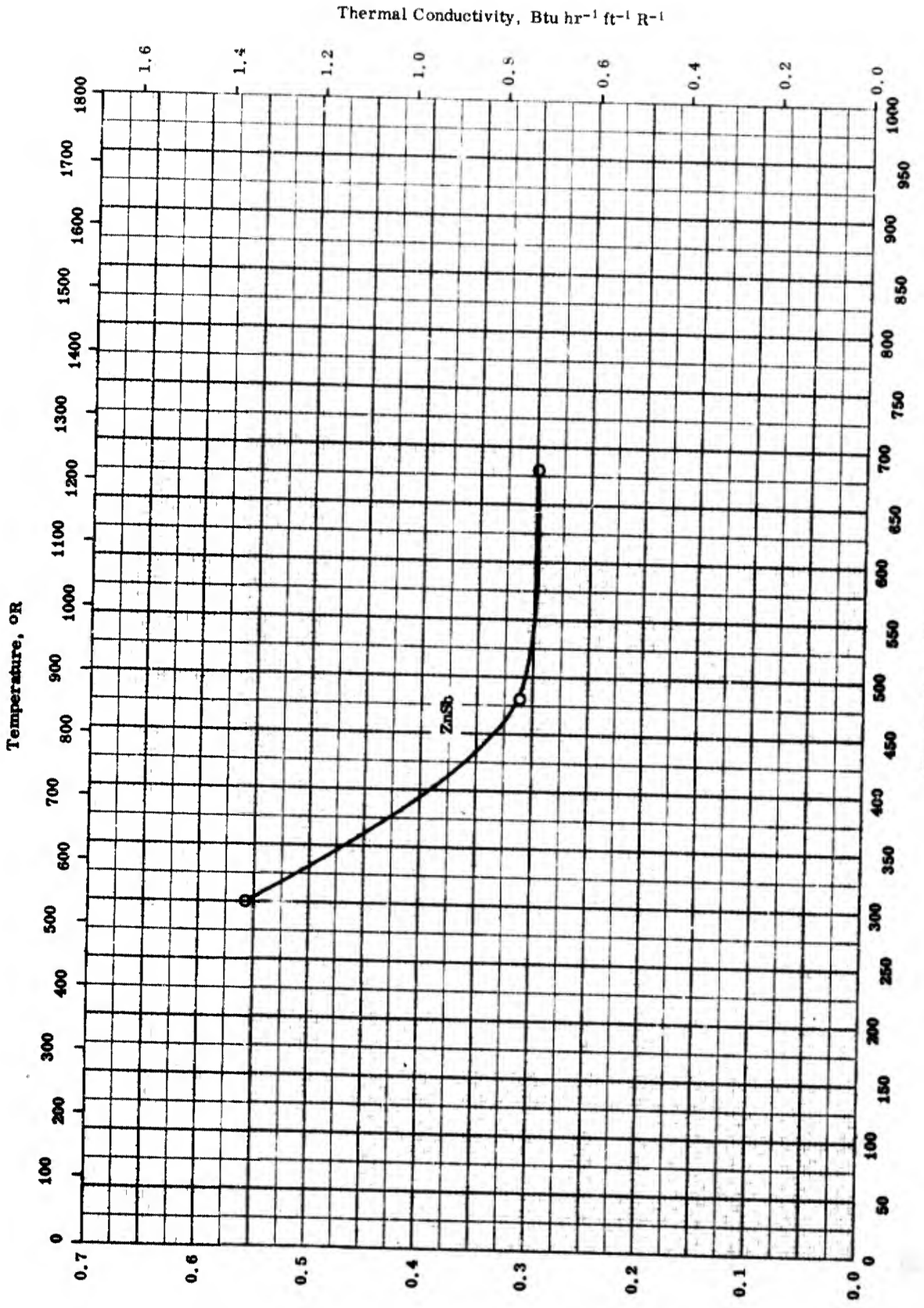
ELECTRICAL RESISTIVITY -- ZINC ANTIMONIDE

Electrical Resistivity, ohm cm x 10³

ELECTRICAL RESISTIVITY -- ZINC ANTIMONIDE

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
○	53-9	540-769		Not given.	Prepared from spectroscopically pure Zn and Sb; melted by high frequency current in graphite crucible in high pressure purified A atm.
□	60-11	330-720		ZnSb.	

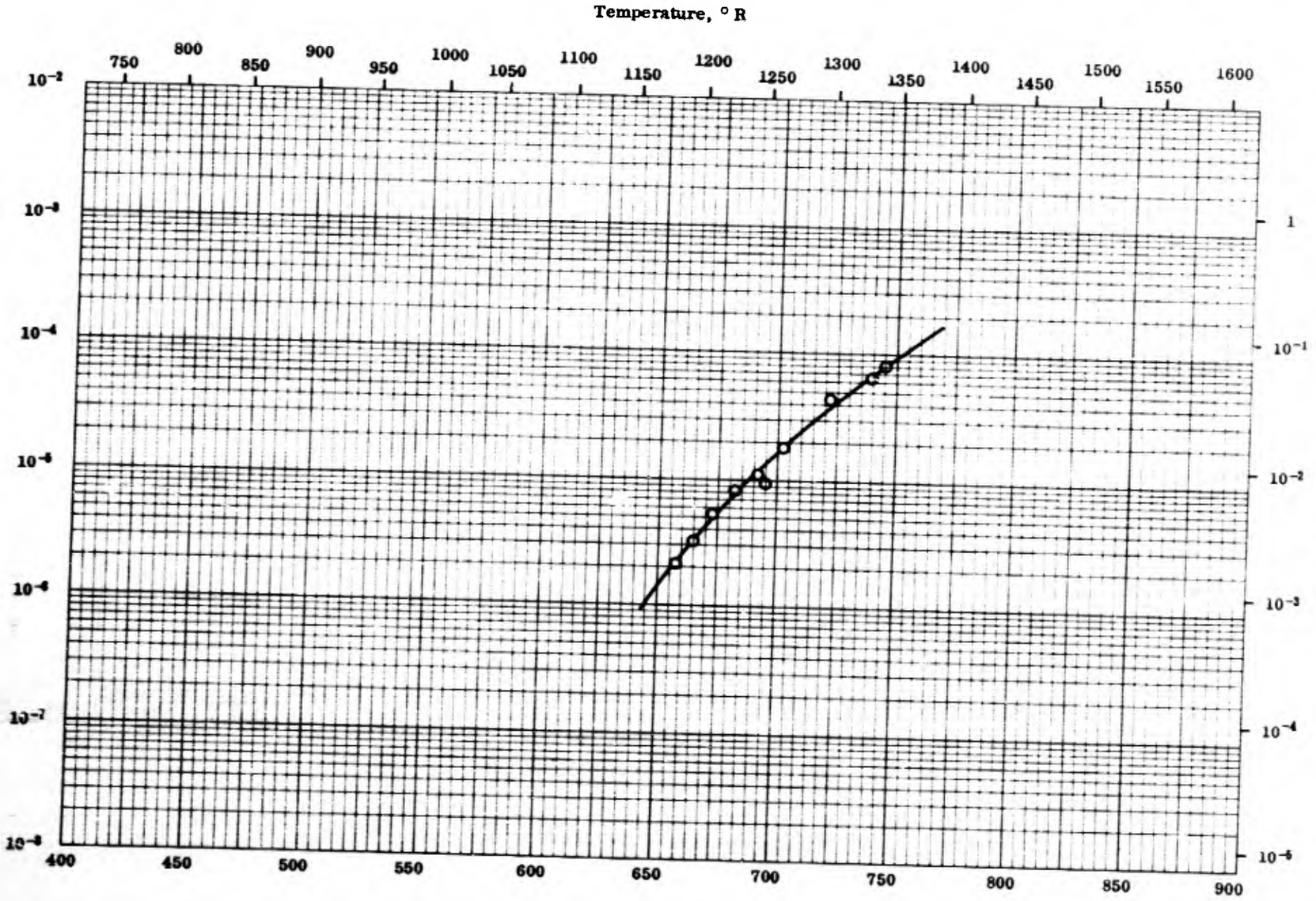


THERMAL CONDUCTIVITY -- ZINC ANTIMONIDE

THERMAL CONDUCTIVITY -- ZINC ANTIMONIDE

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
O	60-11	300-680		ZnSb.	



TPRC

VAPOR PRESSURE -- ZINC ANTIMONIDE

VAPOR PRESSURE -- ZINC ANTIMONIDE

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
O	62-13	658-745		ZnSb.	Prepared by melting stoichiometric Zn and Sb at about 750 C in an evacuated Vycor tube; ground, cold-pressed, and sintered at 500 C.

PROPERTIES OF OTHER MISCELLANEOUS METAL ANTIMONIDES

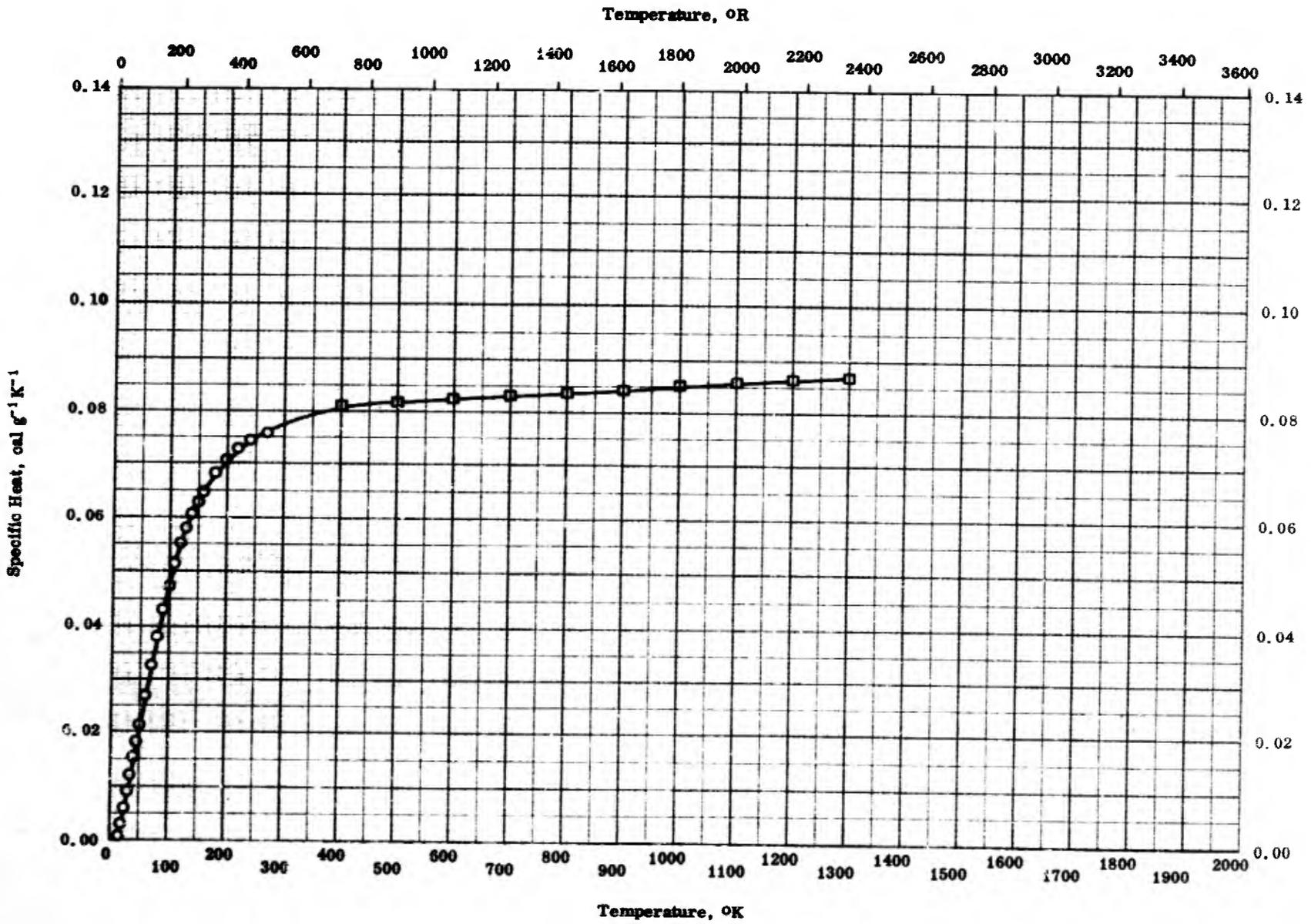
REPORTED VALUES

		Density	$g\ cm^{-3}$	$lb\ ft^{-3}$
○		ThSb	9.32	582
□		$ThSb_2$	9.09	567
△		Th_3Sb_4	9.55	596
		Melting Point	**K**	**R**
▽		La_2Sb	≈1733	≈3120
		La_3Sb_2	≈1972	≈3550

PROPERTIES OF OTHER MISCELLANEOUS METAL ANTIMONIDES

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
○	56-18	298		ThSb with 65.59 Th from 99.7 Th and 99.9 Sb; cubic NaCl type crystal.	Synthesized; heated to 1200 - 1300 C.
□	56-18	298		$ThSb_2$ with 48.8 Th from same raw materials; tetragonal crystal.	Same as above; heated to 1000 C.
△	56-18	298		Th_3Sb_4 with 58.84 Th from same materials; body-centered cubic crystal.	Same as above.
▽	54-35	1733-1972		Series of lanthanum antimonides.	



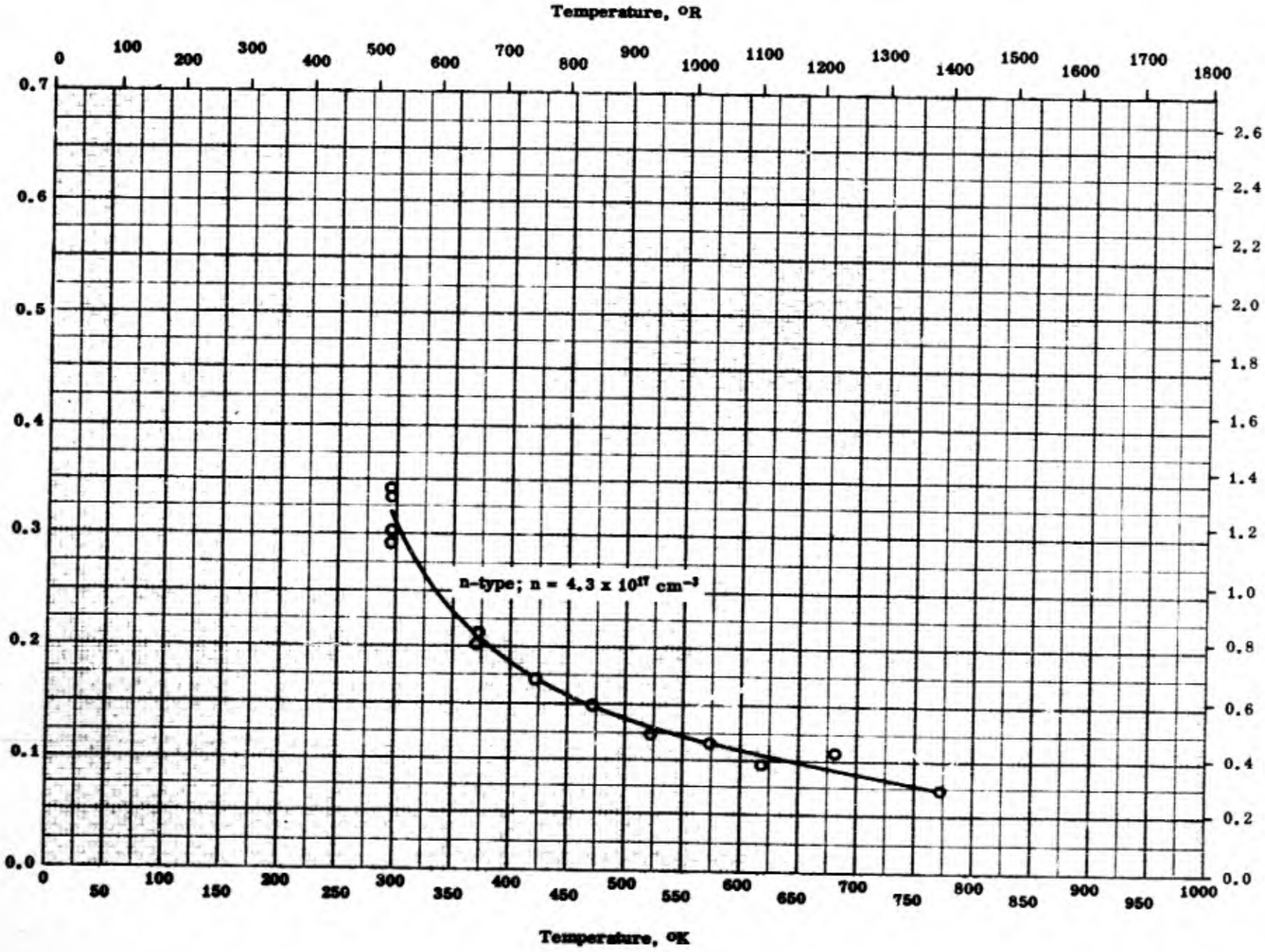
TPRC

SPECIFIC HEAT — GALLIUM ARSENIDE

SPECIFIC HEAT — GALLIUM ARSENIDE

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
O	63-14	12-273	≤ 2.0	GaAs.	
□	63-15	400-1250		99.99 GaAs.	

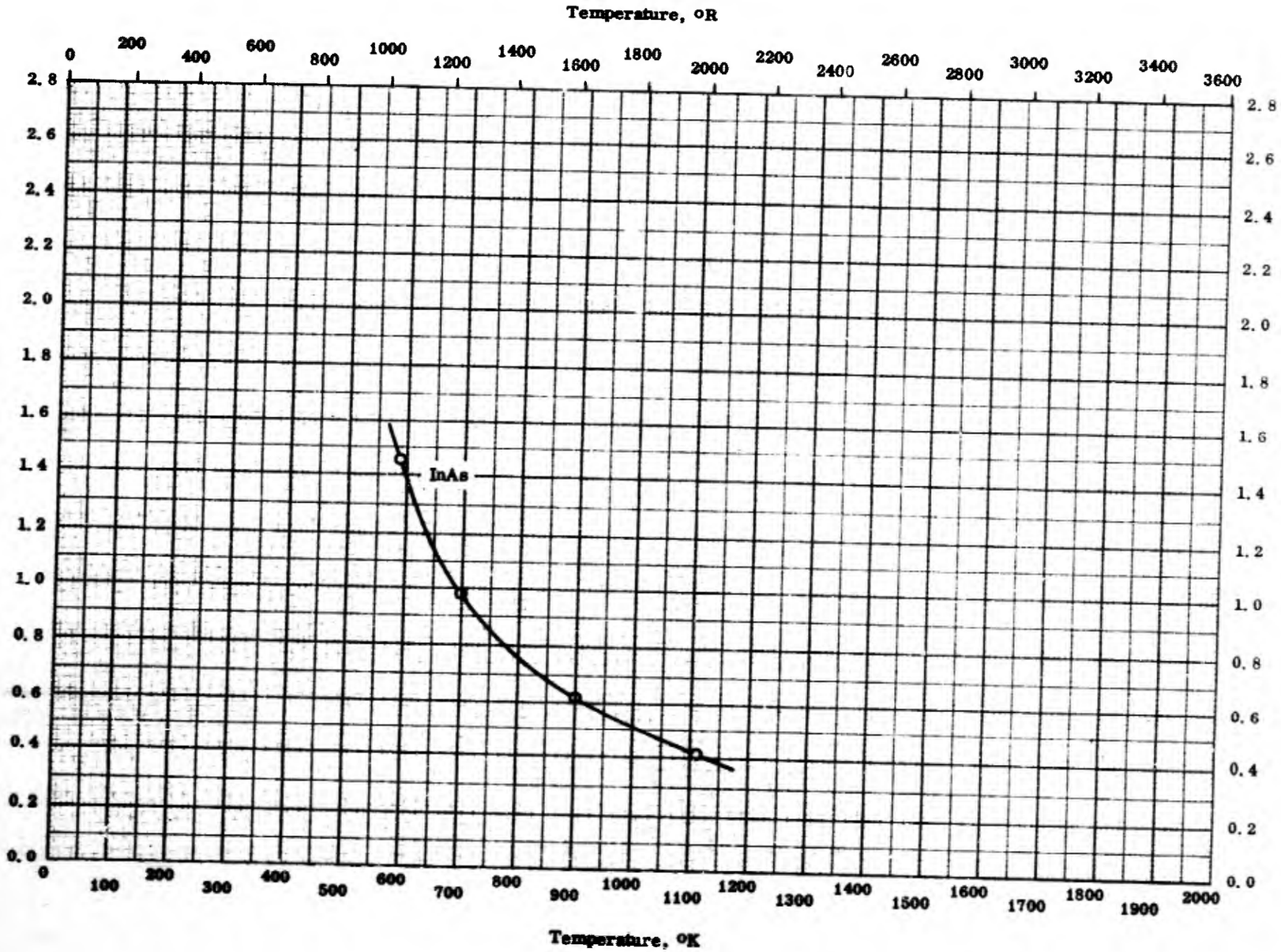


THERMAL DIFFUSIVITY -- GALLIUM ARSENIDE

THERMAL DIFFUSIVITY -- GALLIUM ARSENIDE

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
O	61-1	295-772		n-type with $n = 4.3 \times 10^{17}$ cm^{-3}; sample 1.0 by 1.0 by 0.174 cm; hall coefficients, R_H (25 C) = -14.6 cm^3 coulb^{-1}, electrical resistivity, ρ(25 C) = 4.1×10^{-3} ohm-cm. and electrical mobility, μ_H = 3600 cm^2 (volt-sec)$^{-1}$, heat capacity, C = 0.347 joule g^{-1}C^{-1}, and density, d = 5.31 g cm^{-3}.	Taped into shape from initial rectangular parallelepiped of 1.0 by 10 by 0.149 cm.



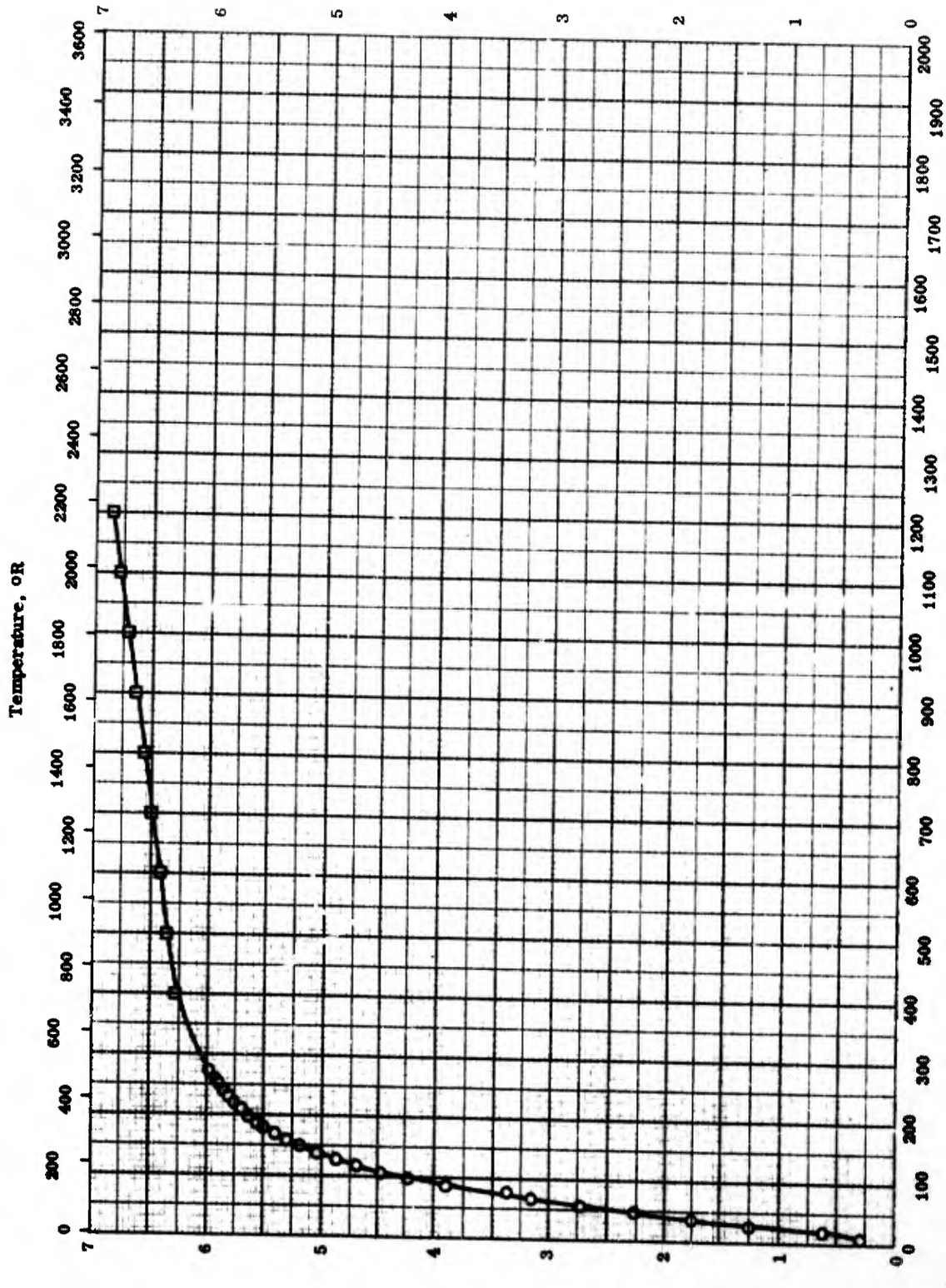
TPRC

ELECTRICAL RESISTIVITY -- INDIUM ARSENIDE

ELECTRICAL RESISTIVITY -- INDIUM ARSENIDE

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
O	60-11	590-1110		InAs, 5×10^{17} cm^{-3}.	

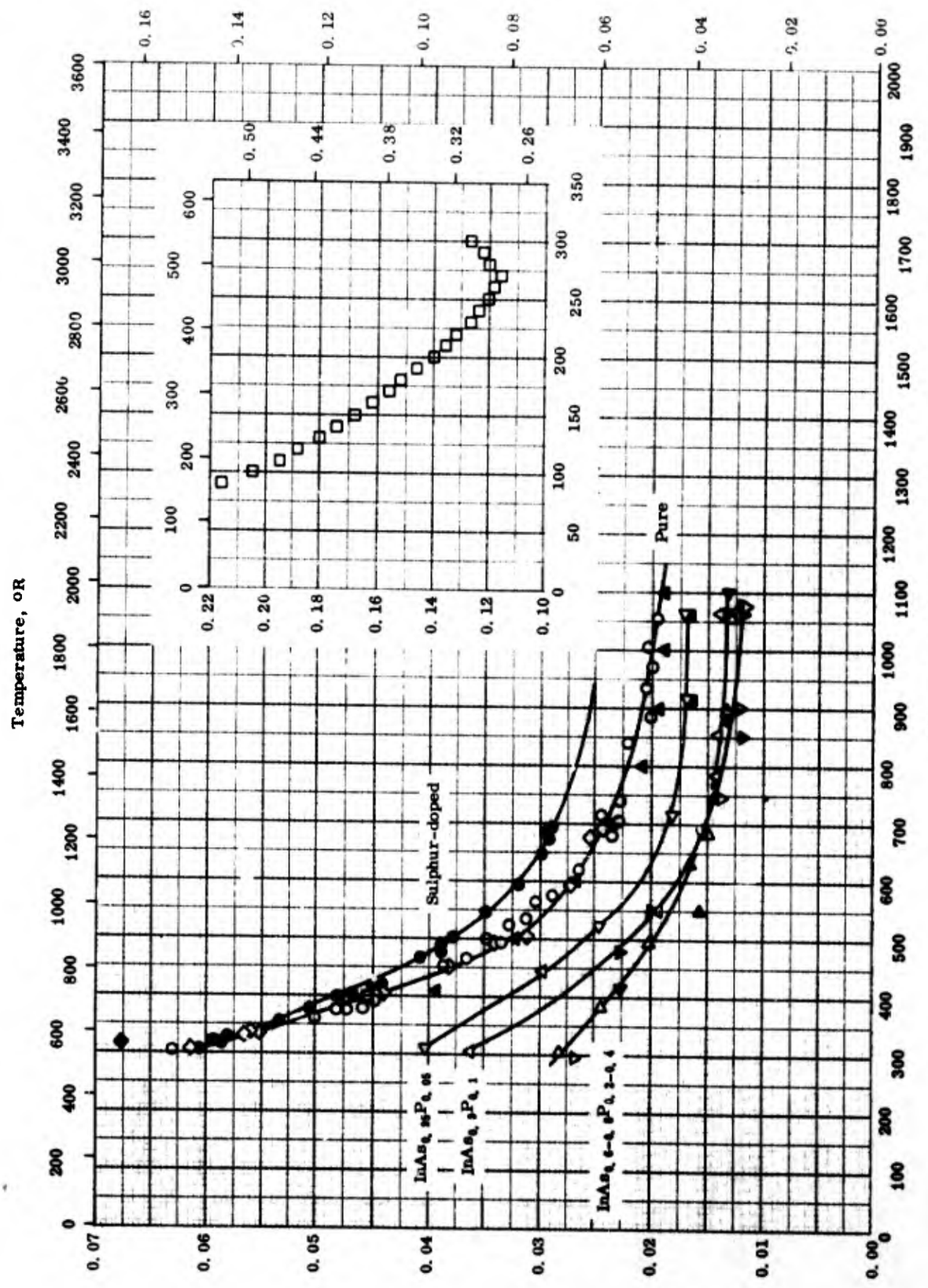


SPECIFIC HEAT -- INDIUM ARSENIDE

SPECIFIC HEAT — INDIUM ARSENIDE

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
○	63-14	11-273	≤ 2.0	InAs.	
□	63-15	400-1200		99.99 InAs.	



THERMAL CONDUCTIVITY -- INDIUM ARSENIDE

THERMAL CONDUCTIVITY -- INDIUM ARSENIDE

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
◆	57-3	313		InAs.	Contact resistance reduced by indium amalgam.
◁	59-3	310-1063	10	$InAs_{1-x}P_x$; n-type with extrinsic carrier density near 10^{17} cm^{-3} and X, impurity concentration, 0.05 x (4 x 10^{17}); made by 99.999 pure In, 99.999 As, and purified commercial white phosphorus.	Prepared in a two-zone tube furnace with vapor pressure of phosphorus carefully controlled
▷	59-3	303-1058	10	Same as above except X = 0.2 x (1 x 10^{17}).	Same as above.
▽	59-3	298-1078	10	Same as above except X = 0.4 x (2 x 10^{17}).	Same as above.
△	59-3	305-1066	10	Same as above except X = 0.1 x (6 x 10^{6}).	Prepared by diluting samples of higher phosphorus content with proper amount of In and As and zone-melted.
○	58-2	301-1054		InAs; polycrystal with extrinsic carrier concentration 10^{18} cm^{-3}; doping agent in the form of In +S alloy.	
□	58-1	90-300		InAs; p-type with concentration of current carriers of the order 10^{18} cm^{-3}	Synthesized and remelted to obtain the right form with heating rate of 100 C per hr; zone-melted to a purity of the order of 10^{-4} %.
◇	60-9	309-691	±5	InAs; polycrystal with impurity electron concentration about 3 x 10^{16} cm^{-3}.	
●	60-9	308-693	±5	InAs; sulphur - doped polycrystal with impurity electron concentration about 10^{18} cm^{-3}.	
▲	60-11	410-1100		InAs; carrier concentration 5 x 10^{17} cm^{-3}.	

(continued onto next page)

THERMAL CONDUCTIVITY -- INDIUM ARSENIDE (continued)

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
■	60-11	525-1065		$InAs_{0.95}P_{0.05}$; carrier concentration 4×10^{17} cm^{-3}.	
▼	60-11	480-1065		$InAs_{0.9}P_{0.1}$; carrier concentration 6×10^{16} cm^{-3}.	
◀	60-11	415-1100		$InAs_{0.8}P_{0.2}$; carrier concentration 10^{17} cm^{-3}.	
▶	60-11	550-1075		$InAs_{0.6}P_{0.4}$; carrier concentration 2×10^{17} cm^{-3}.	

PROPERTIES OF OTHER MISCELLANEOUS METAL ARSENIDES

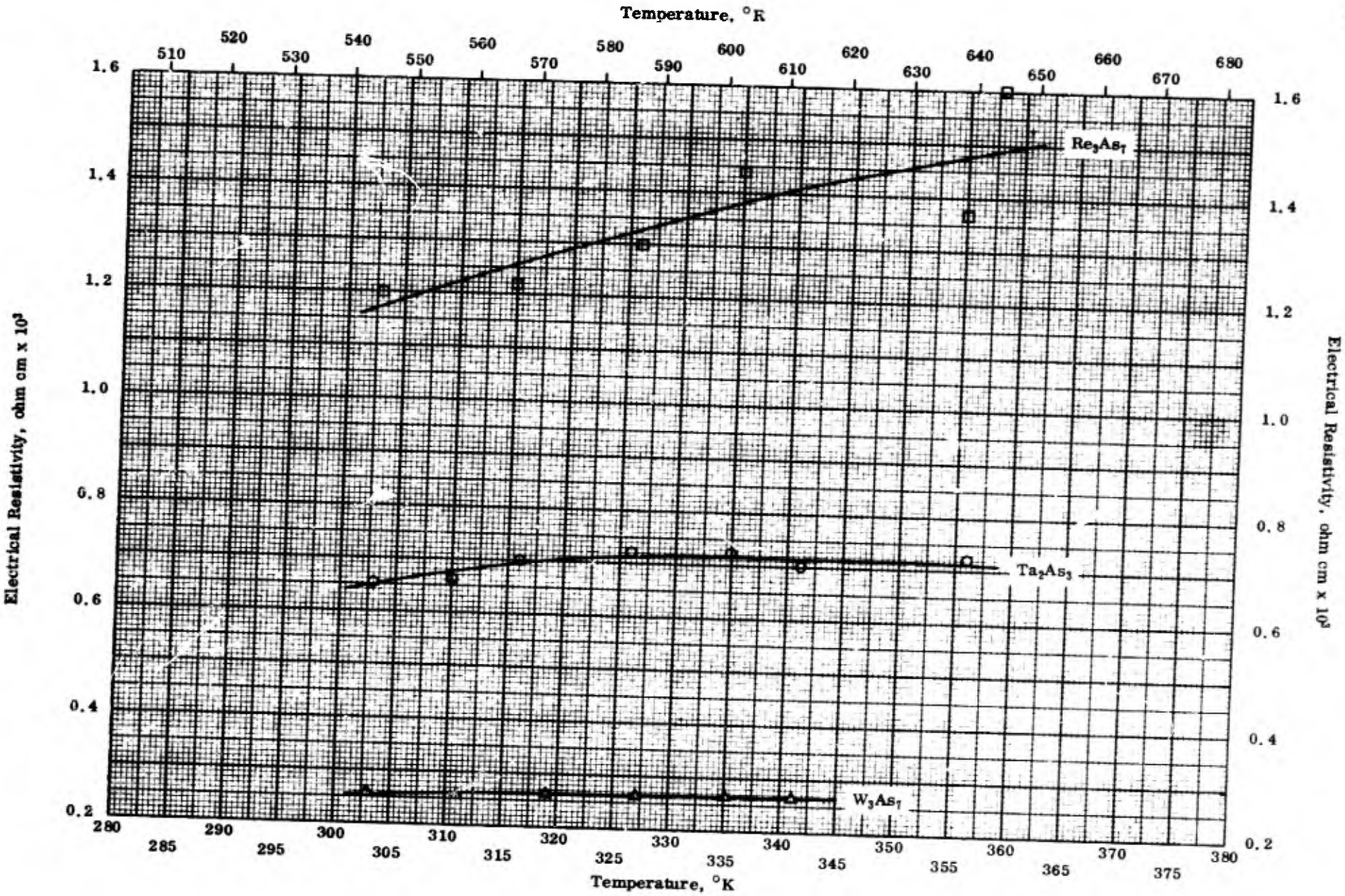
REPORTED VALUES

Density		g cm^{-3}	lb ft^{-3}
○	La_3As_4	6.14	383.1
Melting Point		K	R
□	Mn_7As	1672	3010
△	Pt_2As_3	≈1733	≈3119

PROPERTIES OF OTHER MISCELLANEOUS METAL ARSENIDES

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
○	62-21	298		LaAs.	
□	52-26	1672		Mn_3As.	
△	55-33	1733		Pt_2As_3	



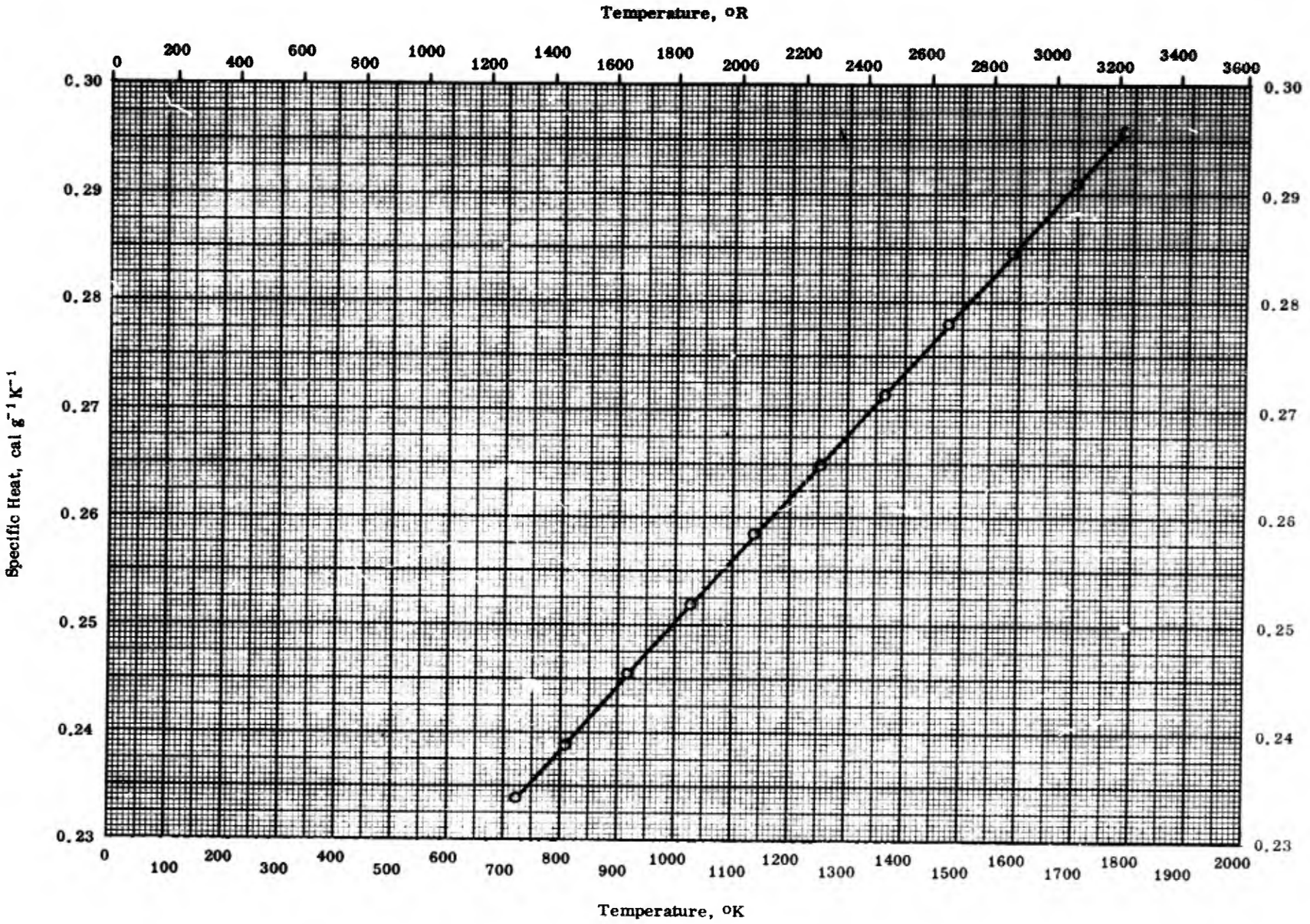
ELECTRICAL RESISTIVITY -- MISCELLANEOUS ARSENIDES

ELECTRICAL RESISTIVITY -- MISCELLANEOUS ARSENIDES

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
○	61-17	303-356		Ta_2As_3.	Hot-pressed at 1550 F and 4000 psi.
□	61-17	303-358		Re_2As_7; prepared from Re_2As_3 by adding additional As; homogeneous sample with no elemental residuals.	Same as above.
△	61-17	303-341		W_3As_7; prepared from W_2As_3 by adding additional As; homogeneous sample with no elemental residuals.	Same as above.

TPRC

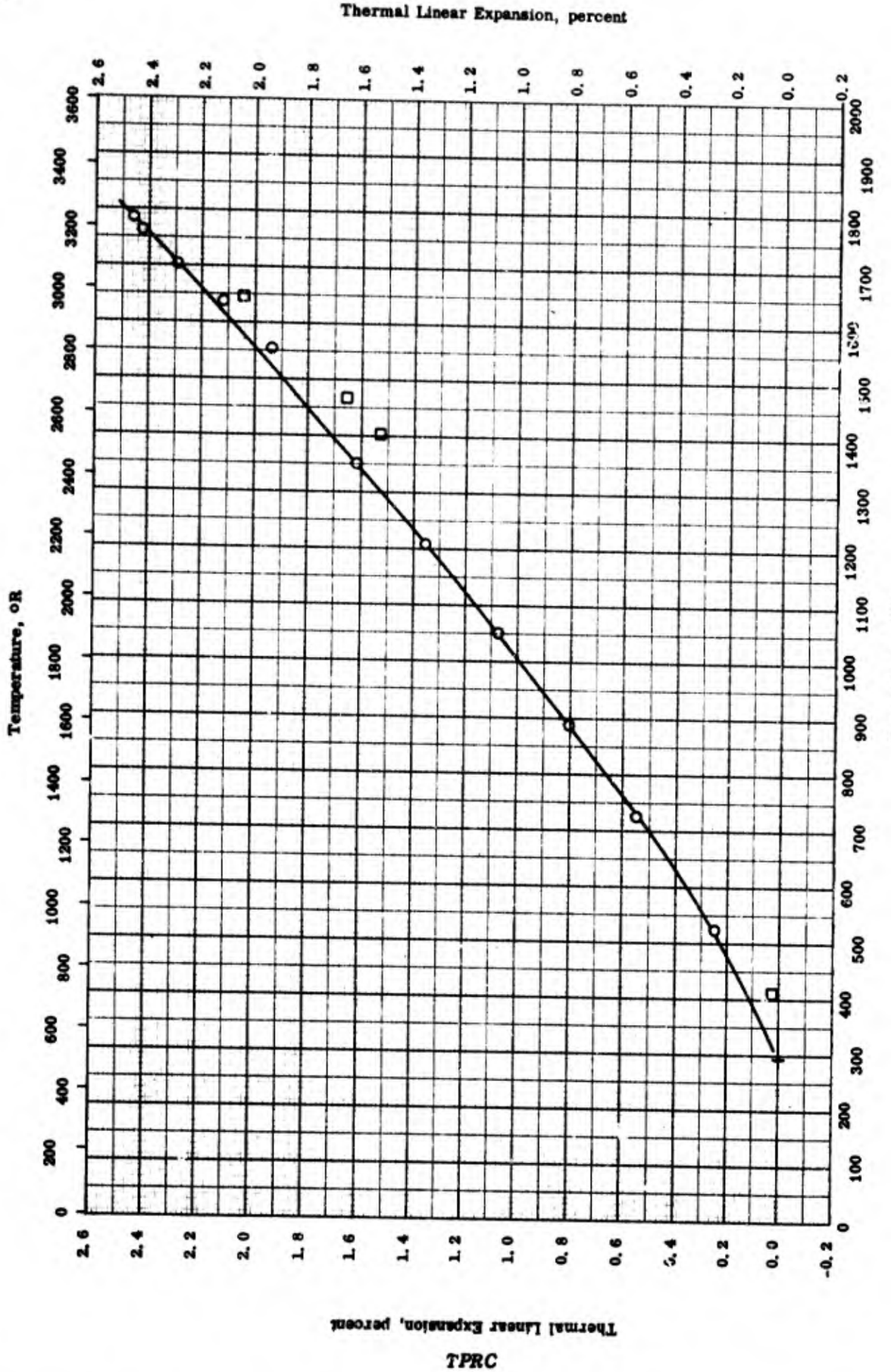


SPECIFIC HEAT -- HAFNIUM BERYLLIDE

SPECIFIC HEAT -- HAFNIUM BERYLLIDE

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
O	61-9	728-1783		Hf_2Be_{21}; 34.1 Be.	Hot pressed.



THERMAL LINEAR EXPANSION -- HAFNIUM BERYLLIDE

THERMAL LINEAR EXPANSION -- HAFNIUM BERYLLIDE

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
○	60-28	299-1787		Hf_2Be_{21}; specimen dimension 3-1/4 x 1/2 x 1/4 in.^{3}; grain size 23μ; 95.8% absolute density. [Author's design.: H. P. 322].	Hot pressed with Mo linear; max pressing temperature 2825 F and max pressure 2000 psi; heating.
□	60-28	411-1781		Same as above.	Cooling data of above specimen.

PROPERTIES OF MOLYBDENUM BERYLLIDES

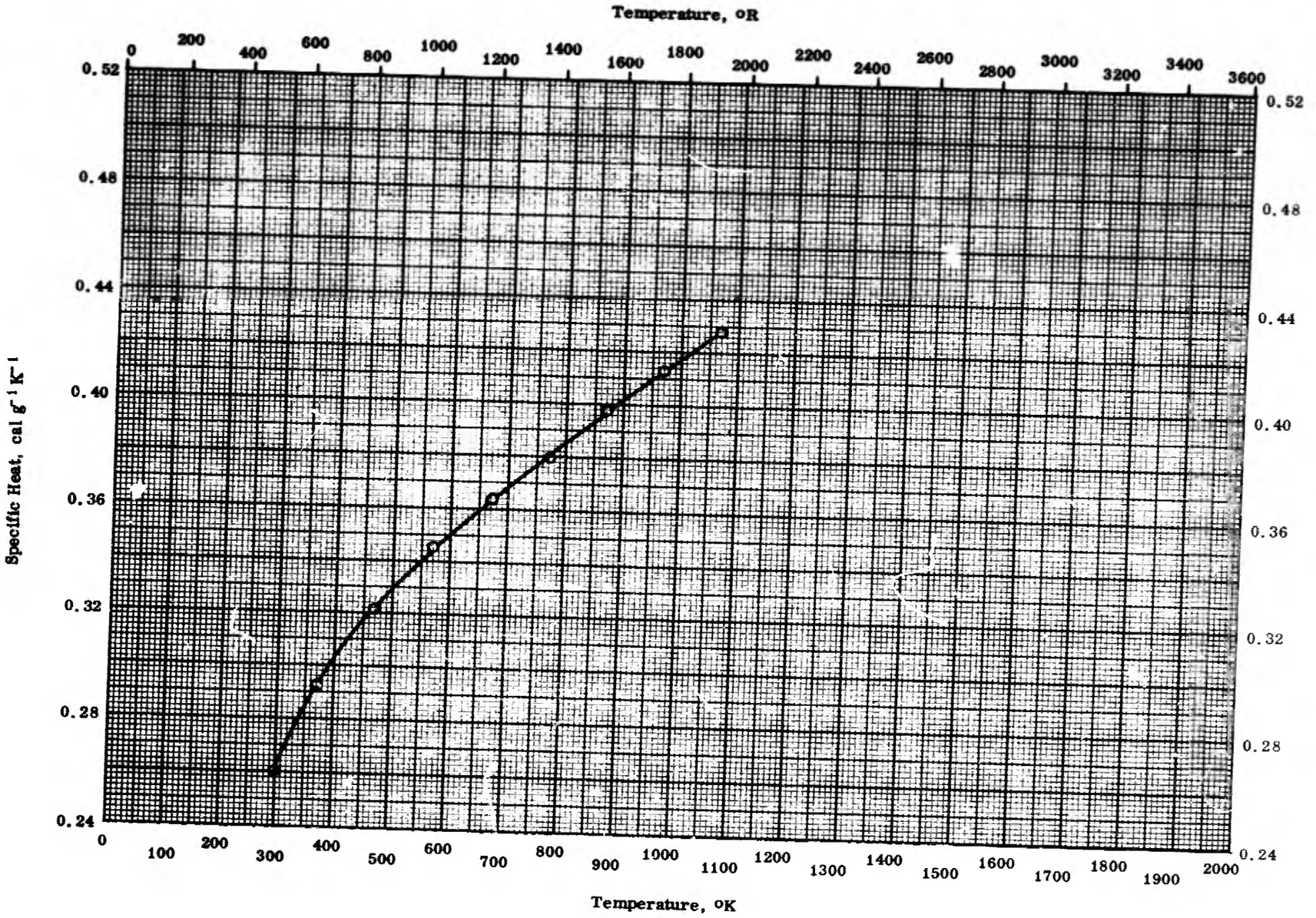
REPORTED VALUES

Density	$g\ cm^{-3}$	$lb\ ft^{-3}$
○ $MoBe_{12}$	3.02	188
Melting Point	**K**	**R**
□ $MoBe_2$	2113	3803

PROPERTIES OF MOLYBDENUM BERYLLIDES

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
O	55-30	298		$MoBe_{12}$; very small single crystal.	Computed from x-ray measurements of lattice.
□	52-26	2113		$MoBe_2$; hexagonal crystal.	



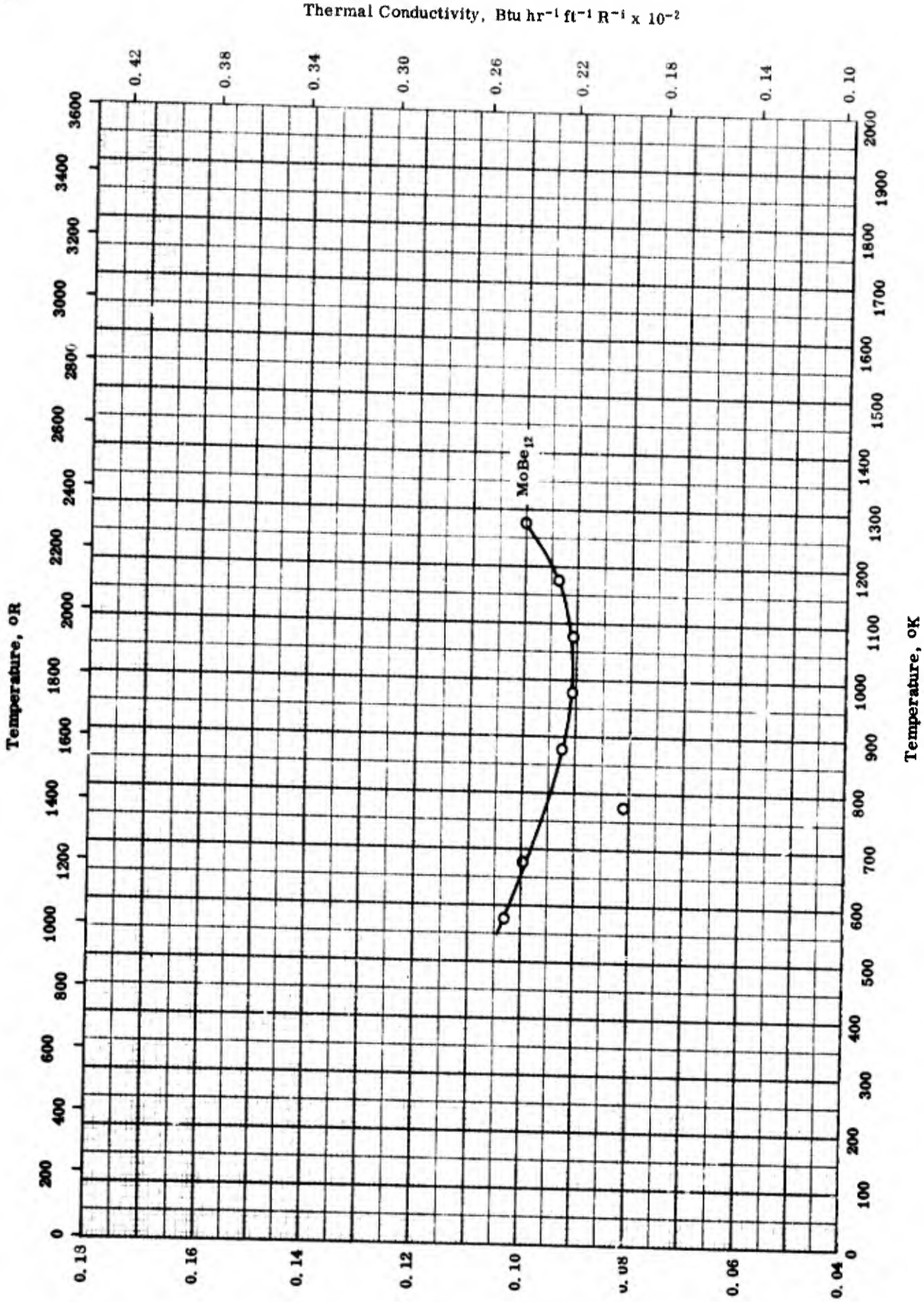
TPRC

SPECIFIC HEAT -- MOLYBDENUM BERYLLIDE

SPECIFIC HEAT -- MOLYBDENUM BERYLLIDE

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept Error %	Sample Specifications	Remarks
O	62-27	303-1073	<3.0	$MoBe_{12}$.	



THERMAL CONDUCTIVITY -- MOLYBDENUM BERYLLIDE

THERMAL CONDUCTIVITY -- MOLYBDENUM BERYLLIDE

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
O	62-8	573-1273		$MoBe_{12}$; 2.916 g cm^{-3} bulk density (99+ % theoretical density).	

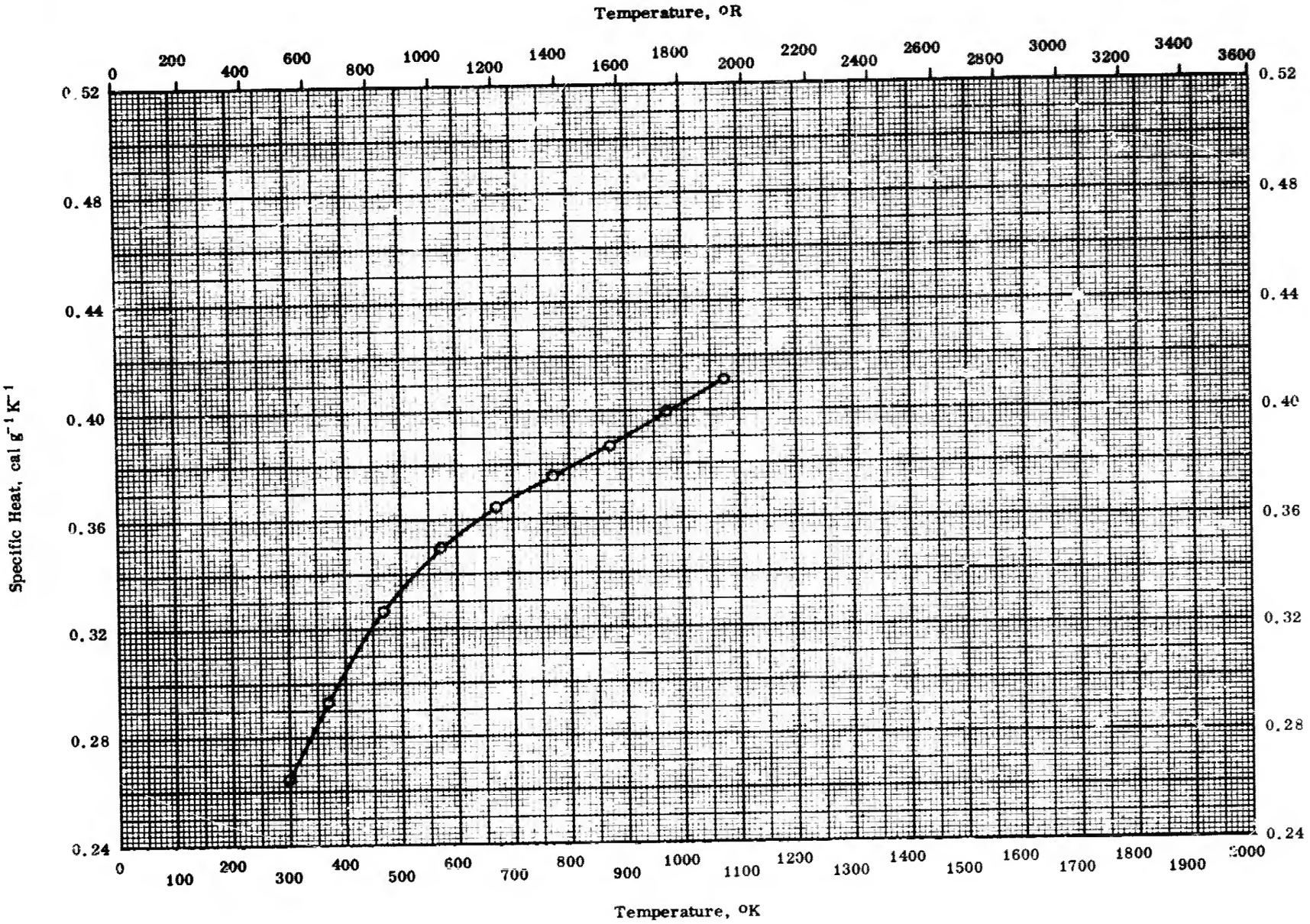
PROPERTIES OF NIOBIUM BERYLLIDES

REPORTED VALUES

Melting Point		K	R
O	$NbBe_{11}$	1961 ± 28	3530 ± 50
	$NbBe_{12}$	1961 ± 28	3530 ± 50

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
O	59-6	1933-1989		$NbBe_{11}$ and $NbBe_{12}$.	



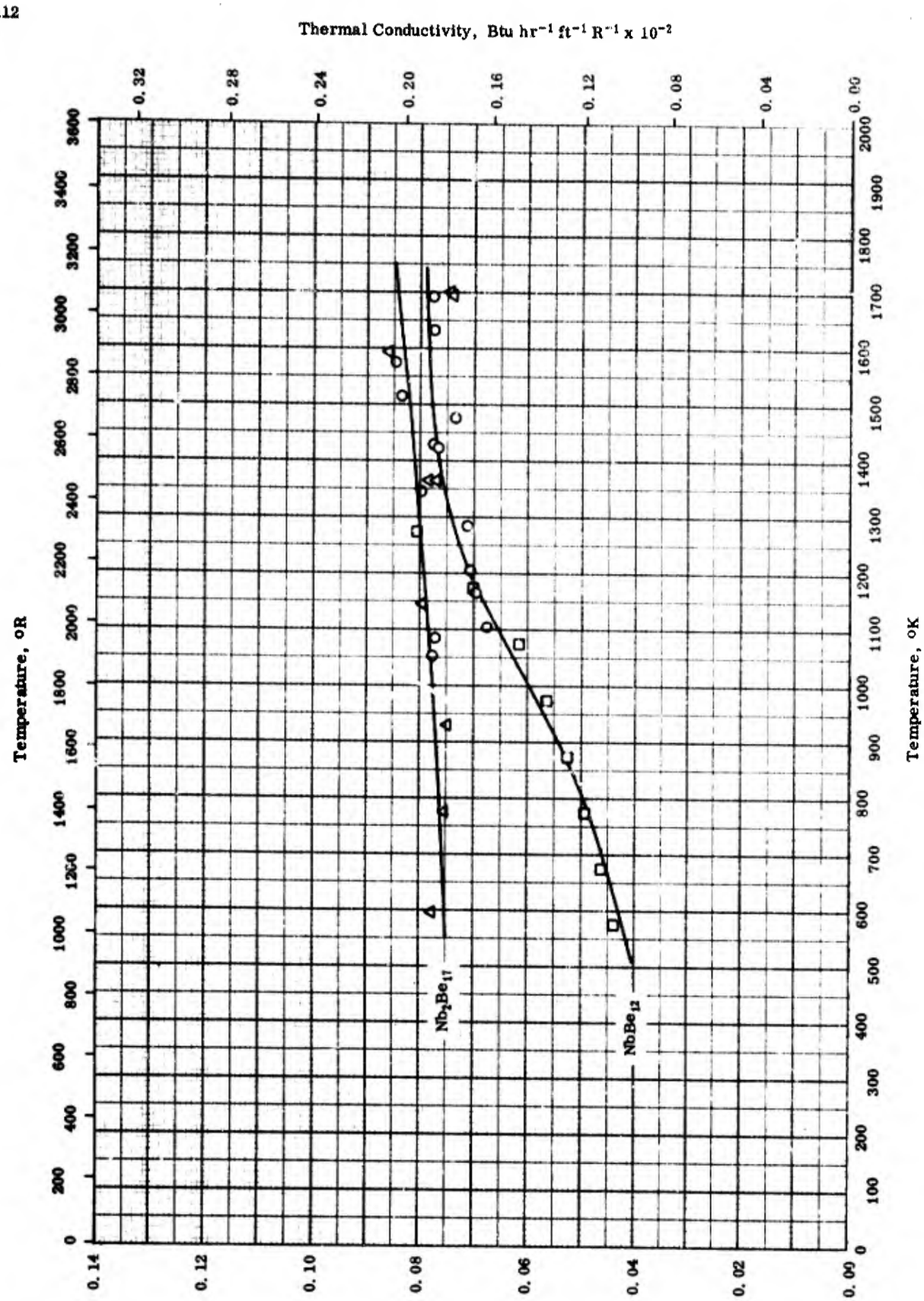
TPRC

SPECIFIC HEAT -- NIOBIUM BERYLLIDE

SPECIFIC HEAT -- NIOBIUM BERYLLIDE

REFERENCE INFORMATION

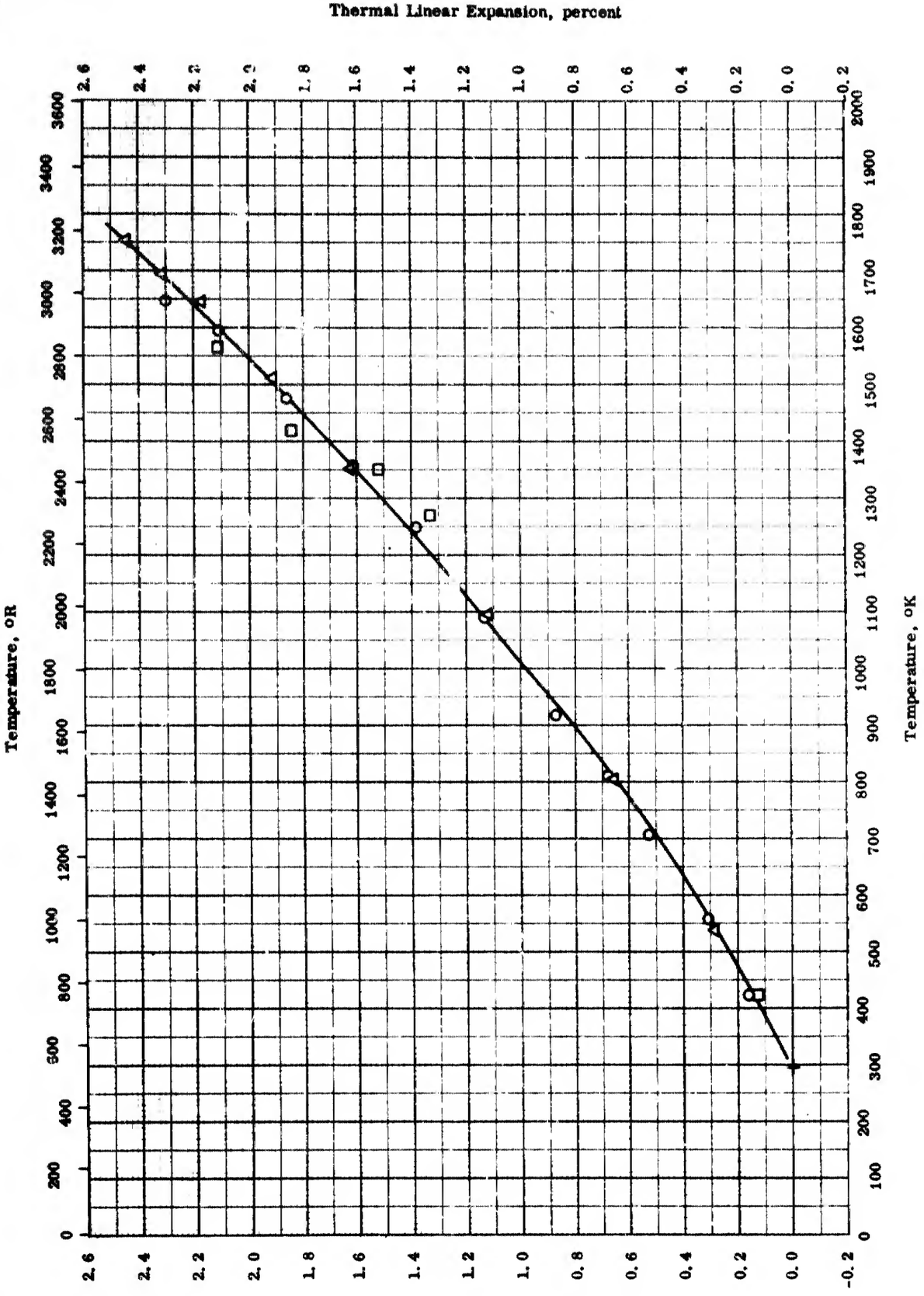
Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
O	62-27	303-1073	<3.0	$NbBe_{12}$	



THERMAL CONDUCTIVITY -- NIOBIUM BERYLLIDE

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
○	59-6	1052-1691		$NbBe_{12}$.	As pressed and machined.
□	62-8	573-1273		$NbBe_{12}$; bulk density 2.711 g cm^{-3}.	
△	62-10	597-1700		Nb_2Be_{17}; 45.1 -200 mesh QMV Be powder from The Brush Beryllium Co. and 53.7 -325 mesh Capacitor Nb powder from Kawecki Chem. Co.; impurities 0.85 O, 0.15 N, 0.09 comb. C, 0.06 Fe, and 0.04 H; density 3.23 g cm^{-3} (theoretical density 3.28).	Cold-pressed and sintered.

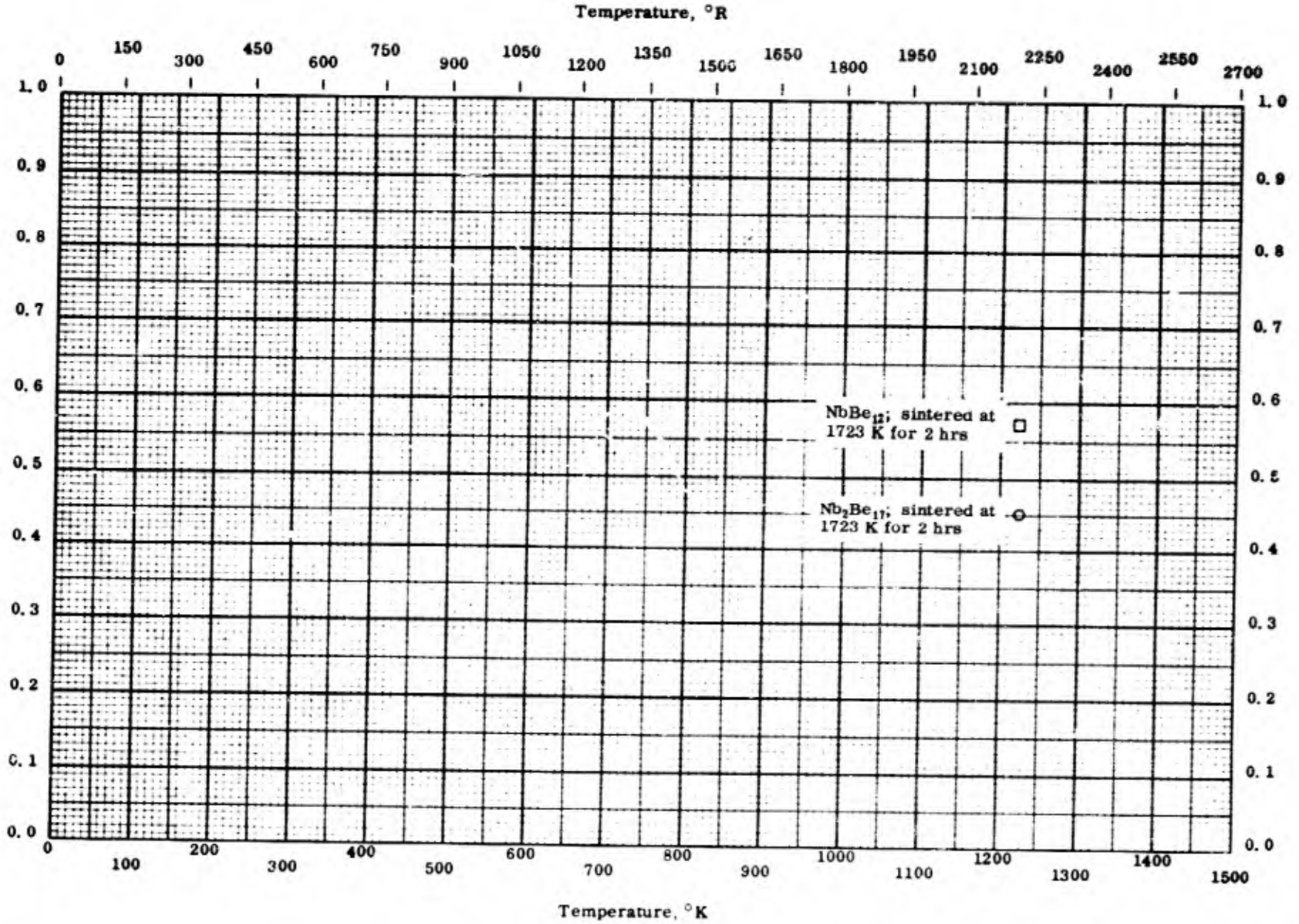


THERMAL LINEAR EXPANSION -- NIOBIUM BERYLLIDE

THERMAL LINEAR EXPANSION -- NIOBIUM BERYLLIDE

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
○	59-6	295-1644		$NbBe_{12}$.	As pressed.
△	59-6	295-1751		$NbBe_{12}$.	As pressed; heating.
□	59-6	423-1751		Same as above.	Cooling data of above specimen.

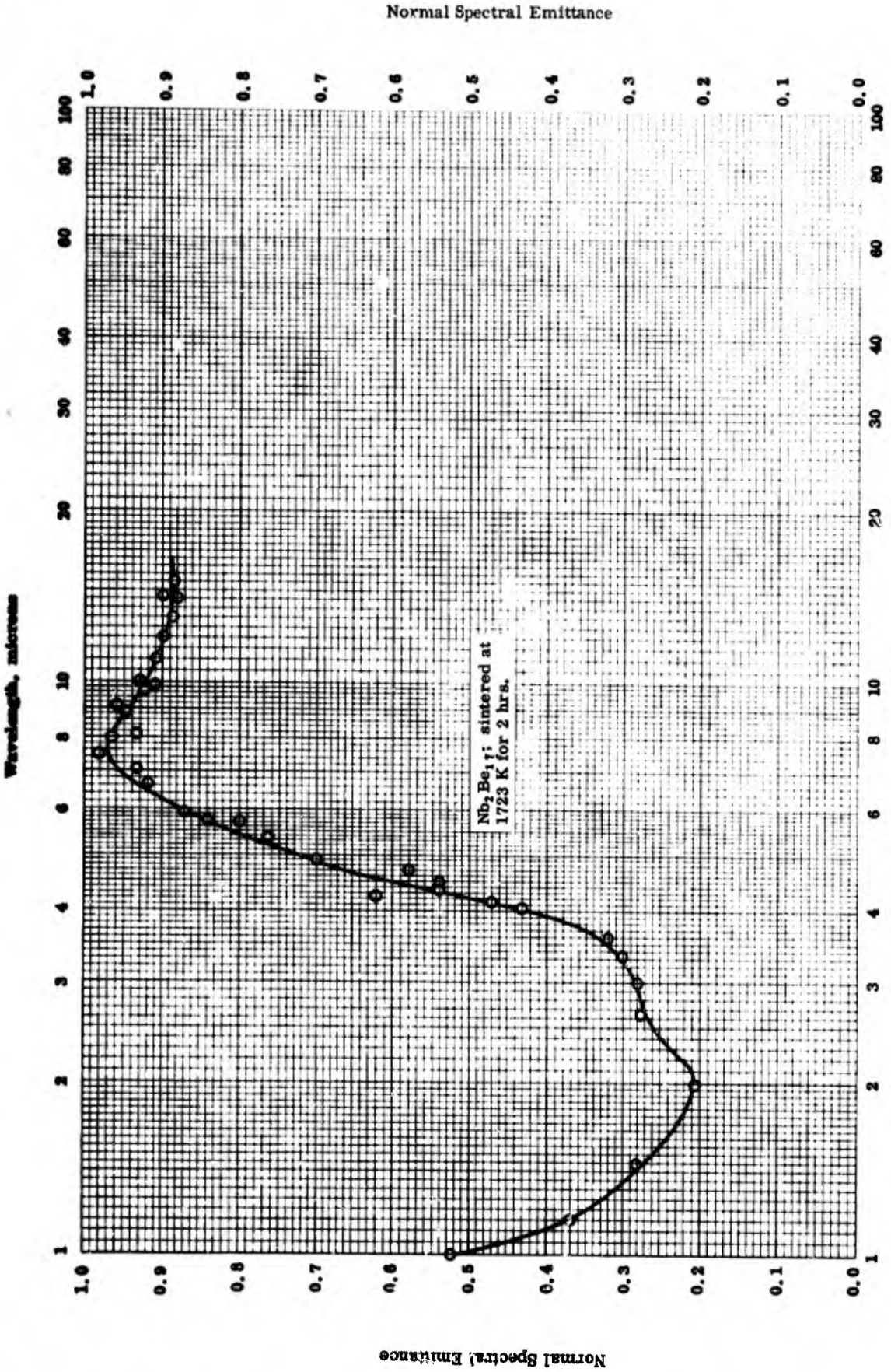


NORMAL TOTAL EMITTANCE -- NIOBIUM BERYLLIDES

NORMAL TOTAL EMITTANCE -- NIOBIUM BERYLLIDES

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
○	63-16	1223	± 8	Nb_2Be_3; 0.07 in. thickness plate; density 1.94 g cm^{-3}.	Sintered at 1723 K for 2 hrs; measured in argon atmosphere; calculated from spectral data.
□	63-16	1223	± 8	$NbBe_{12}$; 0.07 in. thickness plate; density 2.17 g cm^{-3}.	Same as above.

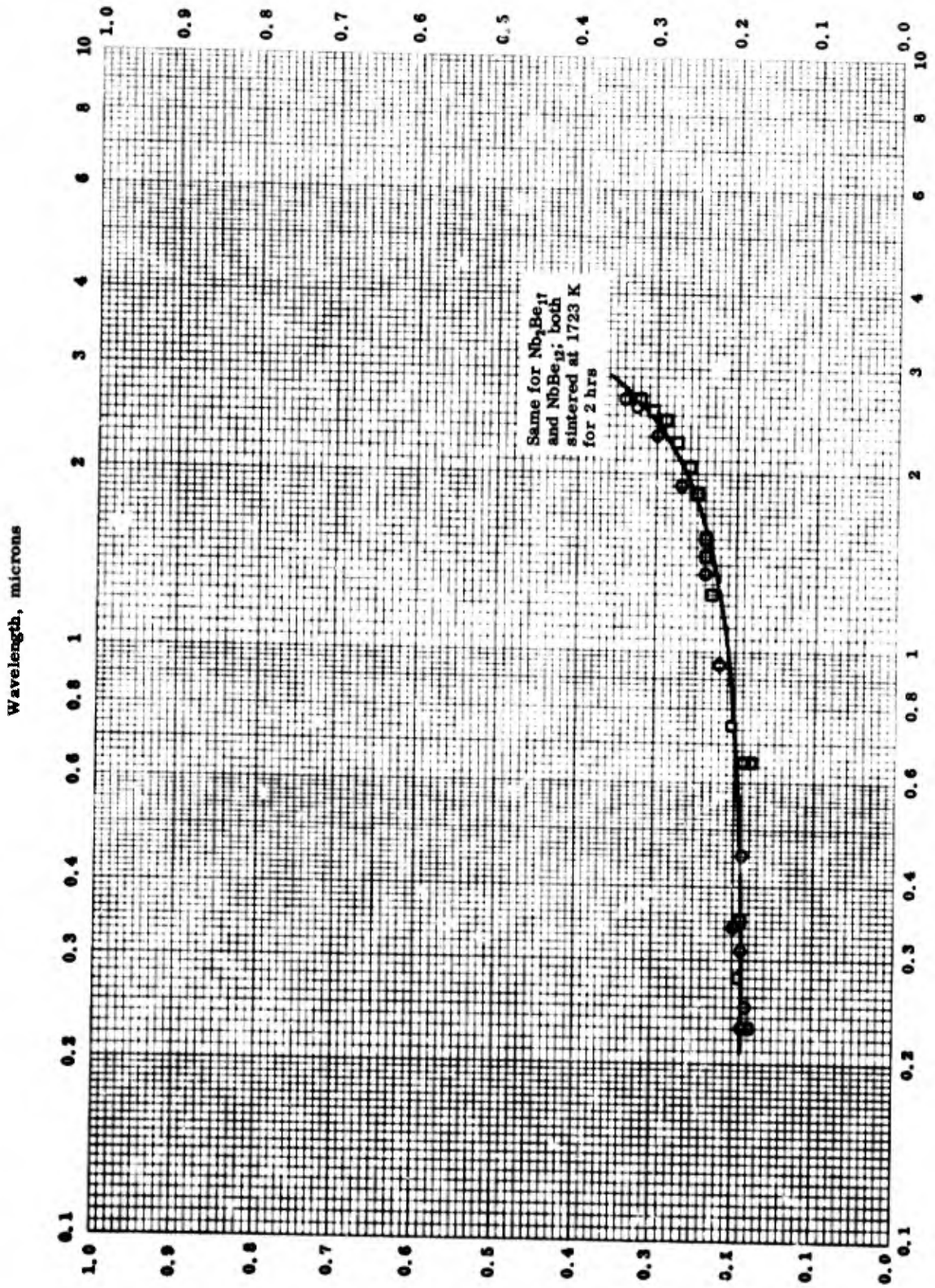


NORMAL SPECTRAL EMITTANCE -- NIOBIUM BERYLLIDE

NORMAL SPECTRAL EMITTANCE — NIOBIUM BERYLLIDE

REFERENCE INFORMATION

Symbol	Ref.	Temp. ° K	Wavelength Range, μ	Rept. Error %	Sample Specifications	Remarks
O	63-16	1223	1-15		Nb_2Be_{17}; 0.07 in. thickness plate; density 1.94 g cm^{-3}.	Sintered at 1723 K for 2 hrs; measured in argon atmosphere; data taken from a curve.



NORMAL SPECTRAL REFLECTANCE -- NIOBIUM BERYLLIDES

NORMAL SPECTRAL REFLECTANCE -- NIOBIUM BERYLLIDES

REFERENCE INFORMATION

Symbol	Ref.	Temp. °K	Wavelength Range, μ	Rept. Error %	Sample Specifications	Remarks
○	63-16	298	0.23-2.65	5	Nb_2Be_{17}: 0.07 in. thickness plate; density 1.94 g cm^{-3}.	Sintered at 1723 K for 2 hrs; data taken from a curve; normal incidence, hemispherical viewing; MgO as reference standard.
□	63-16	298	0.23-2.65	5	$NbBe_{12}$; 0.07 in. thickness plate; density 2.17 g cm^{-3}.	Same as above.

PROPERTIES OF TANTALUM BERYLLIDES

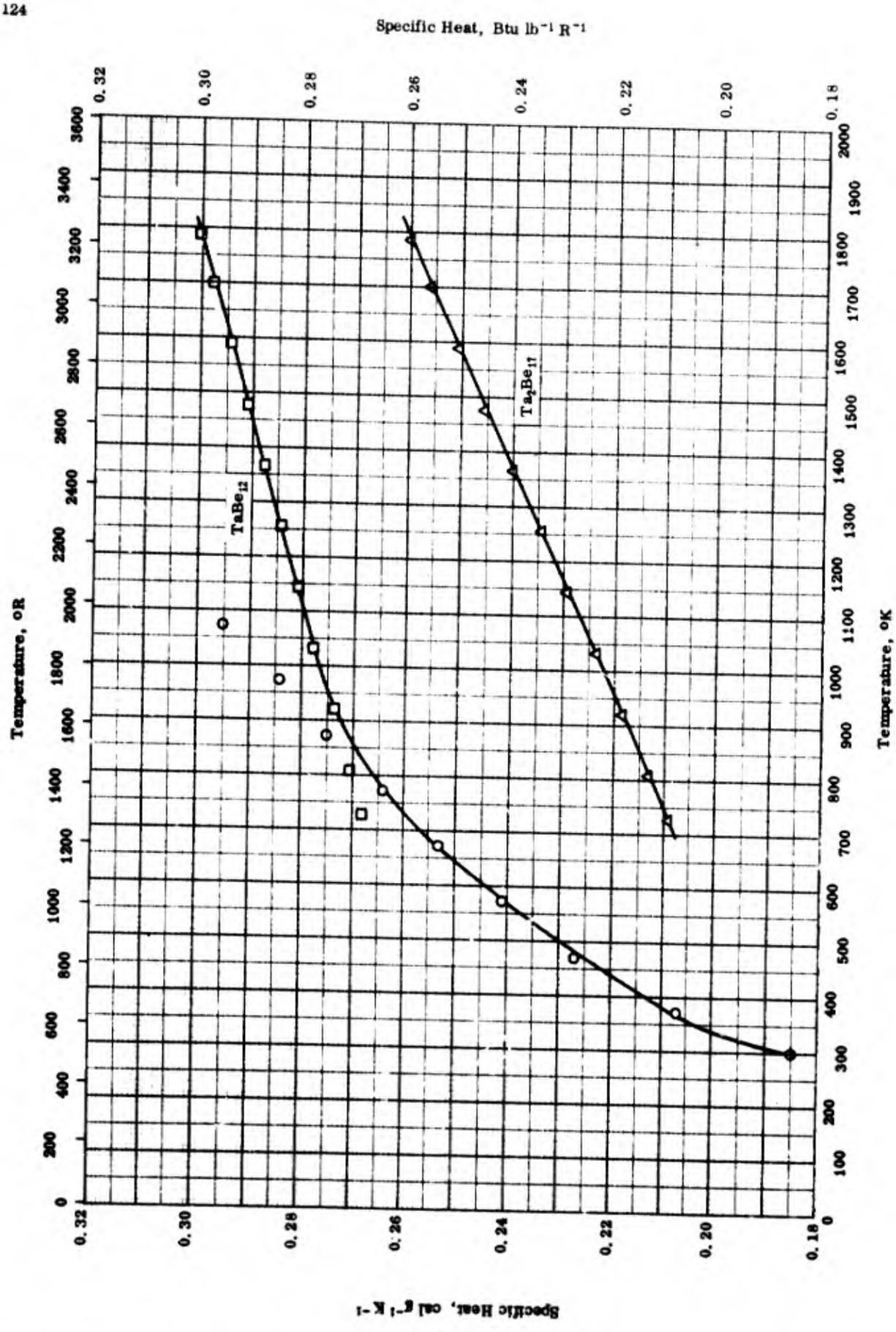
REPORTED VALUES

Melting Point	K	R
○ $TaBe_{12}$	2122 ± 28	3820 ± 50
□ Ta_2Be_{17}	2261 ± 28	4070 ± 50

PROPERTIES OF TANTALUM BERYLLIDES

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
○	59-6	2094-2150		$TaBe_{12}$.	
□	59-6	2233-2289		Ta_2Be_{17}.	



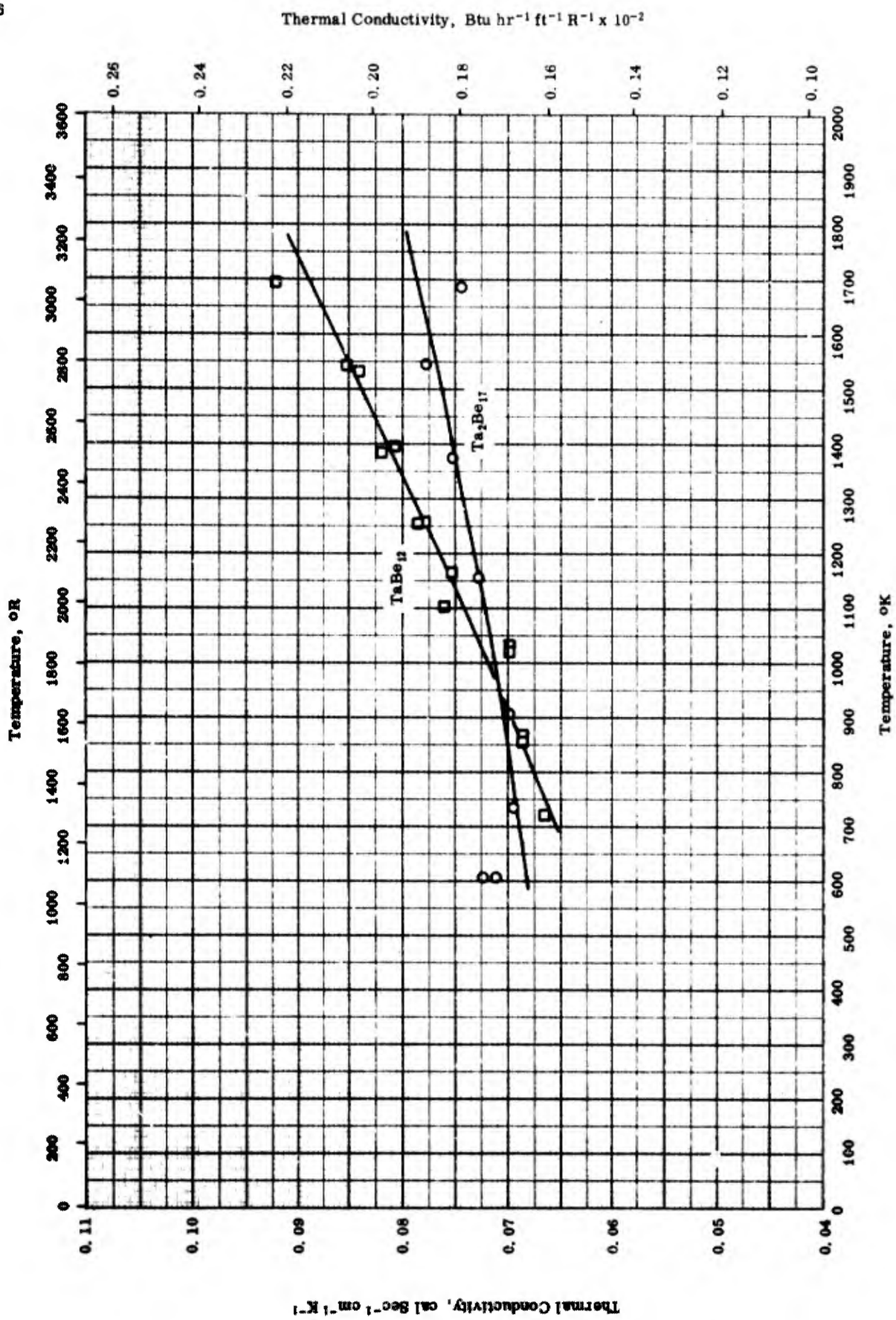
SPECIFIC HEAT -- TANTALUM BERYLLIDES

SPECIFIC HEAT -- TANTALUM BERYLLIDES

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
○	62-27	303-1073	<3.0	$TaBe_{12}$.	
□	61-9	728-1783		$TaBe_{12}$; single phase composition.	Hot pressed.
△	61-9	728-1783		Ta_2Be_{17}; single phase composition.	Hot pressed.

TPRC



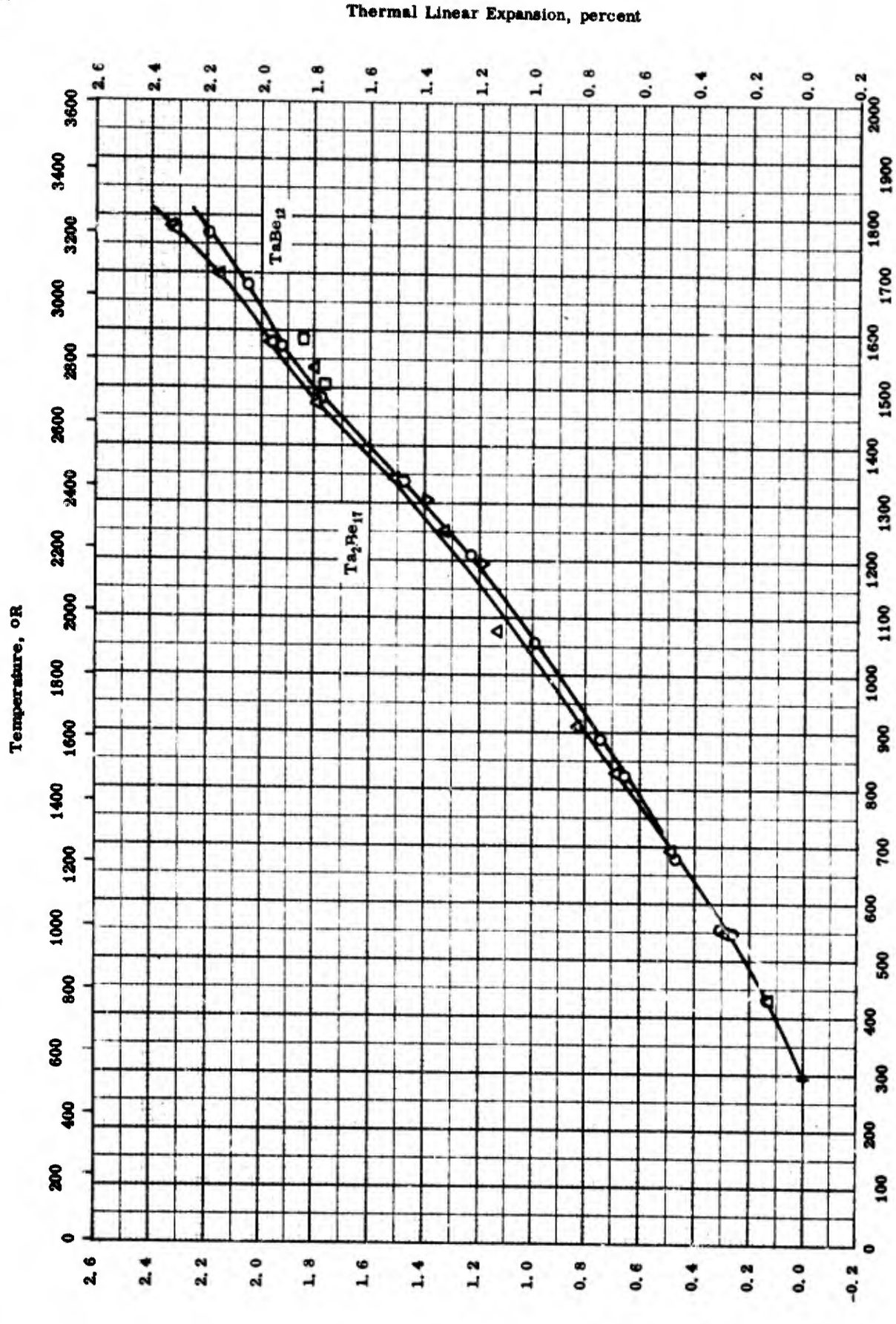
THERMAL CONDUCTIVITY -- TANTALUM BERYLLIDE

THERMAL CONDUCTIVITY -- TANTALUM BERYLLIDE

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
○	62-5	608-1689	5	Ta_2Be_{17}; single phase; 98% of theoretical density.	
□	61-9	721-1698		$TaBe_{12}$.	

TPRC

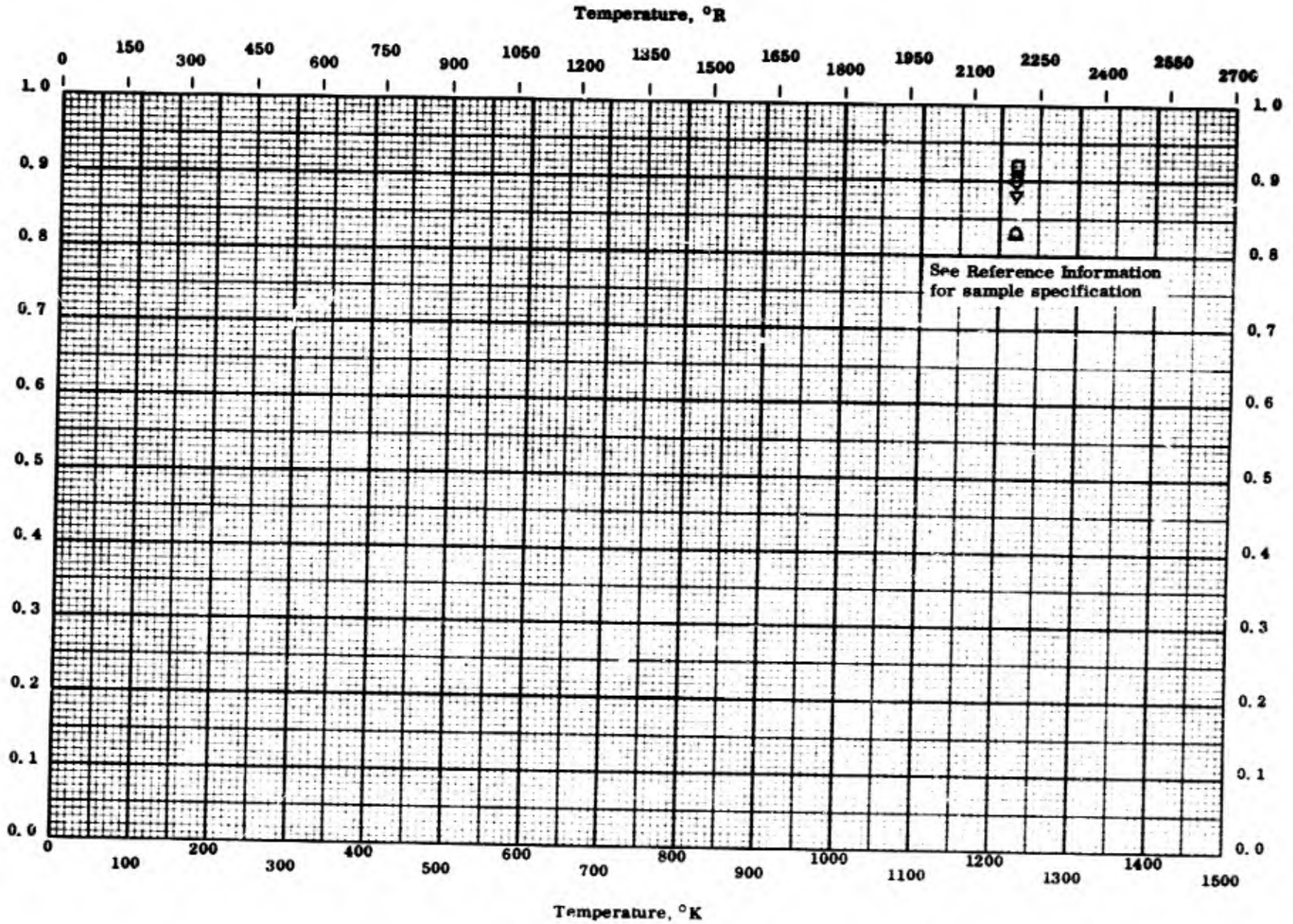


THERMAL LINEAR EXPANSION -- TANTALUM BERYLLIDES

THERMAL LINEAR EXPANSION -- TANTALUM BERYLLIDES

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
○	61-9	300-1768		$TaBe_{12}$; specimen dimension 2-1/2 x 3-1/2 x 1-1/16 in.^{3}; 99.2% absolute density. [Author's design.: H. P. 222].	Max hot-pressing temperature 2780 F and max pressure 2000 psi; pre-oxidized at 2700 F; measured in argon (for T < 2200 F) and in air (for T > 2200 F); heating.
□	61-9	1504-1768		Same as above.	Cooling data of above specimen.
△	61-9	300-1778		Ta_2Be_{17}; same dimension as above; 99.2% absolute density. [Author's design.: H. P. 227].	Max hot pressing temperature 2685 F and max pressure 2000 psi; pre-oxidized at 2700 F; measured in argon (for T < 2200 F) and in air (for T > 2200 F); heating.
▽	61-9	1191-1778		Same as above.	Cooling data of above specimen.

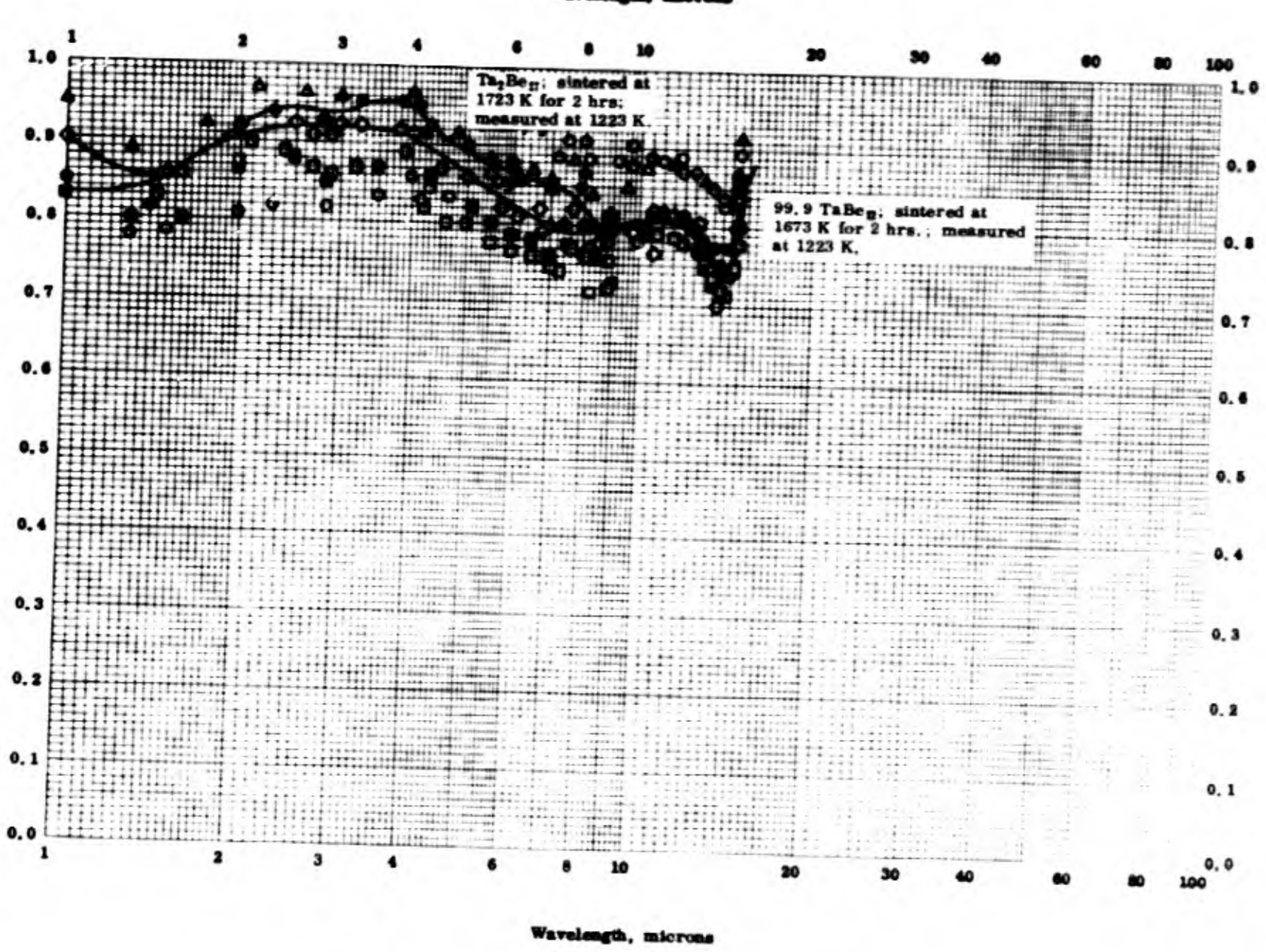


NORMAL TOTAL EMITTANCE -- TANTALUM BERYLLIDES

NORMAL TOTAL EMITTANCE -- TANTALUM BERYLLIDES

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
○	63-16	1223	± 8	98 $TaBe_{11}$ and 2 Ta_2O_5; 0.055 in. thickness plate; density 2.65 g cm^{-3}.	Sintered at 1723 K for 2 hrs; measured in argon; calculated from spectral data.
△	63-16	1223	± 8	98 $TaBe_{11}$, 1 Ta_2O_5 and 1 BeO; 0.068 in. thickness plate; density 2.43 g cm^{-3}.	Same as above except sintered at 1673 K for 2 hrs.
□	63-16	1223	± 8	100 $TaBe_{11}$; 0.055 in. thickness plate; density 2.42 g cm^{-3}.	Same as above.
▽	63-16	1223	± 8	99.9 $TaBe_{11}$ and 0.1 BeO; 0.045 in. thickness plate; density 2.32 g cm^{-3}.	Same as above.
◇	63-16	1223	± 8	99 $TaBe_{11}$ and 1 BeO; 0.073 in. thickness plate; density 2.39 g cm^{-3}.	Same as above.
◁	63-16	1223	± 8	Ta_2Be_{11}; 0.07 in. thickness plate; density 3.6 g cm^{-3}.	Same as above.

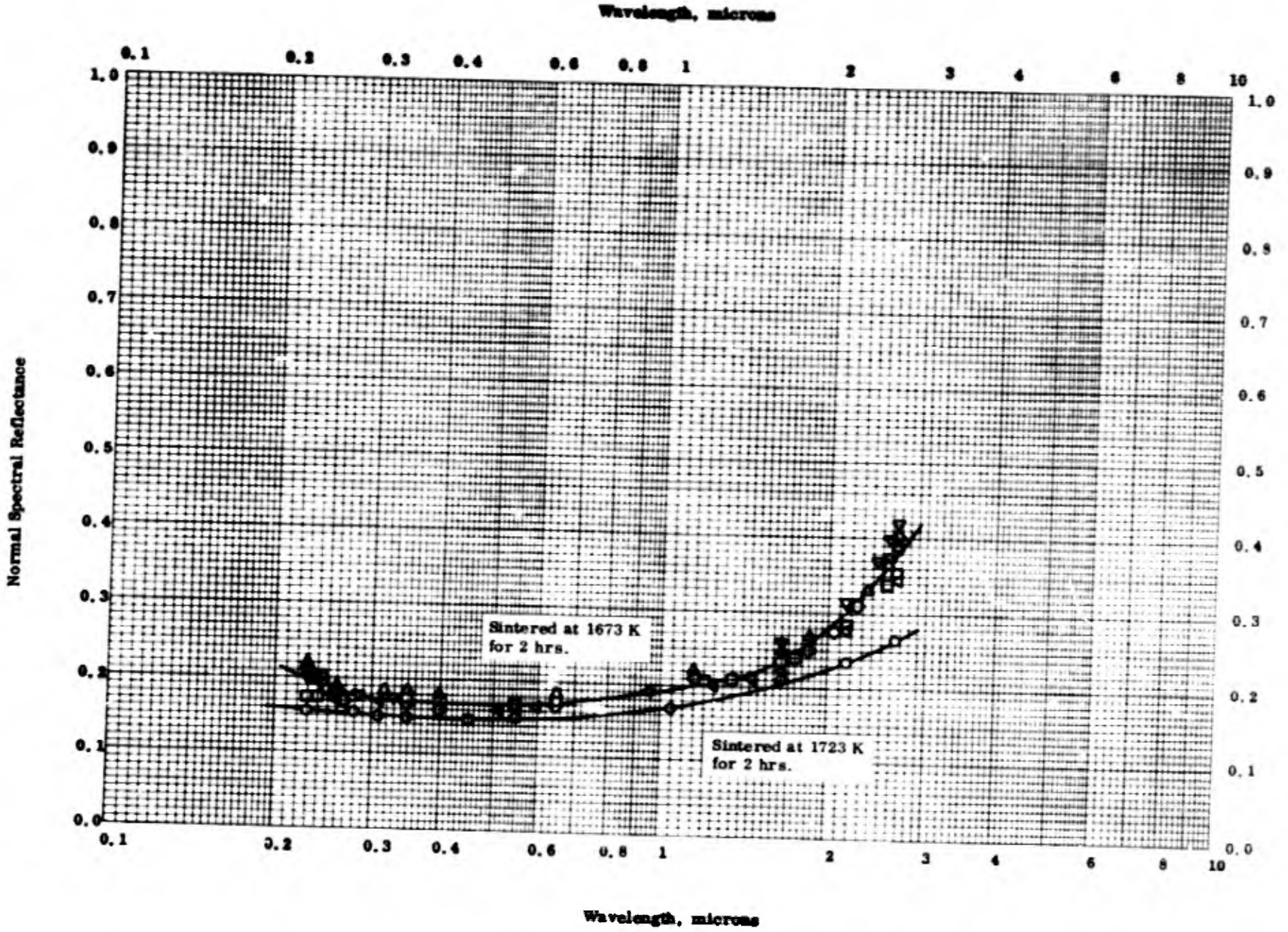


NORMAL SPECTRAL EMITTANCE -- TANTALUM BERYLLIDES

NORMAL SPECTRAL EMITTANCE -- TANTALUM BERYLLIDES

REFERENCE INFORMATION

Symbol	Ref.	Temp. °K	Wavelength Range, μ	Rept. Error%	Sample Specifications	Remarks
○	63-16	1223	1-15		98 $TaBe_{12}$ and 2 Ta_2O_5; 0.055 in. thickness plate; density 2.65 g cm^{-3}.	Sintered at 1723 K for 2 hrs; measured in argon atmosphere. data taken from a curve.
□	63-16	1223	1-15		98 $TaBe_{12}$, 1 Ta_2O_5 and 1 BeO; 0.068 in. thickness plate; density 2.43 g cm^{-3}.	Same as above except sintered at 1673 K for 2 h s.
△	63-16	1223	1-15		100 $TaBe_{12}$; 0.055 in. thickness plate; density 2.42 g cm^{-3}.	Same as above.
◇	63-16	1223	1-15		99.9 $TaBe_{12}$ and 0.1 BeO; 0.045 in. thickness plate; density 2.32 g cm^{-3}.	Same as above.
■	63-16	1223	1-15		99 $TaBe_{12}$ and 1 BeO; 0.073 in. thickness plate; density 2.39 g cm^{-3}.	Same as above.
●	63-16	1223	1-15		Ta_2Be_{17}; 0.07 in. thickness plate; density 3.6 g cm^{-3}.	Sintered at 1723 K for 2 hrs; measured in argon.



TPRC

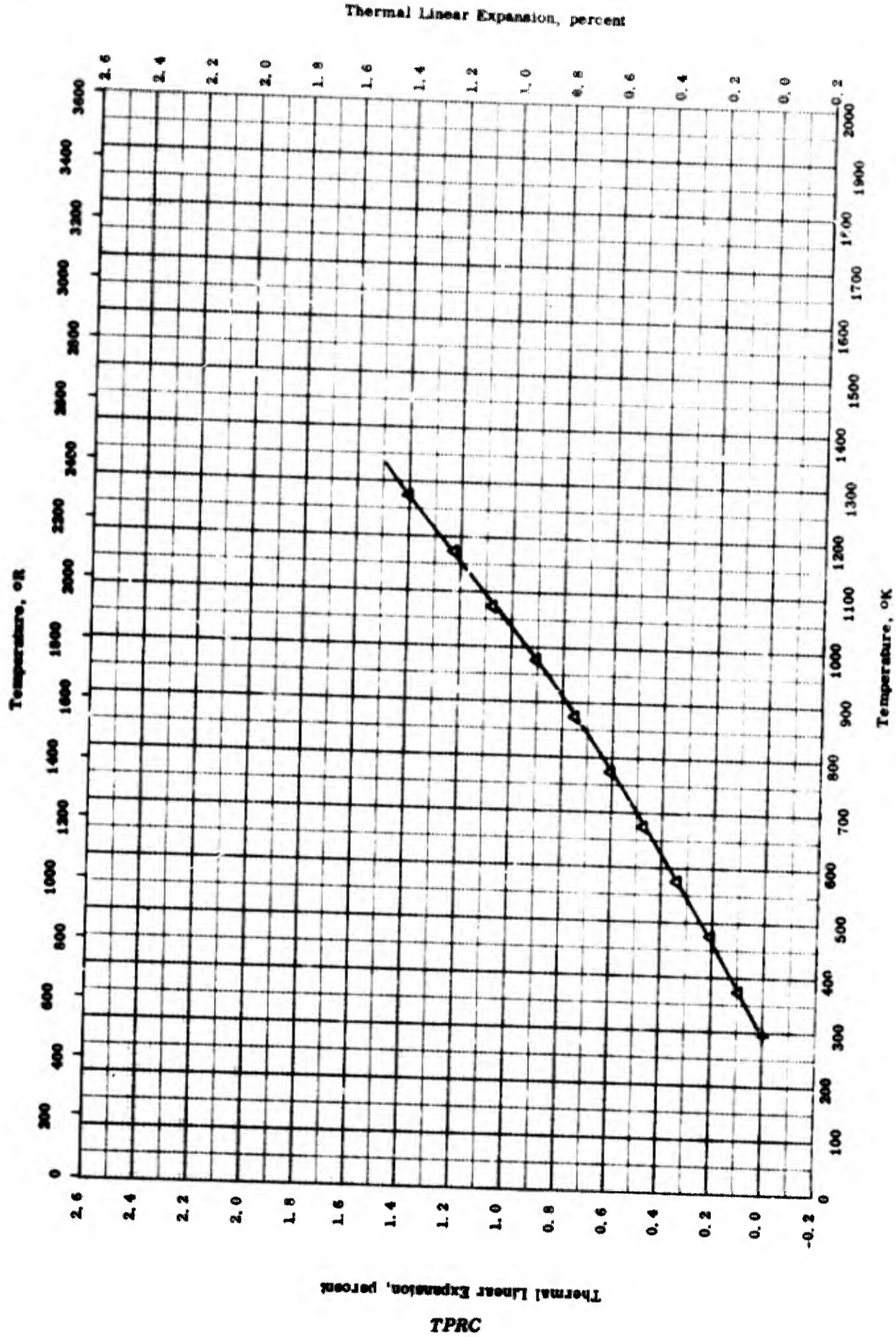
NORMAL SPECTRAL REFLECTANCE -- TANTALUM BERYLLIDES

NORMAL SPECTRAL REFLECTANCE - - TANTALUM BERYLLIDES

REFERENCE INFORMATION

Symbol	Ref.	Temp. °K	Wavelength Range, μ	Rept. Error %	Sample Specifications	Remarks
○	63-16	298	0.23-2.65	5	98 $TaBe_{12}$ and 2 Ta_2O_5; 0.055 in. thickness plate; density 2.65 g cm^{-3}.	Sintered at 1723 K for 2 hrs; data taken from a curve, normal incidence, hemispherical viewing, MgO as reference standard.
△	63-16	298	0.23-2.65	5	98 Ta Be_{12}, 1 Ta_2O_5, and 1 BeO; 0.068 in. thickness plate; density 2.43 g cm^{-3}.	Same as above except sintered at 1673 K for 2 hrs.
□	63-16	298	0.23-2.65	5	100 $TaBe_{12}$; 0.055 in. thickness plate; density 2.42 g cm^{-3}.	Same as above.
▽	63-16	298	0.23-2.65	5	99.9 $TaBe_{12}$ and 0.1 BeO; 0.045 in. thickness plate; density 2.32 g cm^{-3}.	Same as above.
◇	63-16	298	0.23-2.65	5	99 $TaBe_{12}$ and 1 BeO; 0.073 in. thickness plate; density 2.39 g cm^{-3}.	Same as above.
◁	63-16	298	0.23-2.65	5	Ta_2Be_{17}; 0.07 in. thickness plate; density 3.6 g cm^{-3}.	Same as above.

TPRC



THERMAL LINEAR EXPANSION -- THORIUM URANIUM BERYLLIDE

THERMAL LINEAR EXPANSION -- THORIUM URANIUM BERYLLIDE

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
Δ	64-16	293-1273		$(Th_9U)Be_{13}$ [Author's design.: $(90Th - 10U)Be_{13}$].	Specimen prepared by arc melting button material and drop casting through a hole in the hearth into a graphite mold, measured under a vacuum of approx 5×10^{-5} mm Hg.

TPRC

PROPERTIES OF TITANIUM BERYLLIDES

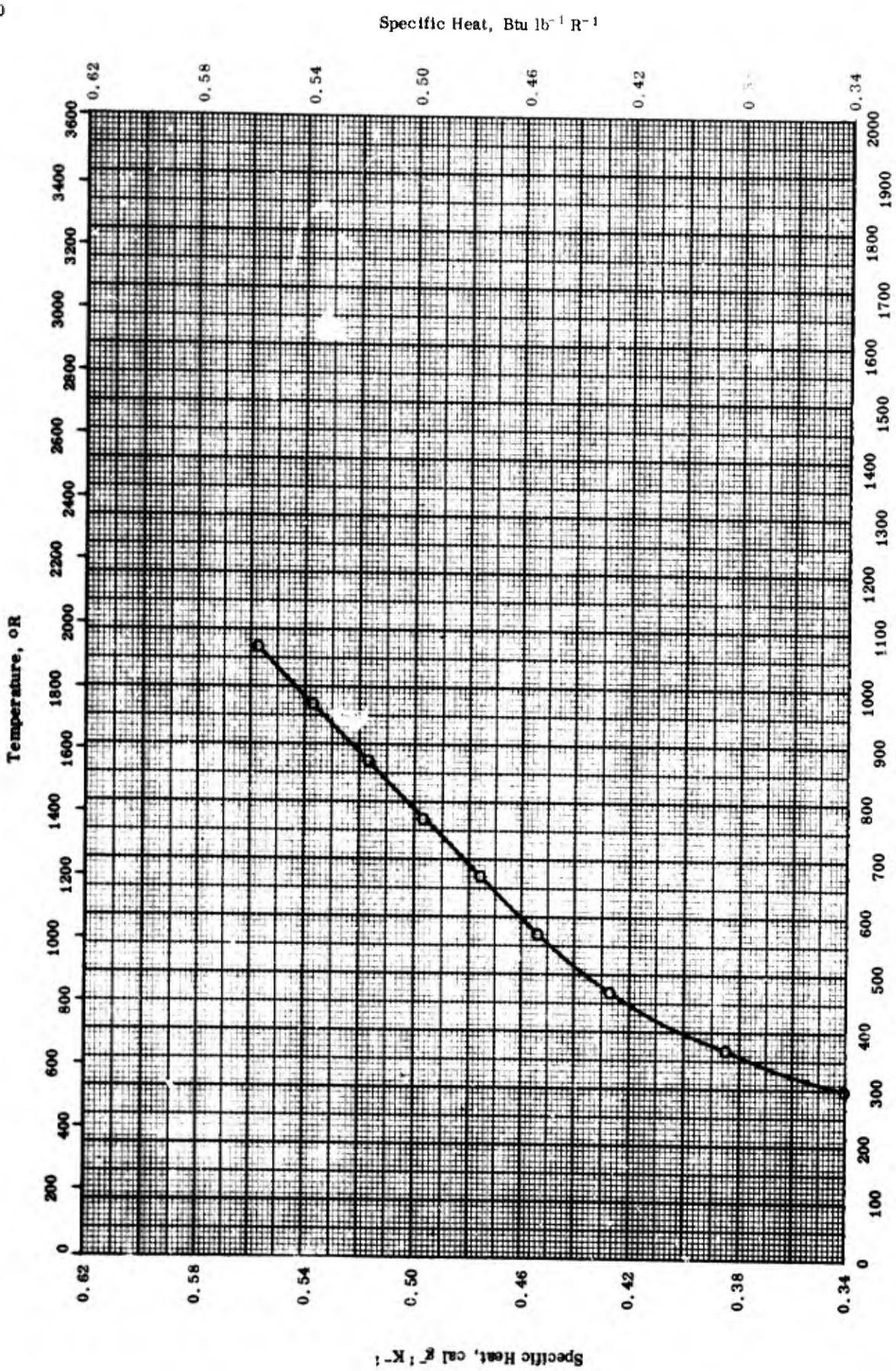
REPORTED VALUES

Density		g cm^{-3}	lb ft^{-3}
○	TiBe	4.17	260
	$TiBe_3$	3.23	202

PROPERTIES OF TITANIUM BERYLLIDES

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
O	49-5	298	±0.5	Titanium beryllides.	Sintered at 1300 - 1600 C by using small size pycnometer.

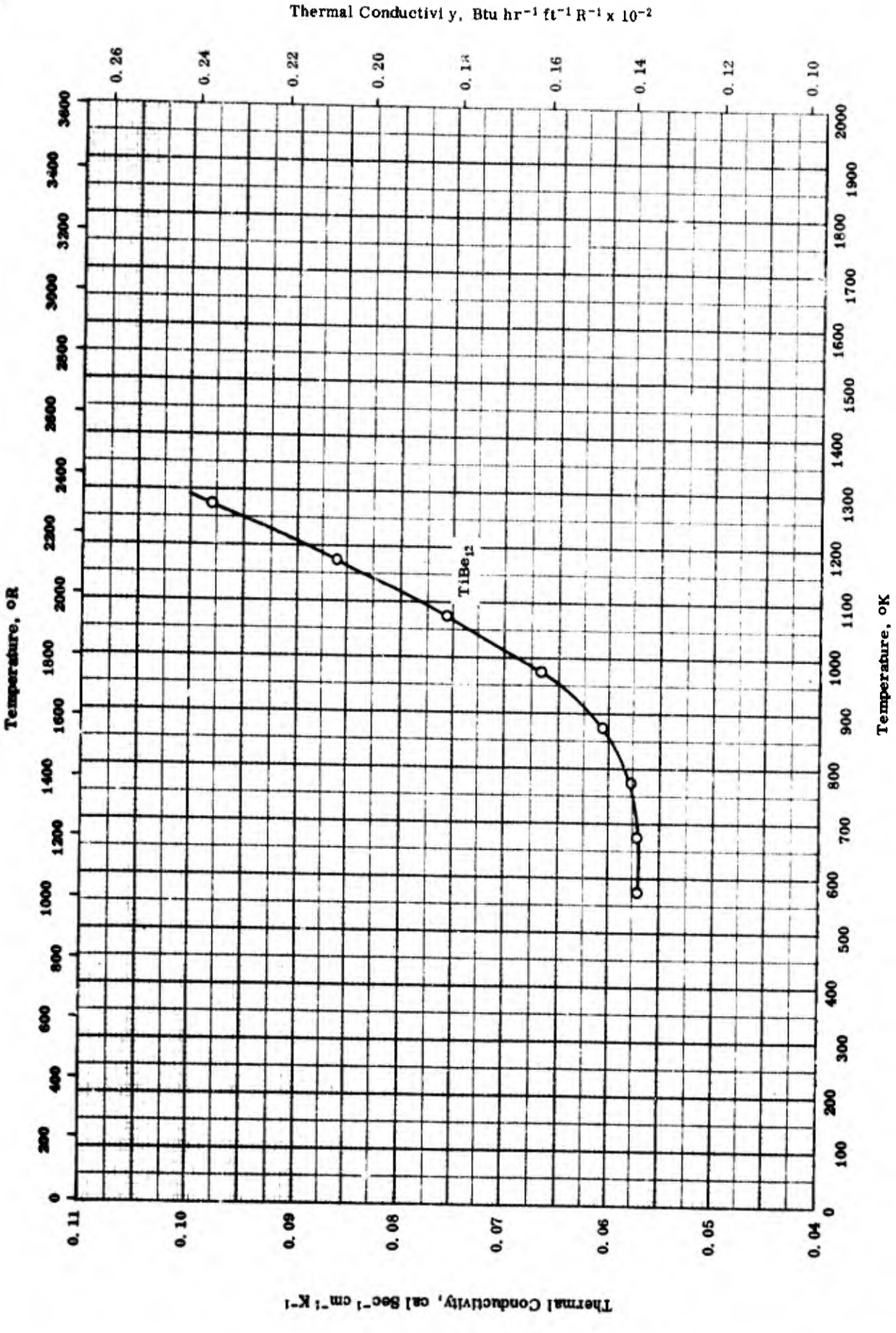


SPECIFIC HEAT -- TITANIUM BERYLLIDE

SPECIFIC HEAT -- TITANIUM BEPYLLIDE

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
O	62-27	303-1073	<3	$TiBe_{12}$.	



THERMAL CONDUCTIVITY -- TITANIUM BERYLLIDE

THERMAL CONDUCTIVITY -- TITANIUM BERYLLIDE

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
O	62-8	573-1273		$TiBe_{12}$; 2.180 g cm^{-3} bulk density.	

PROPERTIES OF URANIUM BERYLLIDES

REPORTED VALUES

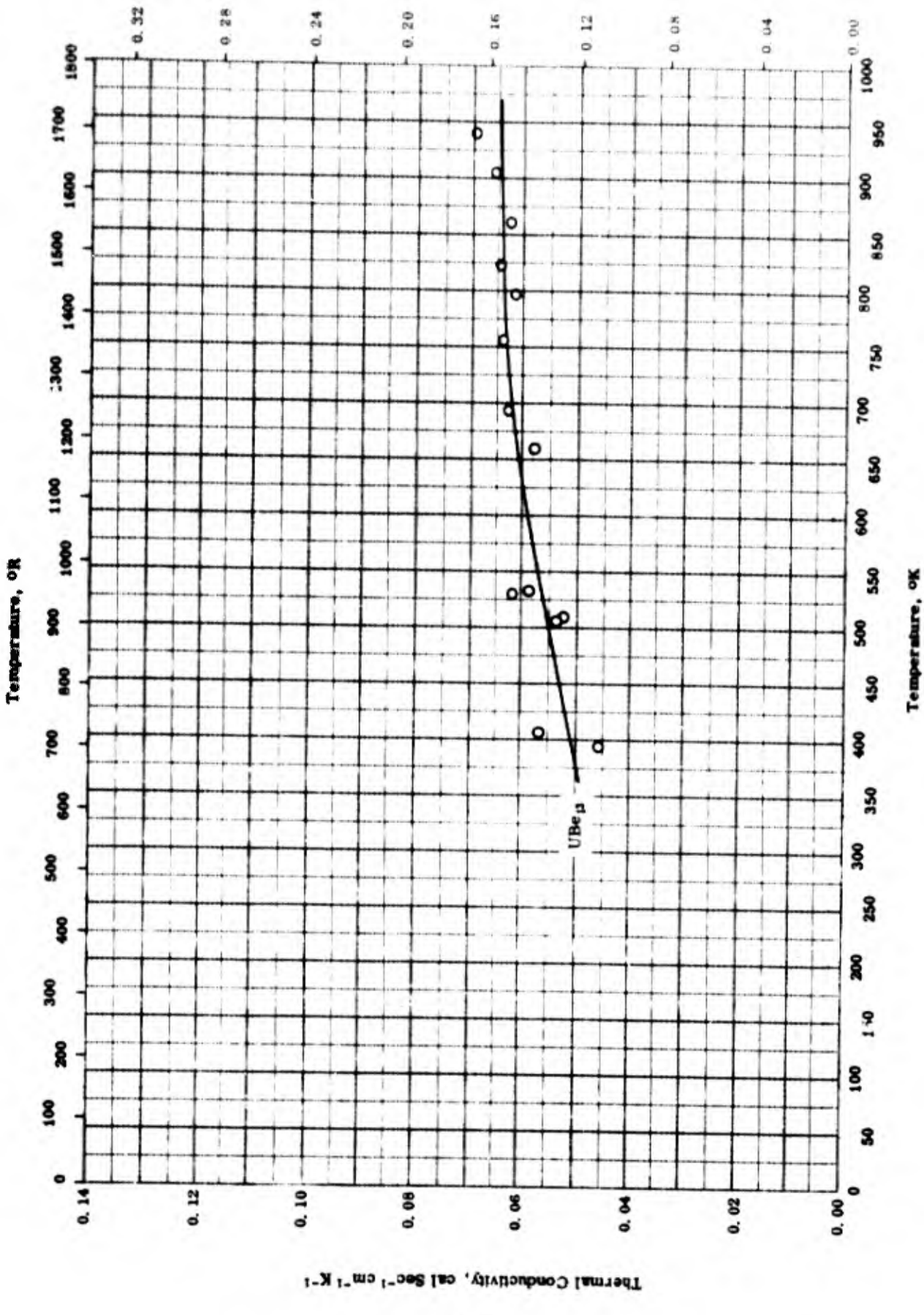
Density	g cm^{-3}	lb ft^{-3}
○ UBe_{13}	4.37	273

PROPERTIES OF URANIUM BERYLLIDES

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
O	57-19	298		UBe_{13}	Computed from x-ray measurements of lattice.

TPRC



THERMAL CONDUCTIVITY -- URANIUM BERYLLIDE

THERMAL CONDUCTIVITY -- URANIUM BERYLLIDE

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
O	59-2	395-940		UBe_{13}; x-ray density 4.37 g cm^{-3}.	Solid-solid reaction of UH_3 and powdered Be in a induction furnace under 1 argon atm at 1550 C and sintered.

TPRC

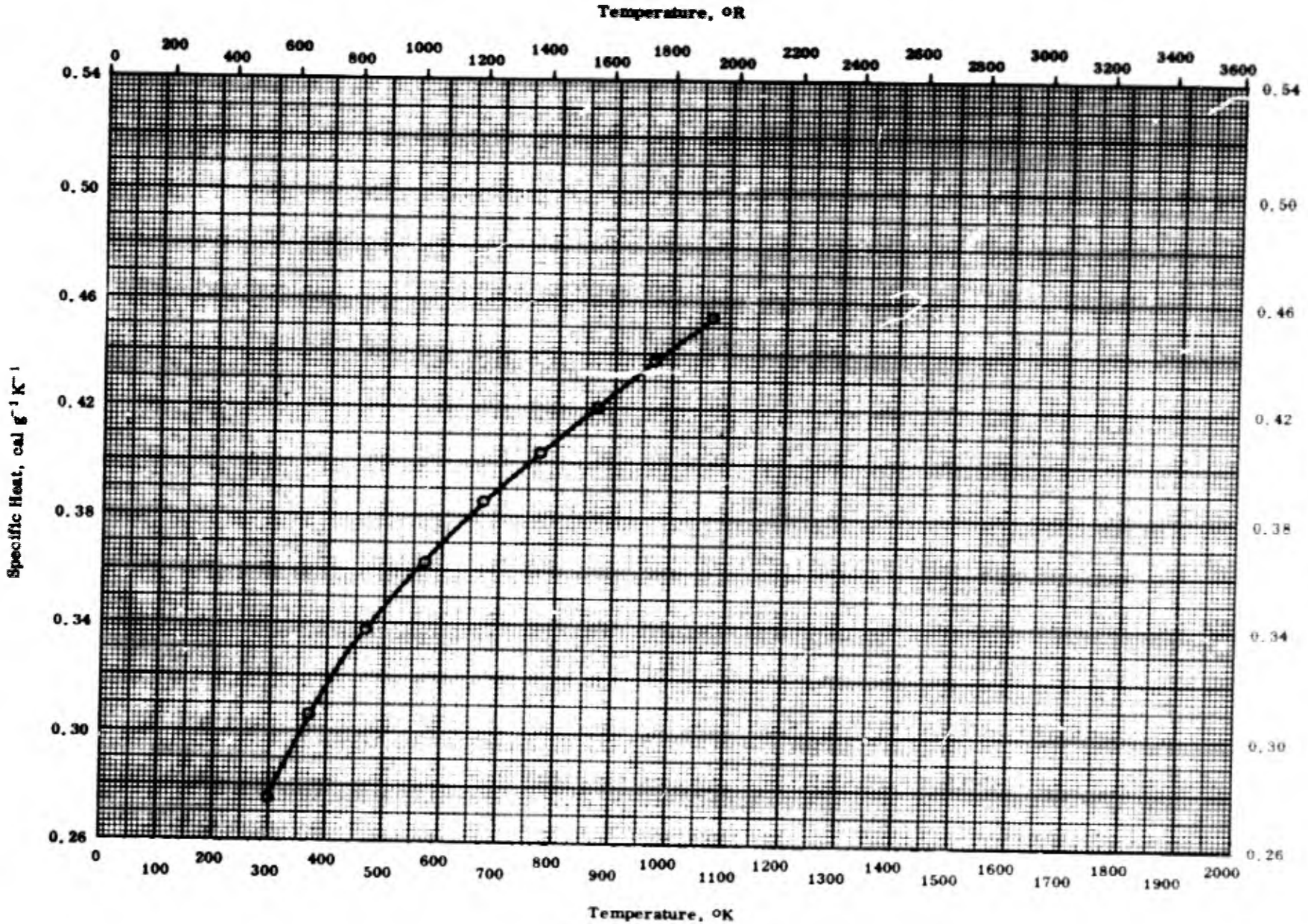
PROPERTIES OF ZIRCONIUM BERYLLIDES

REPORTED VALUES

Melting Point		K	R
○	$ZrBe_4$	1806	3251
□	$ZrBe_2$	1967	3541
△	$ZrBe_{13}$	1872	3370
▽	$ZrBe_{13}$	2200 ± 28	3960 ± 50

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
○	55-40	1806		$ZrBe_4$.	
□	55-40	1967		$ZrBe_5$.	
△	55-38 also 55-40	1872		$ZrBe_{13}$.	
▽	59-6	2172-2228		$ZrBe_{13}$.	

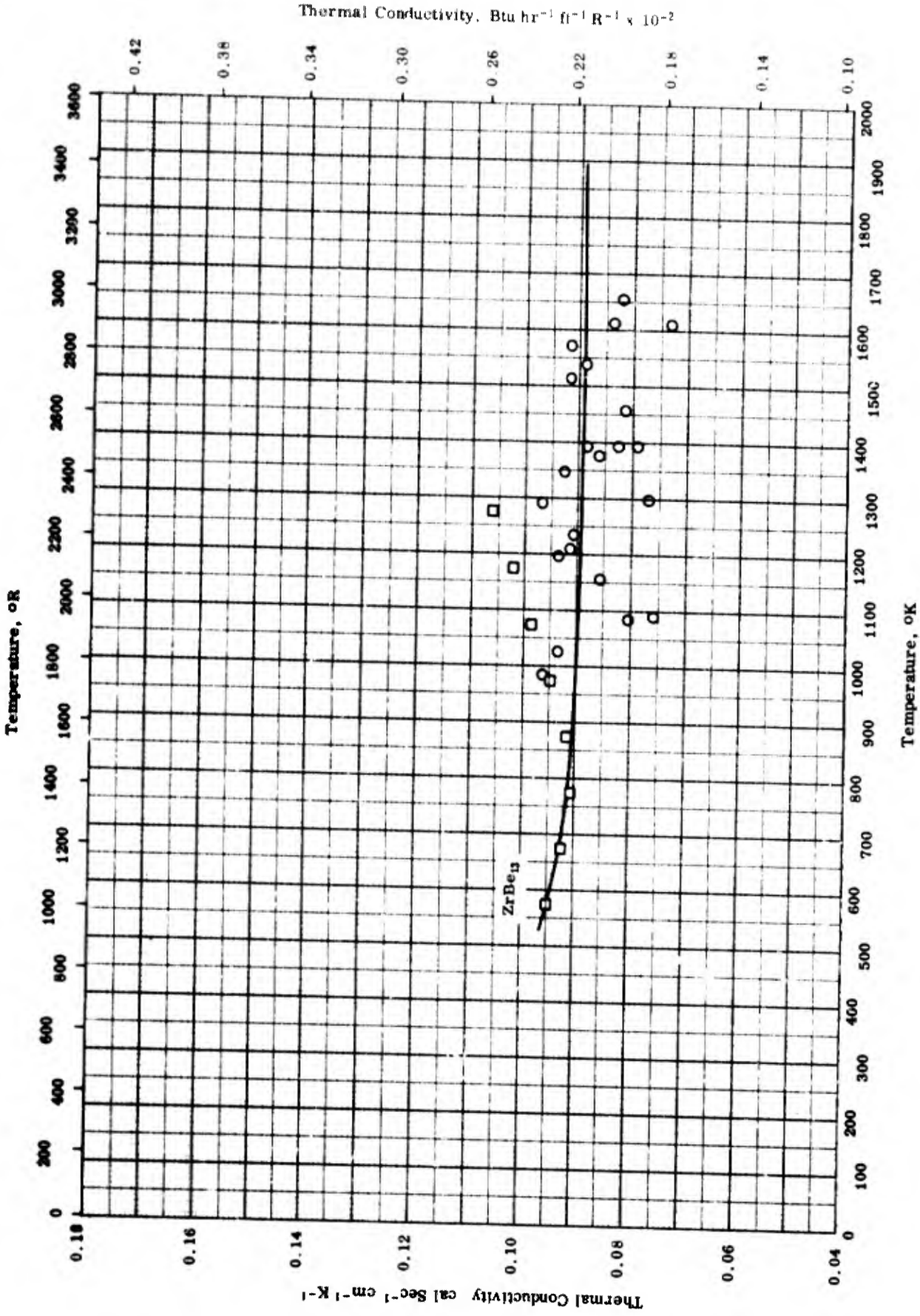


TPRC

SPECIFIC HEAT - ZIRCONIUM BERYLLIDE

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
O	62-27	303-1073	< 3.0	$ZrBe_{13}$.	

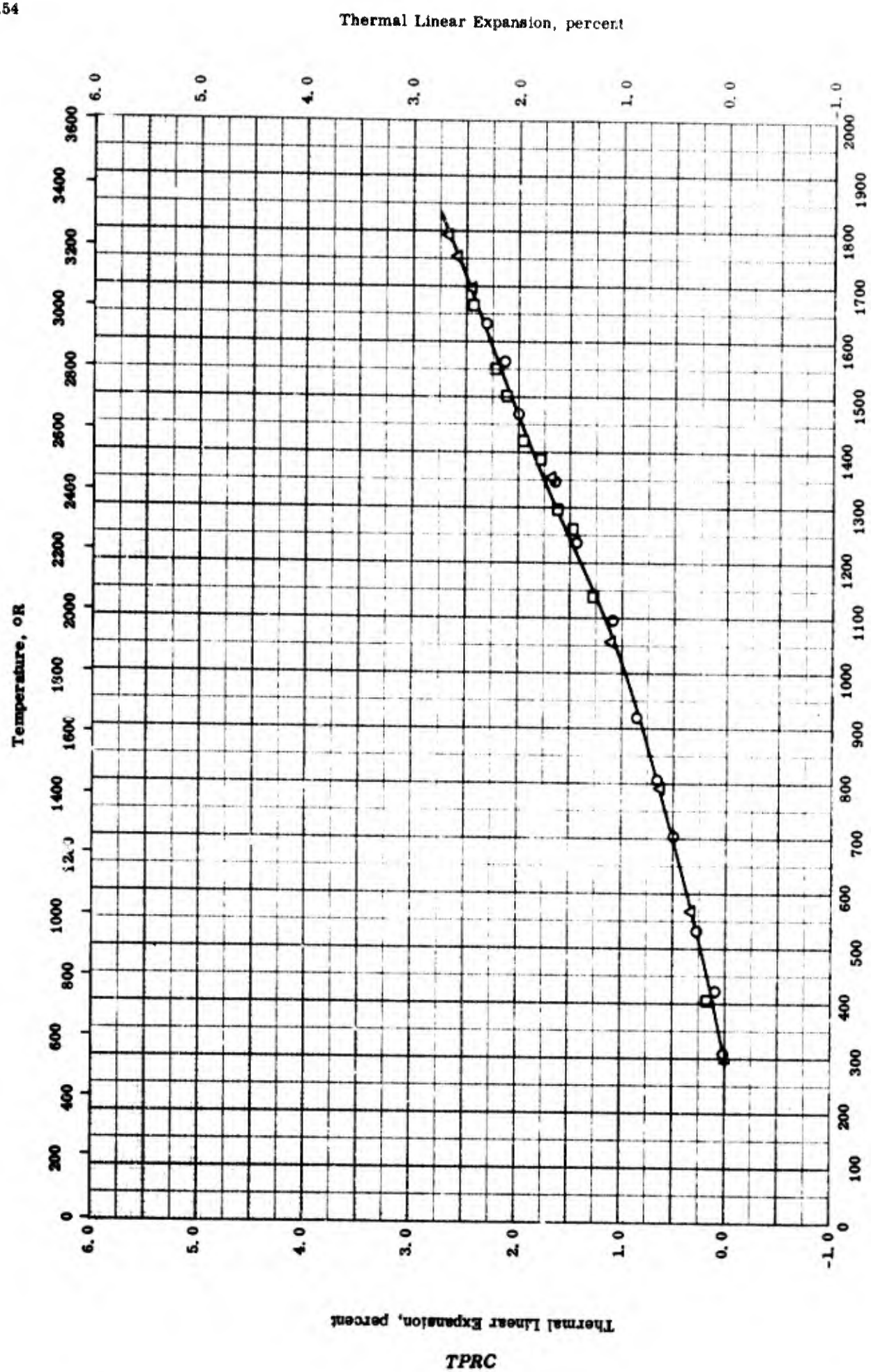


THERMAL CONDUCTIVITY -- ZIRCONIUM BERYLLIDE

THERMAL CONDUCTIVITY -- ZIRCONIUM BERYLLIDE

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
○	59-6	983-1657		$ZrBe_{13}$.	Pressed and machined.
□	62-8	573-1273		$ZrBe_{13}$; 2.750 g cm^{-3} bulk density.	



THERMAL LINEAR EXPANSION -- ZIRCONIUM BERYLLIDE

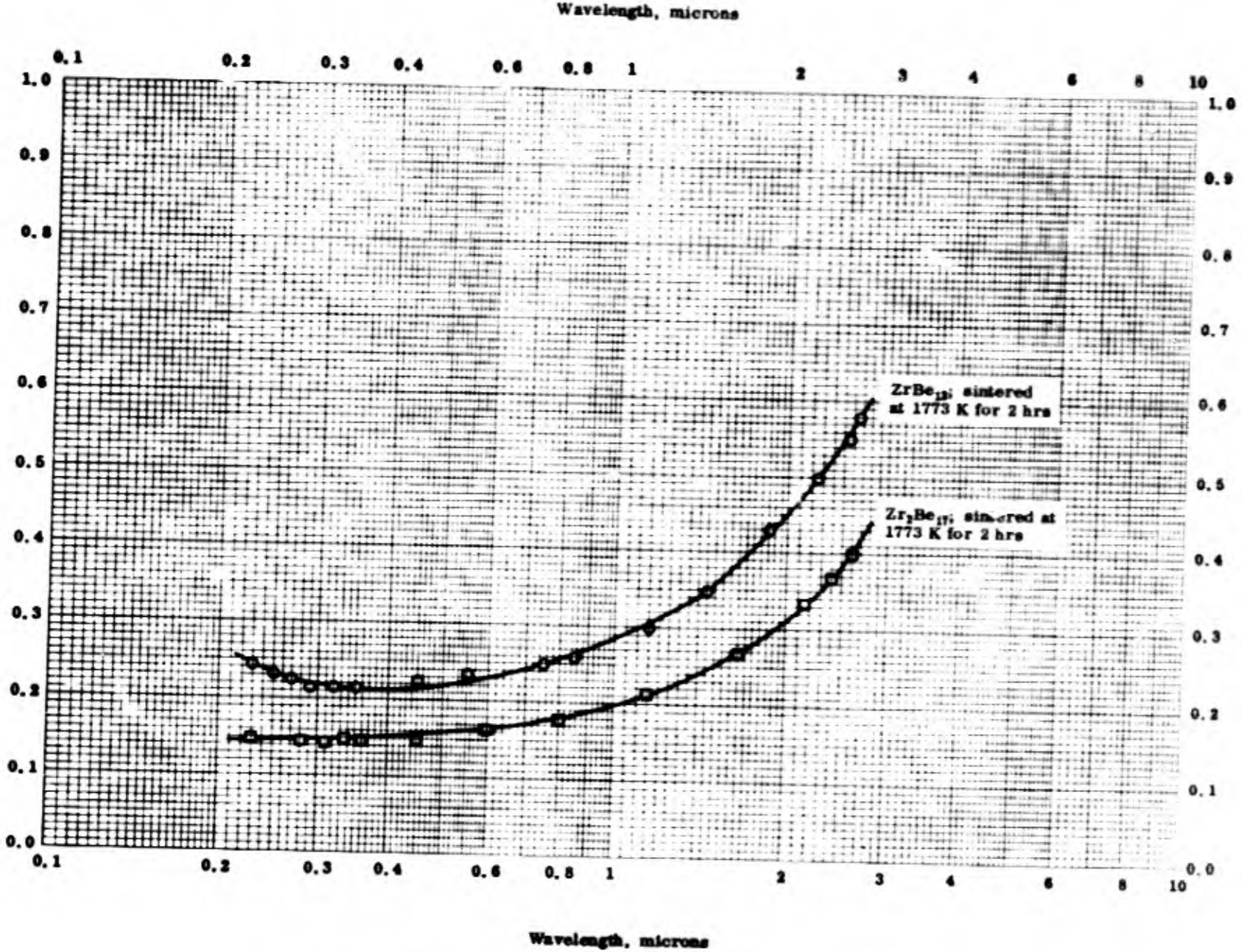
TPRC

THERMAL LINEAR EXPANSION -- ZIRCONIUM BERYLLIDE

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
○	59-6	304-1638		$ZrBe_{13}$.	As pressed.
△	59-6	304-1792		$Zr3e_{13}$.	As pressed; heating.
□	59-6	408-1792		Same as above.	Cooling data of above specimen.

TPRC



NORMAL SPECTRAL REFLECTANCE -- ZIRCONIUM BERYLLIDES

NORMAL SPECTRAL REFLECTANCE -- ZIRCONIUM BERYLLIDES

REFERENCE INFORMATION

Symbol	Ref.	Temp. °K	Wavelength Range, μ	Repr. Error %	Sample Specifications	Remarks
○	63-16	298	0.23-2.65	5	$ZrBe_{13}$; 0.055 in. thickness plate; density 2.16 g cm^{-3}.	Sintered at 1773 K for 2 hrs. data taken from a curve, normal incidence, hemispherical viewing. MgO as reference standard.
□	63-16	298	0.23-2.65	5	Zr_2Be_{17}; 0.06 in. thickness plate; density 2.07 g cm^{-3}.	Same as above.

PROPERTIES OF OTHER MISCELLANEOUS METAL BERYLLIDES

REPORTED VALUES

Density		g cm^{-3}	lb ft^{-3}
○	$PuBe_{13}$	4.36	272
□	$AgBe_{12}$	3.19	199
△	$PdBe_{12}$	3.18	198
▽	$PtBe_{12}$	4.53	283
Melting Point			
◇	$PuBe_{13}$	>1870	>3370
●	$CrBe_2$	2111	3800
■	CoBe; cubic	1778	3200
▲	$FeBe_2$	1756	3160
▼	PdBe; cubic	1733	3119
◆	VBe_{13}; hexagonal	1978	3560

PROPERTIES OF OTHER MISCELLANEOUS METAL BERYLLIDES

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
○	55-26	298		$PuBe_{13}$.	Computed from x-ray measurements of lattice.
◇	55-26	1870		$PuBe_{13}$.	
□	58-17	298		$AgBe_{12}$.	Computed from x-ray measurements of lattice.
△	58-17	298		$PdBe_{12}$.	Same as above.
▽	58-17	298		$PtBe_{12}$.	
●	54-34	2111		$CrBe_2$.	
■	51-11 also 55-40	1778		Cubic CoBe.	
▲	48-5	1756		$FeBe_2$.	
▼	56-37	1733		Cubic PdBe.	
◆	53-30	1978		VBe_{13}; hexagonal	Probably VBe_{12}.

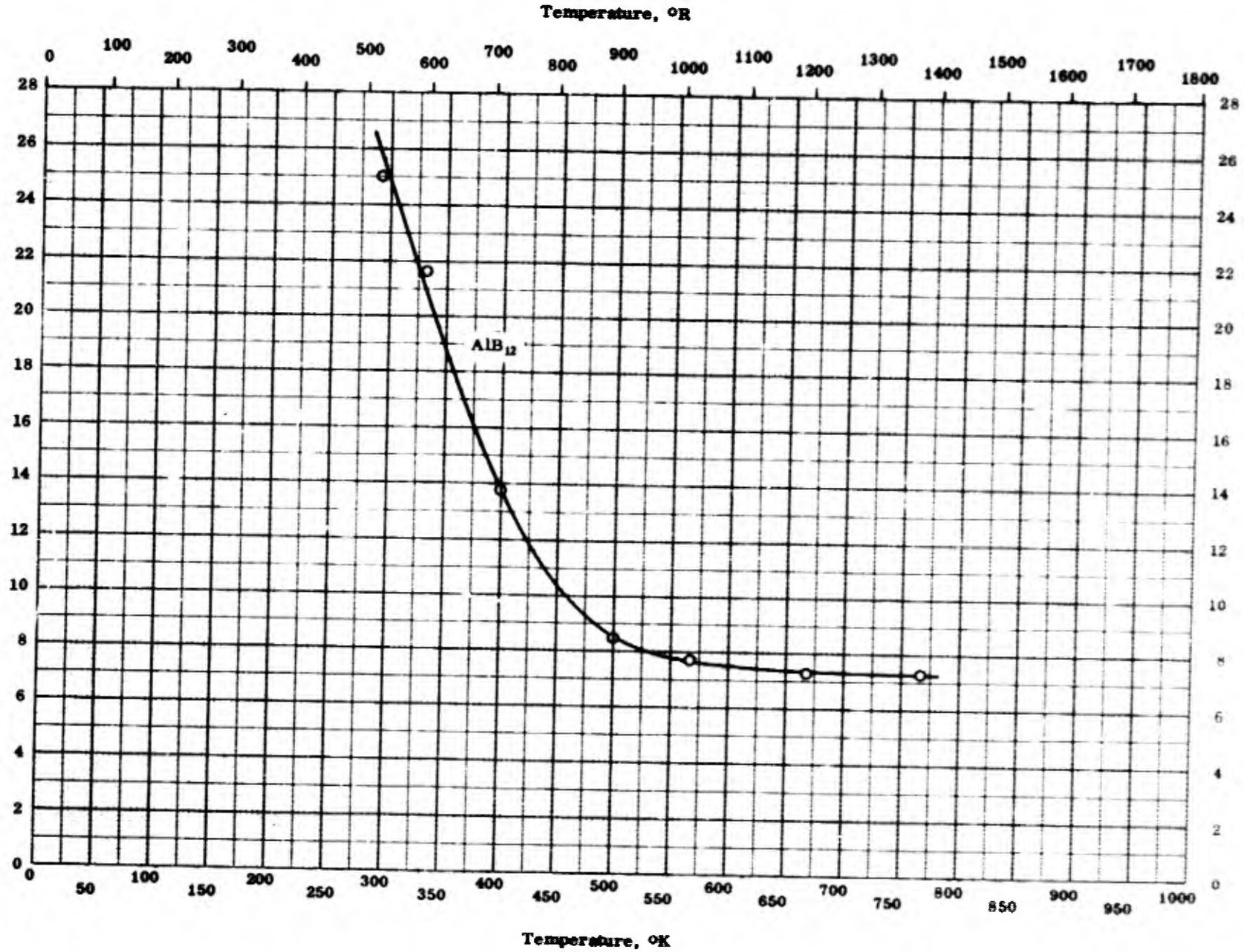
PROPERTIES OF ALUMINUM BORIDES

REPORTED VALUES

Melting Point		K	R
○	AlB_{10}	2373	4271
□	AlB_{12}	2423	4361

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
○	48-4	2373		AlB_{10}.	Decomp. temperature.
□	61-31	2423		AlB_{12}.	Same as above.



ELECTRICAL RESISTIVITY -- ALUMINUM BORIDE

Electrical Resistivity, ohm cm x 10⁻³

ELECTRICAL RESISTIVITY -- ALUMINUM BORIDE

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
O	60-18	295-763		AlB_{12}; 21.5 Al and 76.0 B.	Measured at a constant frequency of 8500 mc.

PROPERTIES OF CHROMIUM BORIDES

REPORTED VALUES

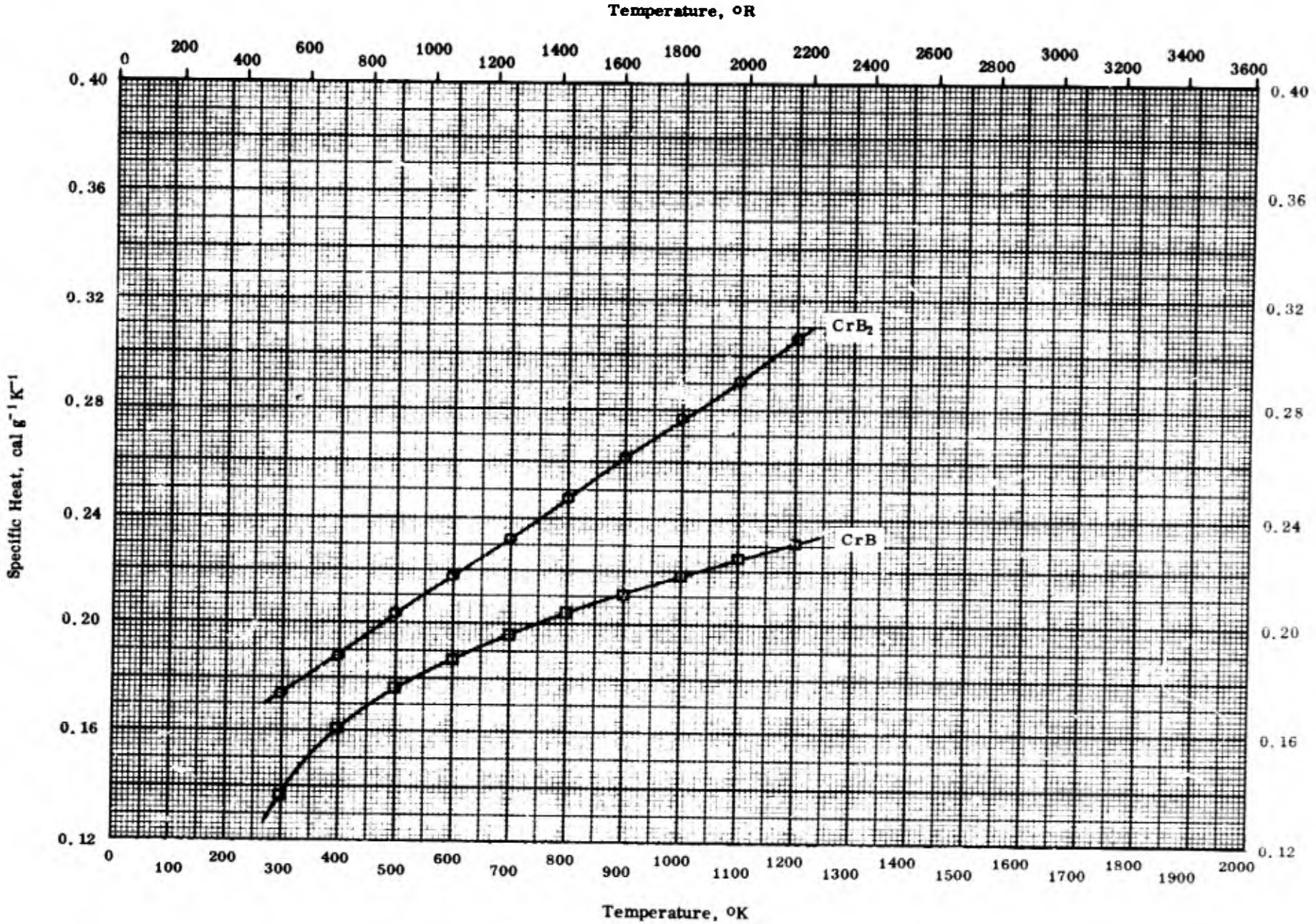
		Density	$g\ cm^{-3}$	$lb\ ft^{-3}$
○	CrB		6.05	378
□	CrB		6.11*	381*
◁	CrB_2		5.60	350
		Melting Point	K	R
△	CrB		2363*	4254*
◇	CrB_2		2423*	4362*
▽	CrB_2		2173	3912
▷	CrB_2		2233	4020
●	Cr_3B_4		2223	4001
	CrB		2323	4181
	Cr_5B_3		2273	4091
	Cr_2B		2163	3893
	Cr_4B		2023	3641
■	CrB_2		2473 ± 50*	4451 ± 90
▲	CrB_2		2423	4361
	CrB		2363 ± 25*	4253 ± 45*
▼	CrB_2		2122	3820

*Most probable value for this compound.

PROPERTIES OF CHROMIUM BORIDES

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
○	49-10	298		CrB; zeta phase.	
□	49-10	298		Same as above.	Density computed from x-ray measurement of lattice.
△	55-21	2363		CrB.	M. P. by visual observation.
◇	55-21	2423		CrB_2.	Same as above.
▽	54-21	2173		CrB_2.	Prepared by direct synthesis.
▷	56-22	2233		CrB_2.	
◁	56-25	298		CrB_2; 65.4 Cr, 30.8 B, 0.15 C, and 0.12 Fe.	Powder produced by carbon reduction of Cr oxide and B_2O_3 at 2000 C, crushed, milled 24 hrs, mixed, heated 1 hr at 1800 C, crushed again, and hot pressed in graphite dies.
●	58-19	2023-2323		Series of chromium borides.	All decomp. temperatures except CrB.
■	59-26	2423-2523		CrB_2.	
▲	55-21	2338-2448		CrB and CrB_2 with 0.45 Fe and 0.096 C.	
▼	60-17	2122		CrB_2.	

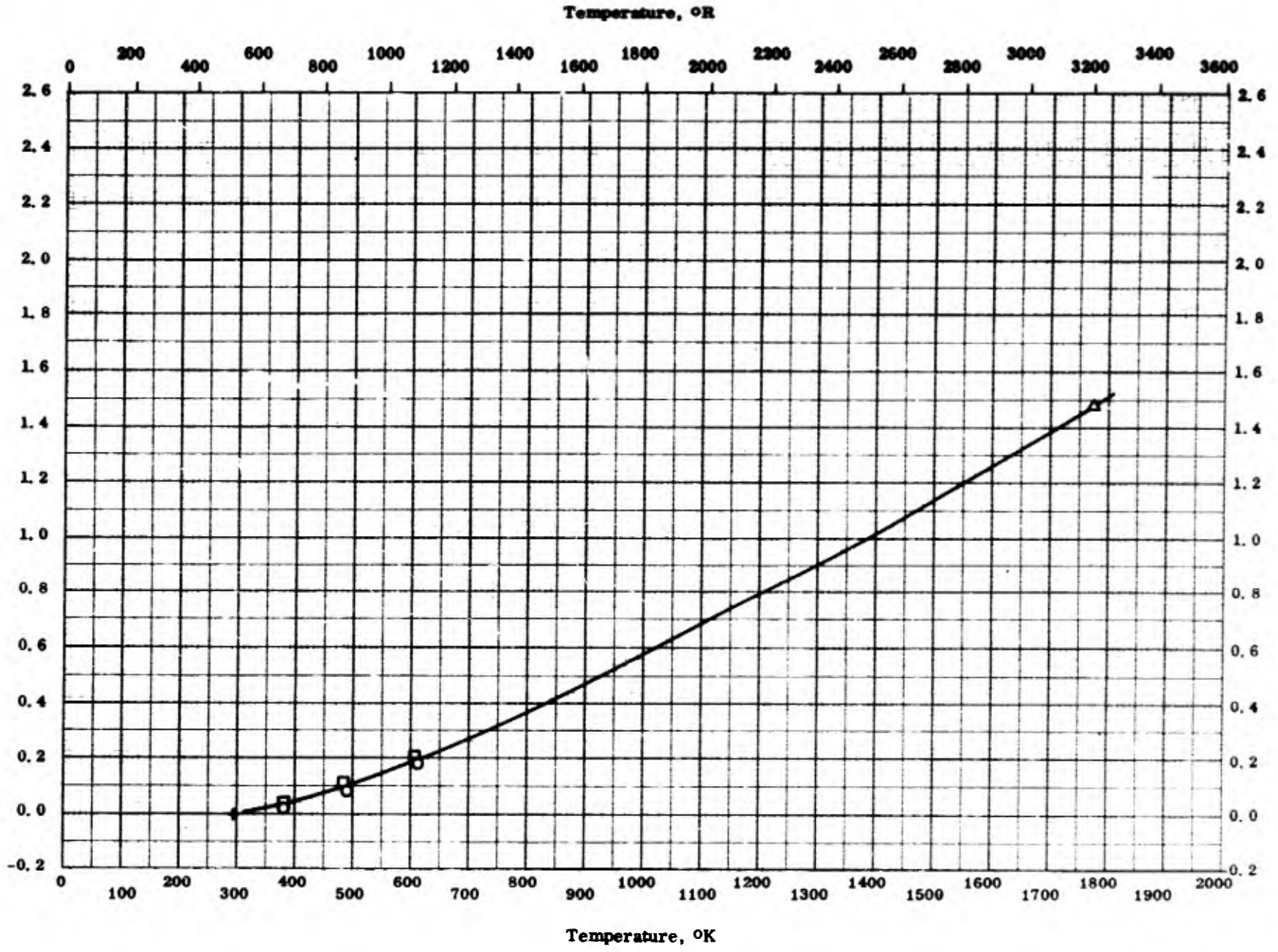


SPECIFIC HEAT -- CHROMIUM BORIDES

SPECIFIC HEAT -- CHROMIUM BORIDES

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
○	62-20	298-1200	0.5	$Cr B_2$; traces of impurities.	
□	62-20	298-1200	0.5	Cr B; traces of impurities.	



THERMAL LINEAR EXPANSION — CHROMIUM BORIDE

THERMAL LINEAR EXPANSION — CHROMIUM BORIDE

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
○	55-17	298-612		CrB_2.	X-ray method; measured along a-axis direction.
□	55-17	298-609		CrB_2.	X-ray method; measured along c-axis direction.
△	62-35	293-1773		CrB_2.	

PROPERTIES OF HAFNIUM BORIDE

MOST PROBABLE VALUES

Property	C.G.S. Units	Brit. Eng. Units
Density	11.2	700
Melting Point	3520	6330

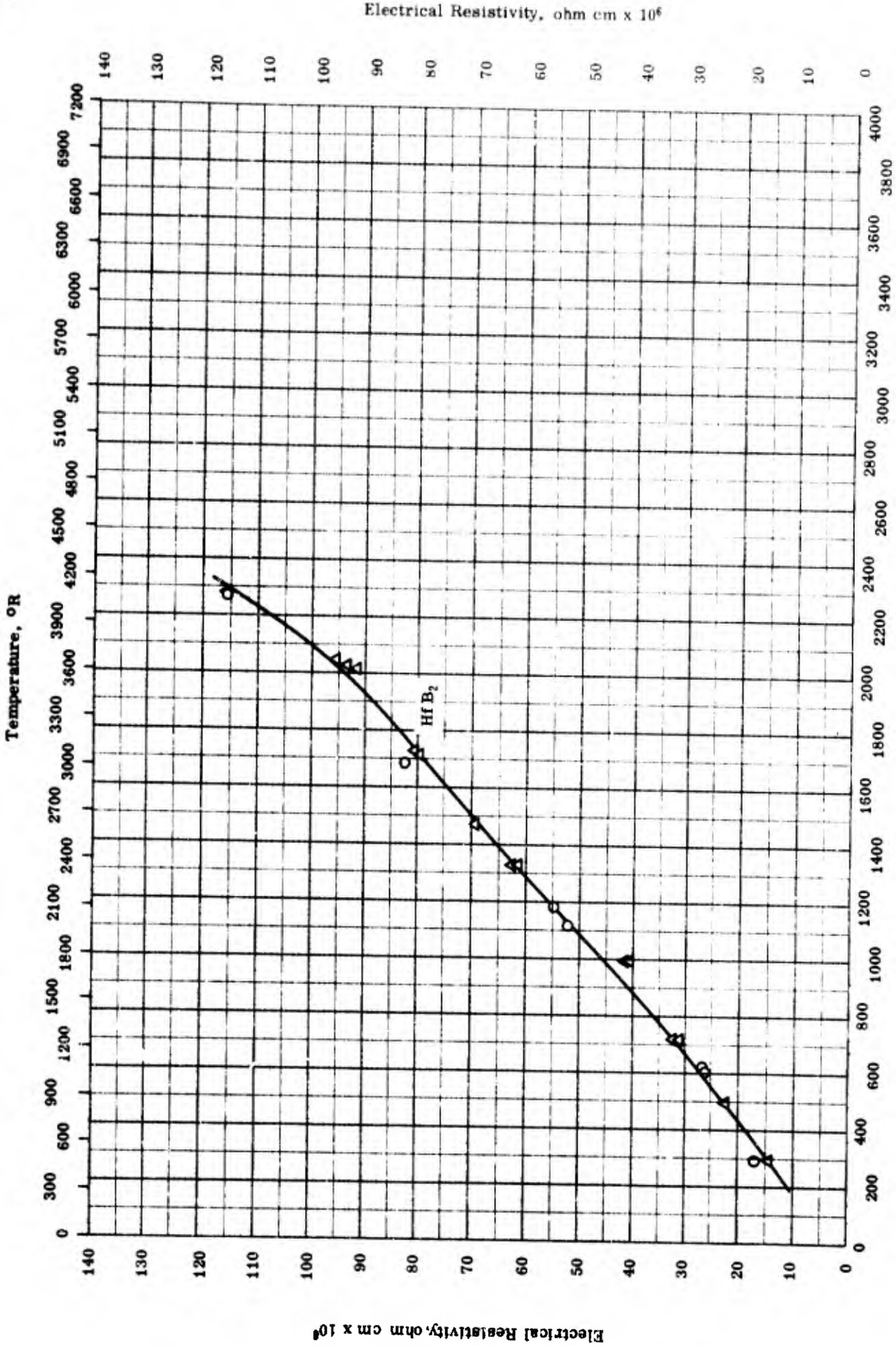
REPORTED VALUES

		$g\ cm^{-3}$	$lb\ ft^{-3}$
Density			
	○	11.2	699
		K	R
Melting Point			
	□	3513	6324
	△	3523	6342
	▽	3523 ± 100	6341 ± 180
	◇	3522	6340

PROPERTIES OF HAFNIUM BORIDE

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
○	56-25	298		HfB_2.	Powder produced by carbon reduction of Hf oxide and B_2O_3 at 2000 C, milled 24 hrs, mixed, heated 1 hr at 1800 C, crushed, and hot-pressed in graphite dies; computed from x-ray measurements of lattice.
□	54-21	3513		HfB_2.	Prepared by direct synthesis.
△	56-22	3523		HfB_2.	
▽	53-20	3423-3623		HfB_2.	
◇	60-17	3522		HfB_2.	

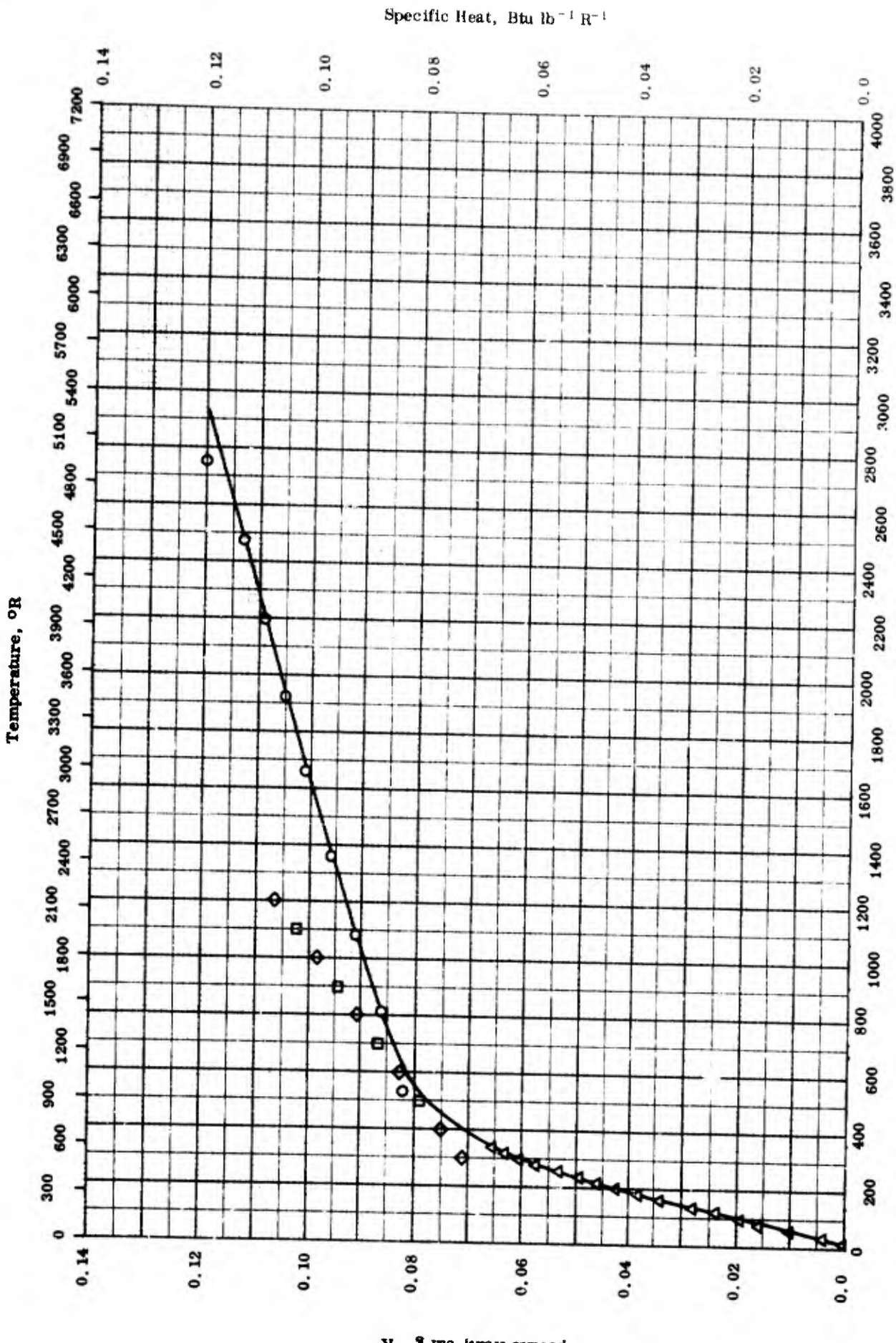


ELECTRICAL RESISTIVITY -- HAFNIUM BORIDE

ELECTRICAL RESISTIVITY -- HAFNIUM BORIDE

REFERENCE INFORMATION

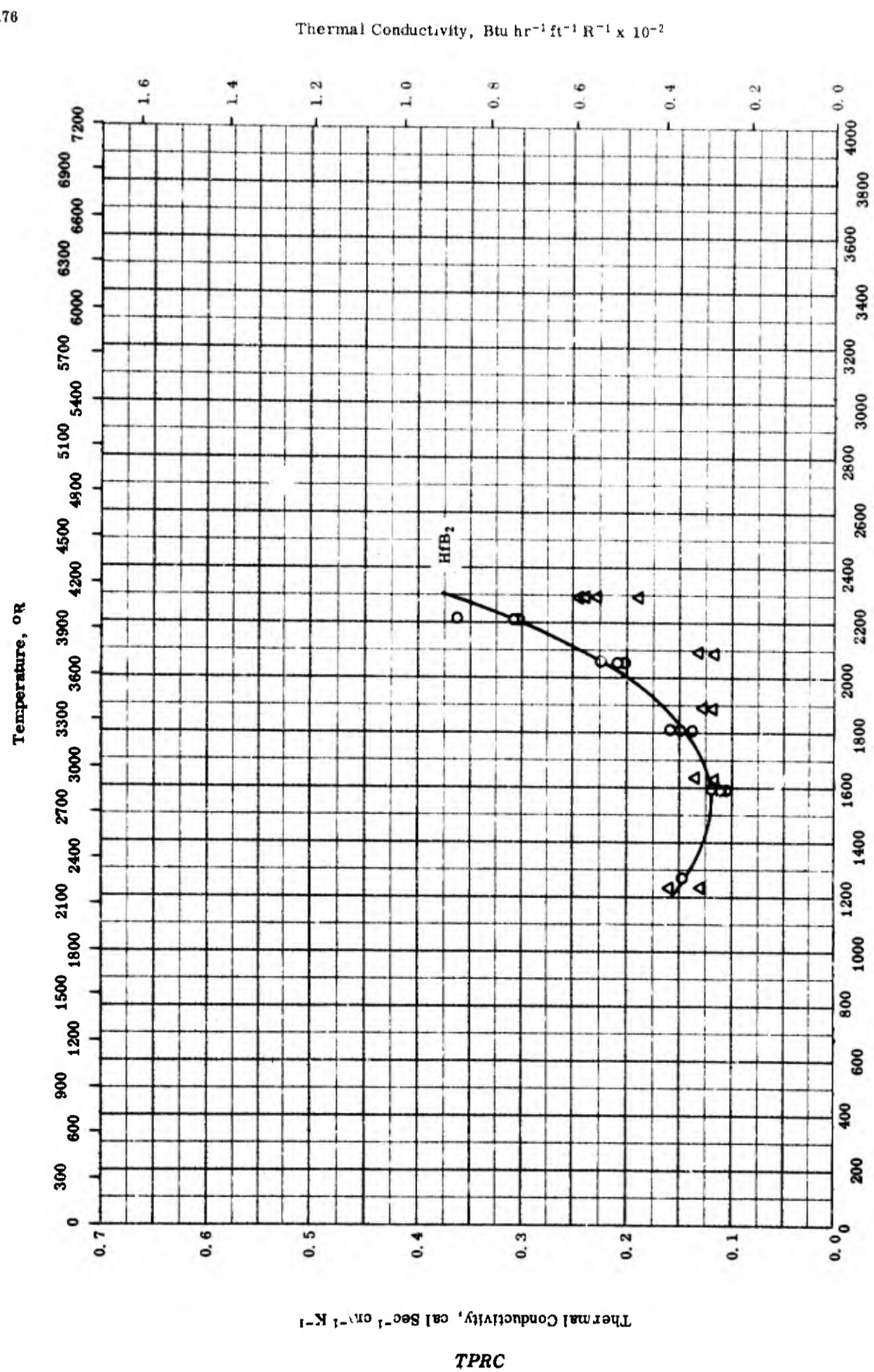
Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
△	62-6	297-2280	2.4	HfB_2; composition before exposure: 89.5 Hf, 10.0 B, and 0.01C, and after exposure: 89.4 Hf and 10.5 B.	Hot pressed; maximum exposure temperature 4810 F.
○	62-6	297-2280	2.4	Same as above.	Same as above; cooling curve.



SPECIFIC HEAT -- HAFNIUM BORIDE

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
○	62-6	533-2755	≤5.0	Hf B_2; before test: 89.5 Hf, 10.0 B, 3.5 Fe, 1.5 Zr, 0.1 Mg, 0.1 Ti, and 0.01 C; density 674 lb ft^{-3}; after test: 89.4 Hf, 10.5 B, and 0.776; density 641 lb ft^{-3}.	Hot pressed; crushed in hardened steel mortar to pass 100-mesh screen.
□	62-18	500-1200	0.5	Hf B_2; single phase composition.	
△	64-3	5-345		Hf B_2; 88.98 Hf, 10.97 Br, 0.16 C, 0.01-0.1 Zr, 0.0042 N_2, 0.003 Fe, 0.003 Ti, 0.0026 O_2, and 0.001 Cr, Cu, Mg an Si.	Zone refined.
◇	62-20	298-1200	0.5	Hf B_2; traces of impurities.	

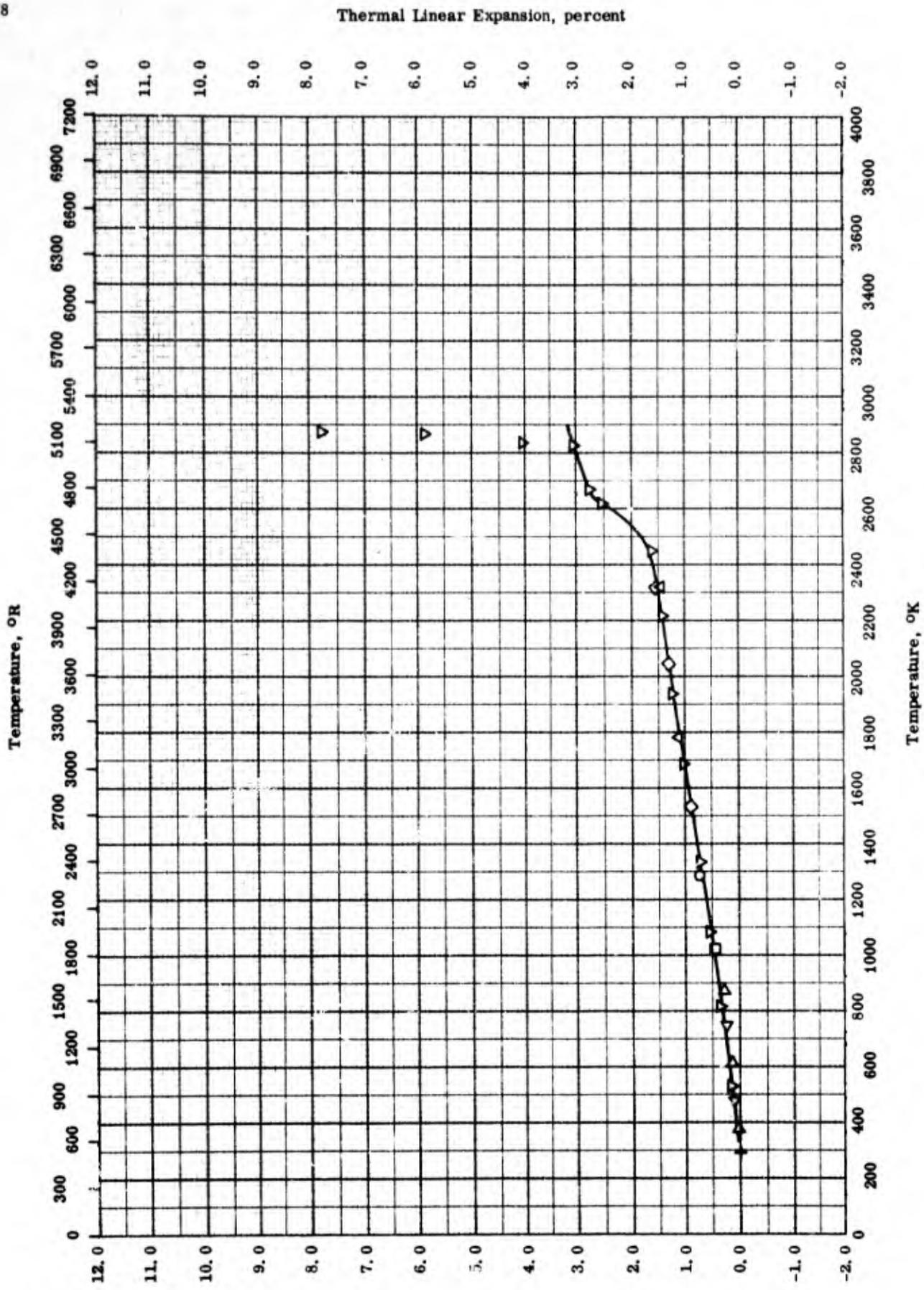


THERMAL CONDUCTIVITY -- HAFNIUM BORIDE

THERMAL CONDUCTIVITY -- HAFNIUM BORIDE

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
O	62-6	1267-2210	5-7	HfB_2.	Ground and then polished thoroughly; heat soaked at 3200 - 3350 F; sample cracked on inspection.
Δ	62-6	1233-2297	5-7	HfB_2.	Same as above except sample found broken on inspection.

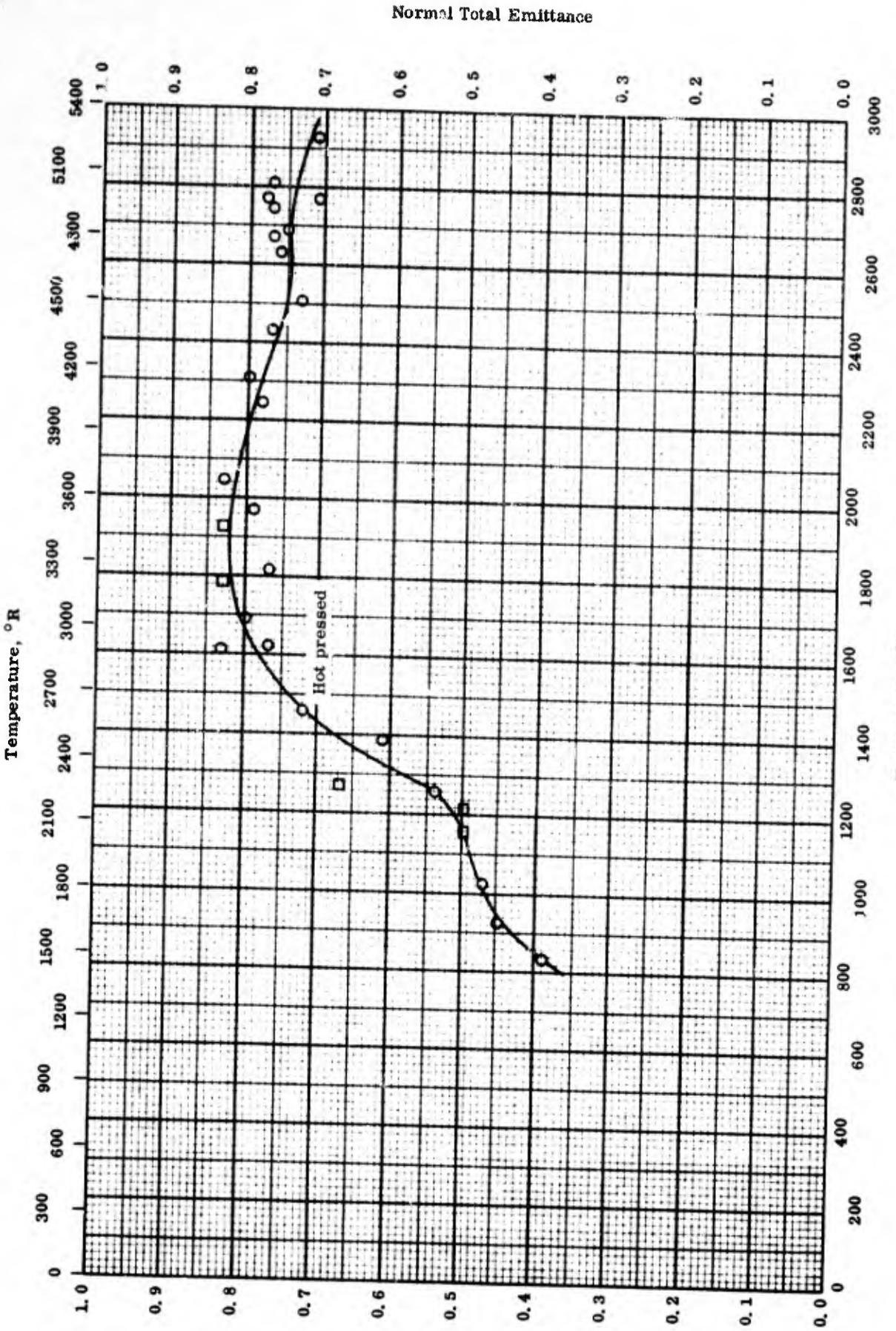


THERMAL LINEAR EXPANSION -- HAFNIUM BORIDE

Thermal Linear Expansion, percent

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
○	63-27	298-1285		HfB_2; 87.05 Hf, 10.86 B, 1.73 Zr, 0.217 O, 0.07 C and 0.012 N; total impurity 0.35 and total analysis 99.99.	Specimen pre-sintered at brightness temperature of 1790 C; x-ray diffraction method; measured along a-axis direction.
□	63-27	298-1285		Same as above.	Same as above except measured along c-axis direction.
◇	64-14	298-2314	1.5	Same as above.	Same as above except measured along a-axis direction.
△	64-14	298-2314	1.5	Same as above.	Same as above except measured along c-axis direction.
▽	62-6	294-2872	5	HfB_2 from Carborundum Co.; composition before exposure: 89.5 Hf, 10.0 B, 0.01 C and elements found by semi-quantitative emission spectrograph (0.1 Mg, 0.1 Ti, 3.5 Fe and 1.5 Zr); after exposure: 89.4 Hg, 10.5 B and 0.77 C; density before exposure 10.7 gcm^{-3} and after exposure 10.1 at 25 C.	Hot-pressed; specimen melted at 4710 F; measured in helium.
▷	55-17	298-879		HfB_2.	X-ray method; measured along a-axis direction.
◁	55-17	298-878		HfB_2.	X-ray method; measured along c-axis direction.

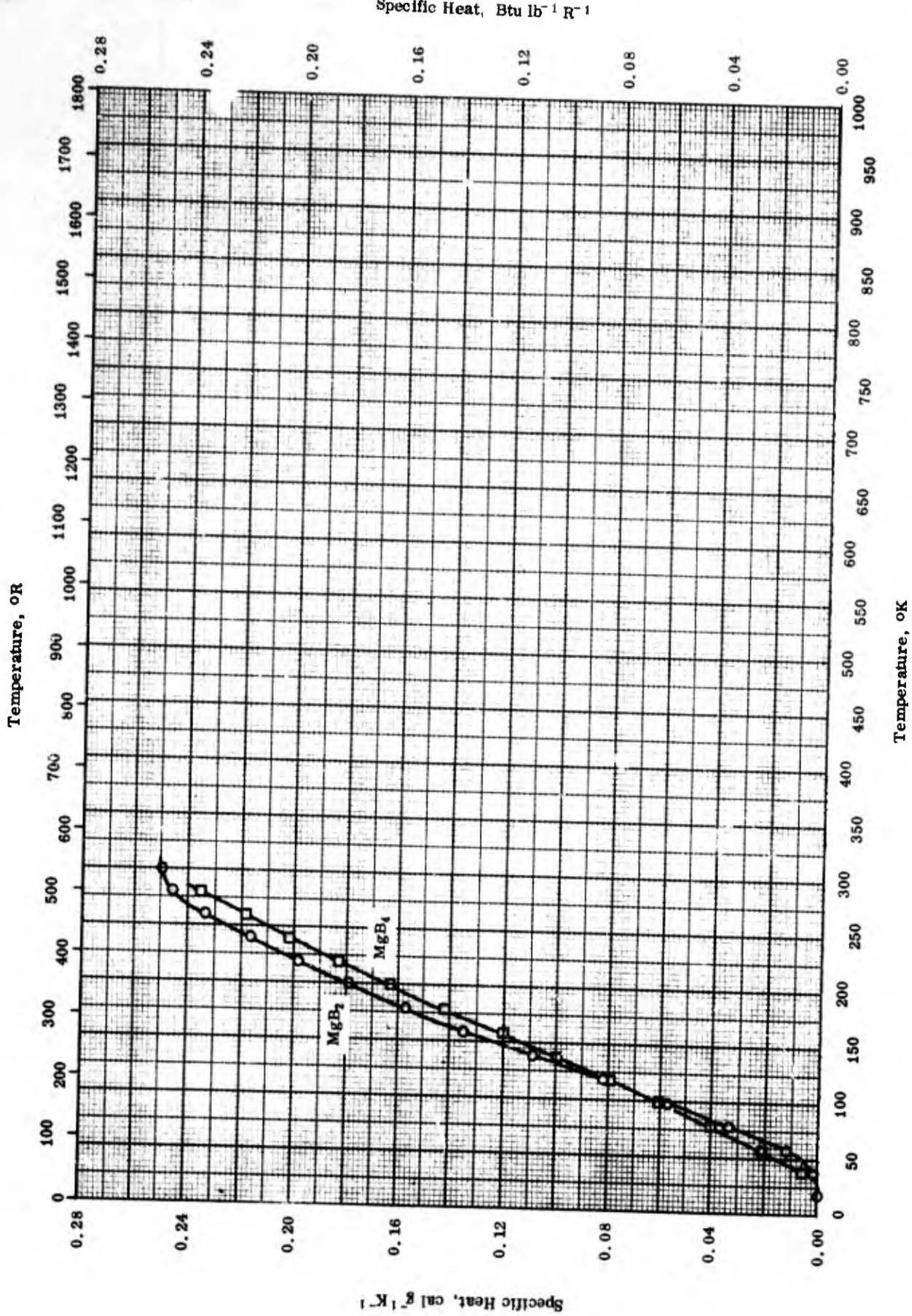


NORMAL TOTAL EMITTANCE -- HAFNIUM BORIDE

NORMAL TOTAL EMITTANCE -- HAFNIUM BORIDE

REFERENCE INFORMATION

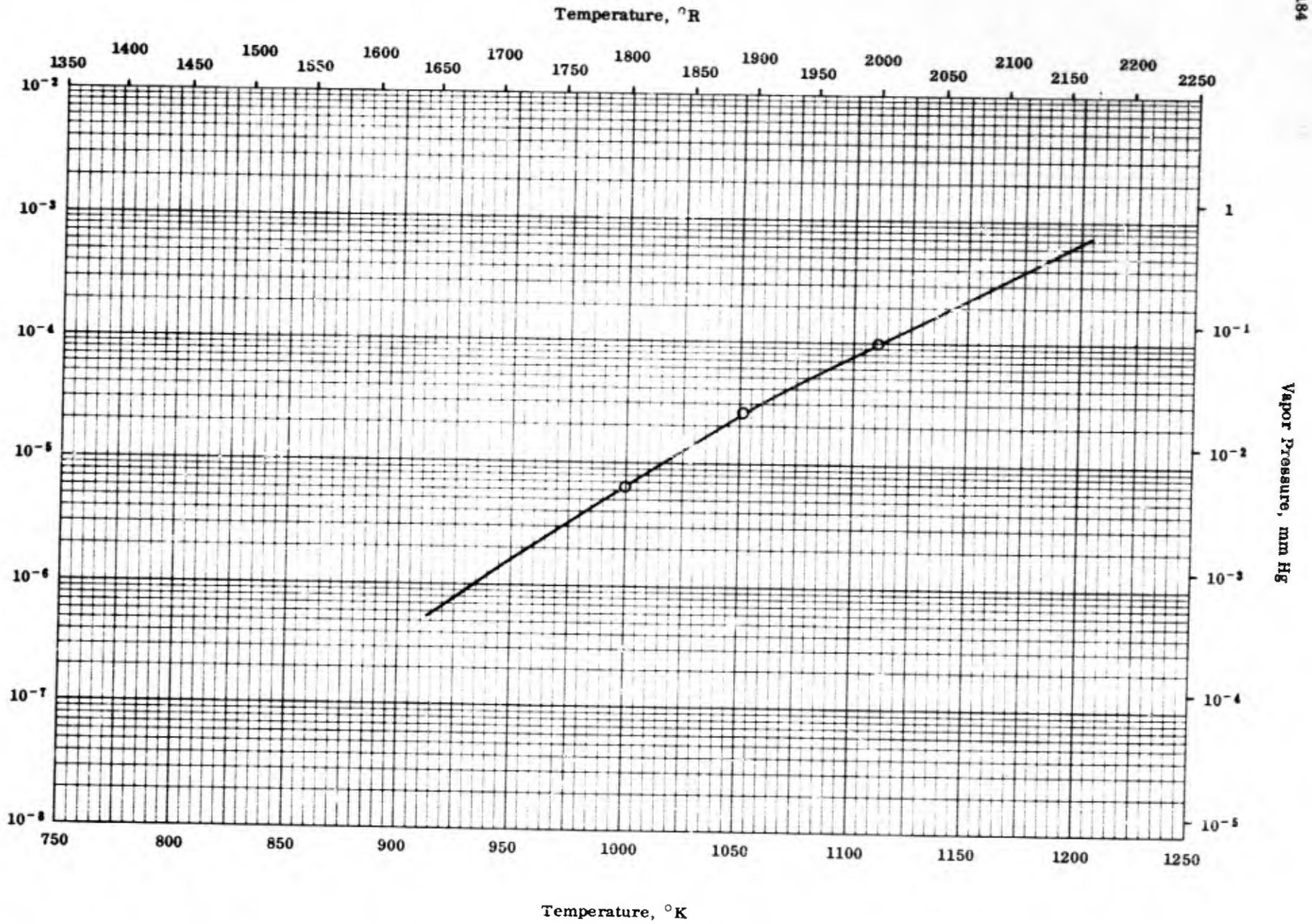
Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
○	62-6	835-2927		HfB_2; density 10.8 g cm^{-3}.	Hot-pressed; measured in dry argon atmosphere.
□	62-6	1160-1922		Same as above.	Same as above; another run.



SPECIFIC HEAT -- MAGNESIUM BORIDES

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
○	56-7 also 57-13	20-300		MgB_2; 93.90 MgB_2, 3.69 B, 1.08 MgB_4, 0.73 MgO, 0.46 Mg and 0.14 others.	Prepared by heating stoichiometric quantities of Mg and B 3 hrs at 900 ± 25 C in He atmosphere; data corrected for impurities
□	56-7 also 57-13	20-300		MgB_4; 89.42 MgB_4; 89.42 MgB_4, 10.32 B, and 0.25 others.	Prepared by heating stoichiometric quantities of Mg and B 3 hrs at 900 ± 25 C in He atmosphere; data corrected for impurities.



VAPOR PRESSURE -- MAGNESIUM BORIDES

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
O	56-3	1000-1111		93.904 MgB_2, 3.687 B, 1.084 MgB_4, 0.731 MgO, 0.140 impurities (as oxides), 0.057 Mg.	At these temperatures the rate of dissociation of 2 $MgB_2(s) \rightarrow MgB_4(s) + Mg(g)$ is high; reported data include this effect.

PROPERTIES OF MOLYBDENUM BORIDES

REPORTED VALUES

Density		$g\ cm^{-3}$	$lb\ ft^{-3}$
○	MoB_2.	7.78	486
Melting Point		**K**	**R**
□	MoB_2	2373	4272
△	Mo_2B_5	2373	4272
◇	Mo_2B	2443*	4397*
▽	MoB_2	2373*	4271*
	β-MoB	2653	4775
	Mo_3B_2	2523	4541
	Mo_2B	2413	4343

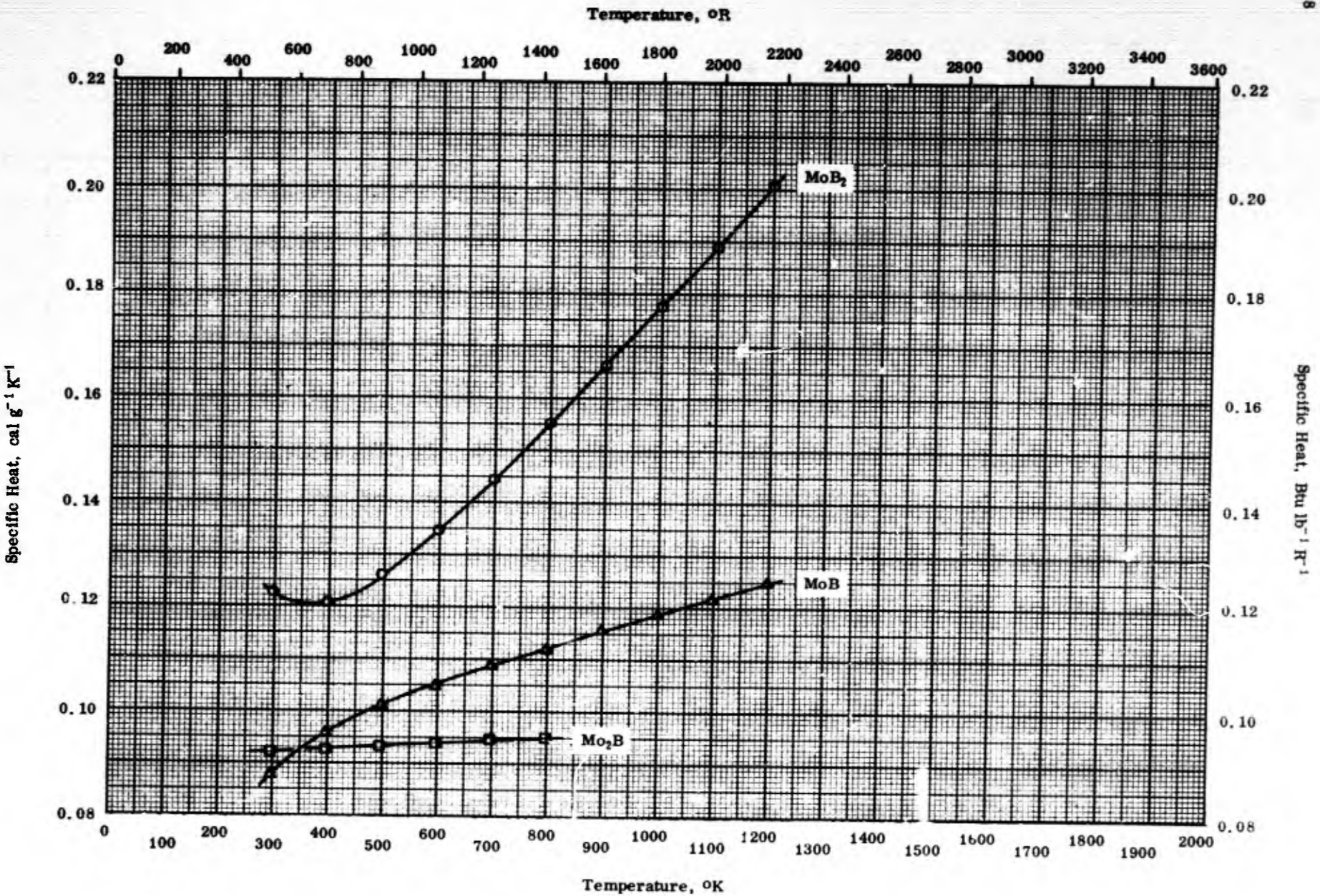
*Most probable value for this compound.

PROPERTIES OF MOLYBDENUM BORIDES

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
○	56-25	298		MoB_2; range of 3 samples: 87.8 - 89.0 Mo, 7.99 - 10.69 B, 0.61 Fe, and 0.41 - 0.59 C.	Produced by carbon reduction of Mo oxide and B_2O_3 at 2000 C; crushed; milled 24 hrs; mixed; held 1 hr at 1800 C; crushed again; hot pressed in graphite dies; density computed from x-ray measurements of lattice.
□	54-21	2373		MoB_2.	Prepared by direct synthesis; tested in He atmosphere.
△	56-22	2373		Mo_2B_5.	
◇	55-28	2443		Mo_2B.	Arc melted; MP by calibrated optical pyrometer sighting on liquid-solid interface.
▽	53-21	298		Series of molybdenum borides.	

TPRC

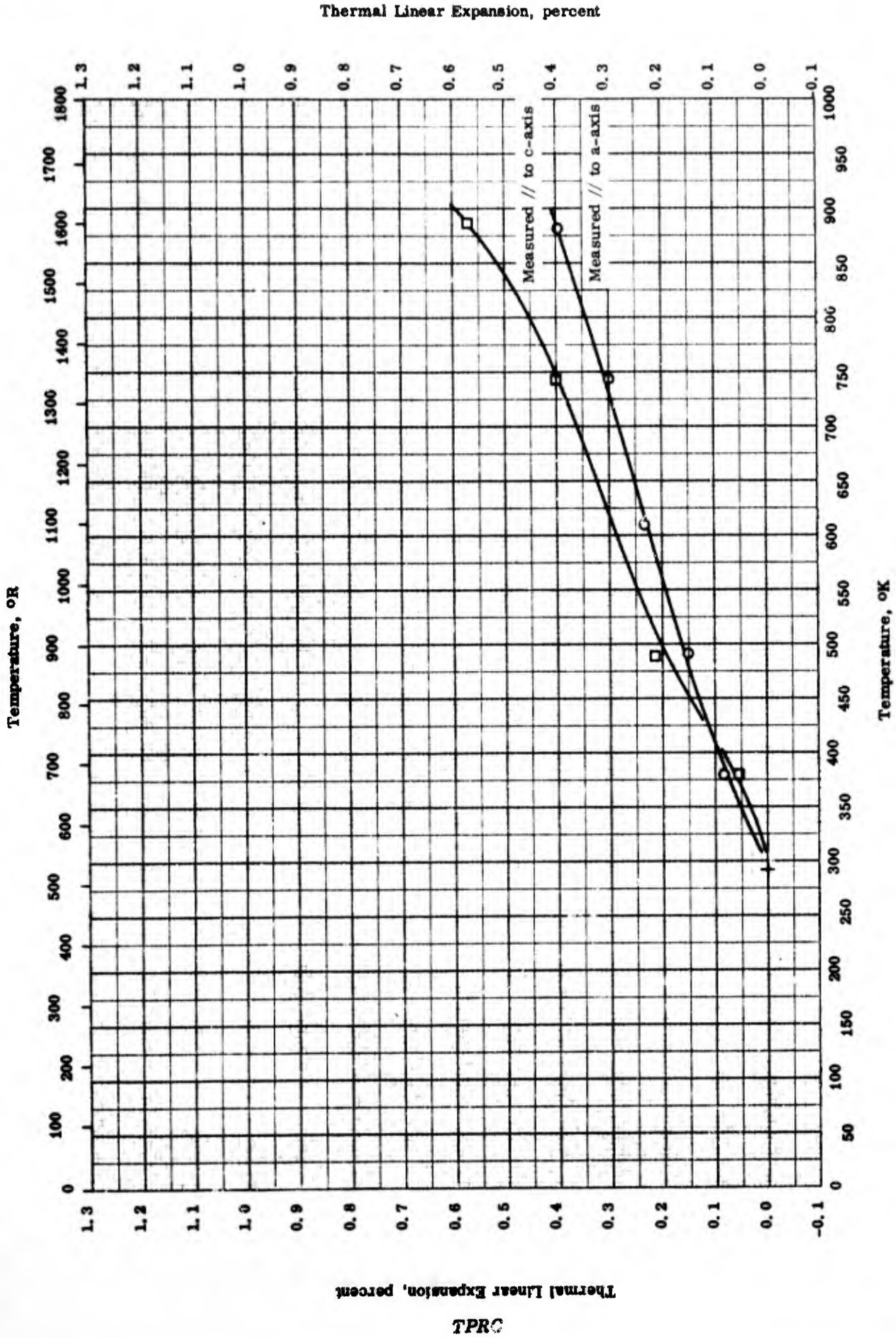


SPECIFIC HEAT -- MOLYBDENUM BORIDES

SPECIFIC HEAT -- MOLYBDENUM BORIDES

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
○	62-20	298-1200	0.5	MoB_2; traces at impurities.	
□	62-20	298-800		Mo_2B; traces of impurities.	
△	62-20	298-1200		MoB; traces of impurities.	

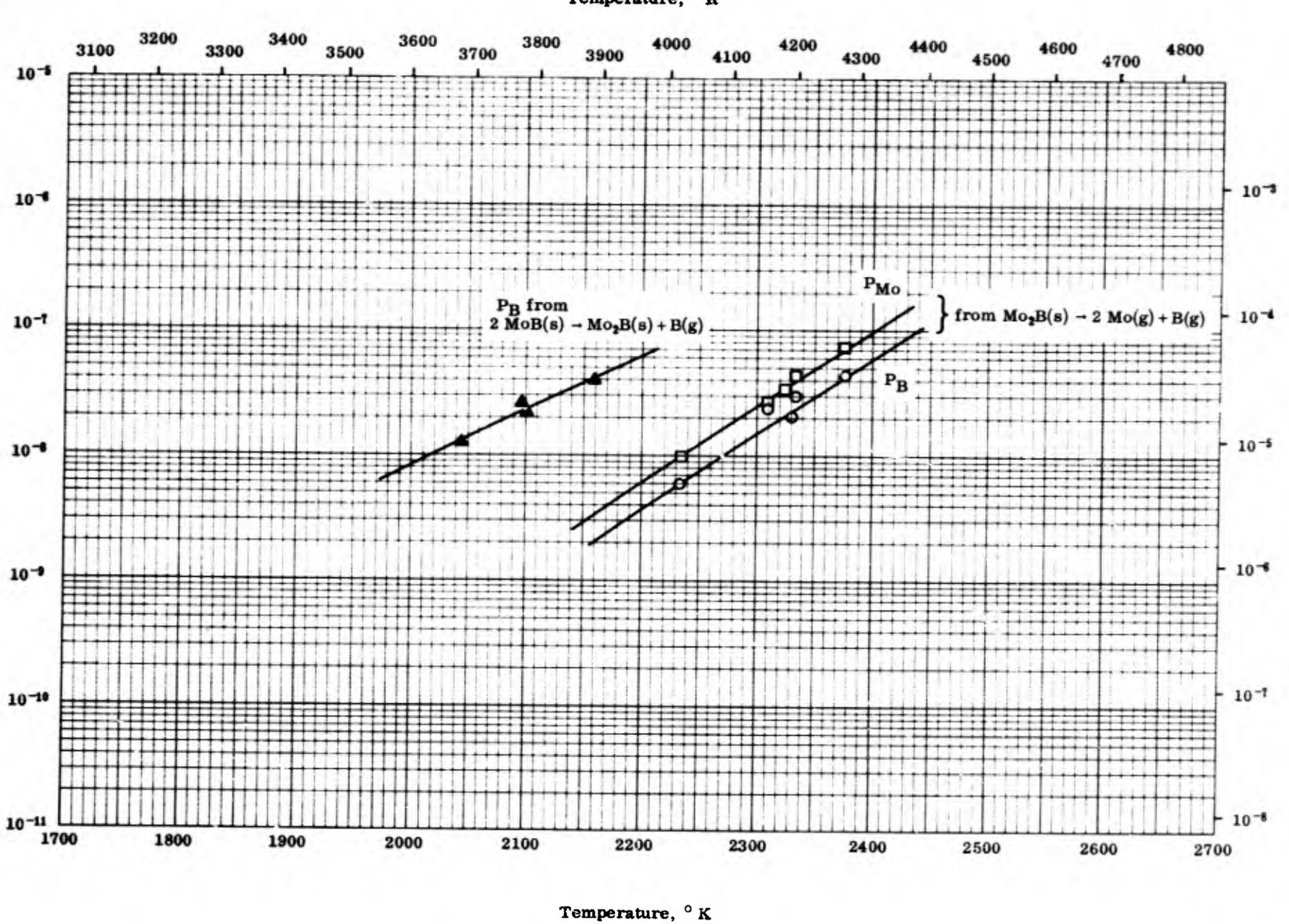


THERMAL LINEAR EXPANSION -- MOLYBDENUM DIBORIDE

THERMAL LINEAR EXPANSION -- MOLYBDENUM DIBORIDE

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
○	55-17	298-882		MoB_2.	X-ray method; measured parallel to a-axis direction.
□	55-17	298-886		Same as above.	X-ray method; measured parallel to c-axis direction.



TPRC

VAPOR PRESSURE -- MOLYBDENUM BORIDE

VAPOR PRESSURE -- MOLYBDENUM BORIDE

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
○	53-1	2234-2377		B from $Mo_2B(s) \rightarrow 2\ Mo(g) + B(g)$; prepared from 99.9 pure Mo with C as main impurity; traces of N, C, Fe, Ni; and 99.0 pure B powder.	Pressed and heated, ground, mixed, pressed at 6000 psi, reacted several min. at 1000 - 1200 C, then 10 min. at 1400 - 1800 C; ground again; pressed at 12,000 - 14,000 psi; presintered at 1500 - 1900 C; vacuum sintered at 2100 - 2250 C.
□	53-1	2234-2377		Mo from $Mo_2B(s) \rightarrow 2\ Mo(g) + B(g)$.	Same as above.
▲	53-1	2048-2161		B from $2\ MoB_{0.98}(s) \rightarrow Mo_2B(s) + 0.92\ B(g)$.	Same as above.

PROPERTIES OF NIOBIUM BORIDES

REPORTED VALUES

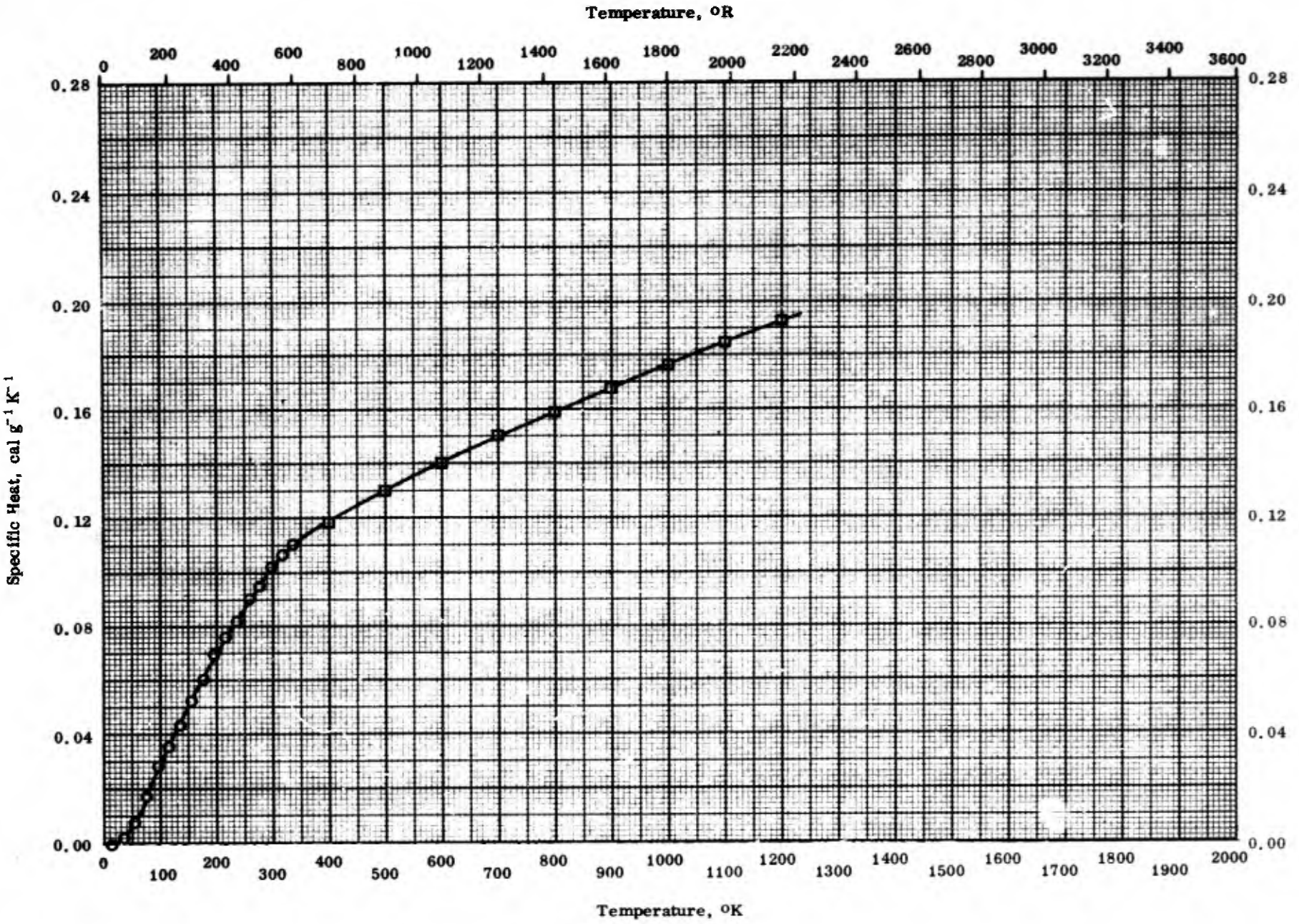
Density		g cm^{-3}	lb ft^{-3}
○	NbB_2	6.60	412
□	NbB_2	7.21	450
△	NbB_2	6.97*	435*
Melting Point		**K**	**R**
◇	NbB_2	3273	5892
▽	NbB_2	3323*	5982*
●	NbB_2	3273	5891
	Nb_3B_4	3173	5711
	Nb_3B_2	2223	4001
	NbB	2553	4595

*Most probable value for this compound.

PROPERTIES OF NIOBIUM BORIDES

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
○	49-9	298		NbB_2; 81.3 Nb and 16.9 B (cf. theor. 81.2 Nb and 18.8 B).	Density by pycnometer using ethyl benzene.
□	49-9	298		Same as above.	Density computed from x-ray measurements of lattice.
△	56-25	298		NbB_2; range of 3 samples: 80.4 - 81.8 Nb; 18.1 - 18.7 B 0.18 - 0.27 C; 0.26- 0.68 O_2; 0.04 - 0.05 Fe.	Powder produced by carbon reduction of Nb oxide and B_2O_3 at 2000 C, crushed, milled 24 hrs, mixed, held 1 hr at 2250 C, crushed again, and hot pressed in graphite dies; density computed from x-ray measurements of lattice.
◇	56-22	3273		NbB_2.	
▽	54-21	3323		NbB_2.	Prepared by direct synthesis.
●	59-25	2223-3273		Series of Niobium borides.	Decomp. temperatures for Nb_3B_4 and Nb_3B_2.



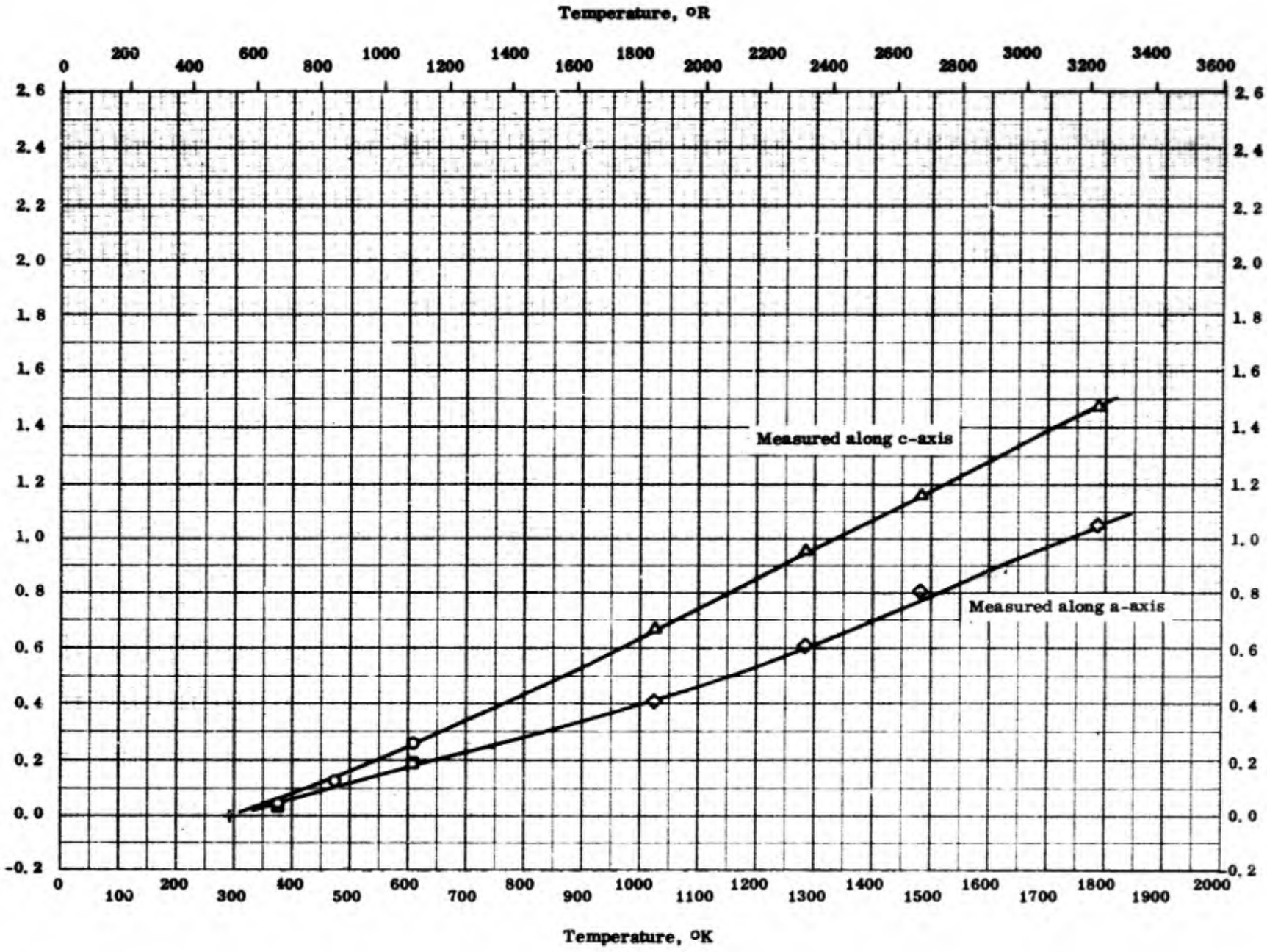
SPECIFIC HEAT -- NIOBIUM BORIDES

SPECIFIC HEAT -- NIOBIUM BORIDES

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
○	63-7 also 63-9	5-350	0.1-5	Nonstoichiometric $NbB_{1.963}$; 99.868 $NbB_{1.963}$; 0.13 Ti, 0.0142 C, 0.0066 O_2, 0.0055 N_2, 0.001 Fe, 0.001 Si.	Zone melted.
□	62-20	298-1200	0.5	NbB_2; traces of impurities.	

TPRC

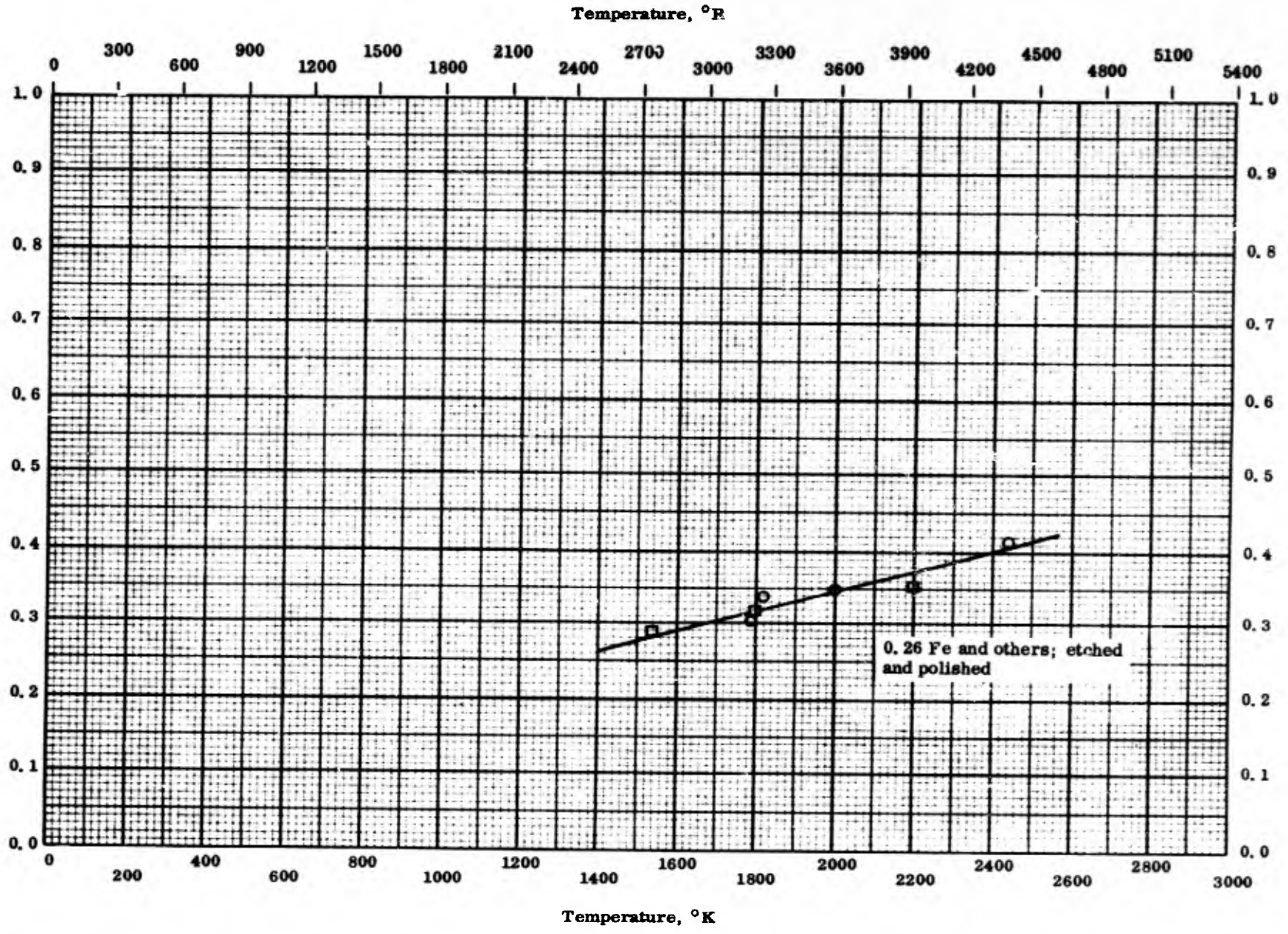


THERMAL LINEAR EXPANSION — NIOBIUM BORIDE

THERMAL LINEAR EXPANSION -- NIOBIUM BORIDE

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
○	55-17	298-610		NbB_2.	X-ray method; measured along c-axis direction.
□	55-17	298-609		NbB_2.	X-ray method; measured along a-axis direction.
◇	64-17	298-1787		NbB_2; 78.87 Nb, 19.28 B, 0.41 O, 0.23 C and 0.01 >N; 0.5 total impurity and 99.29 total analysis.	Lattice constant processed by least square program; measured in a-axis direction; average of 5 consecutive runs.
△	64-17	298-1787		Same as above.	Same as above except measured in c-axis direction.



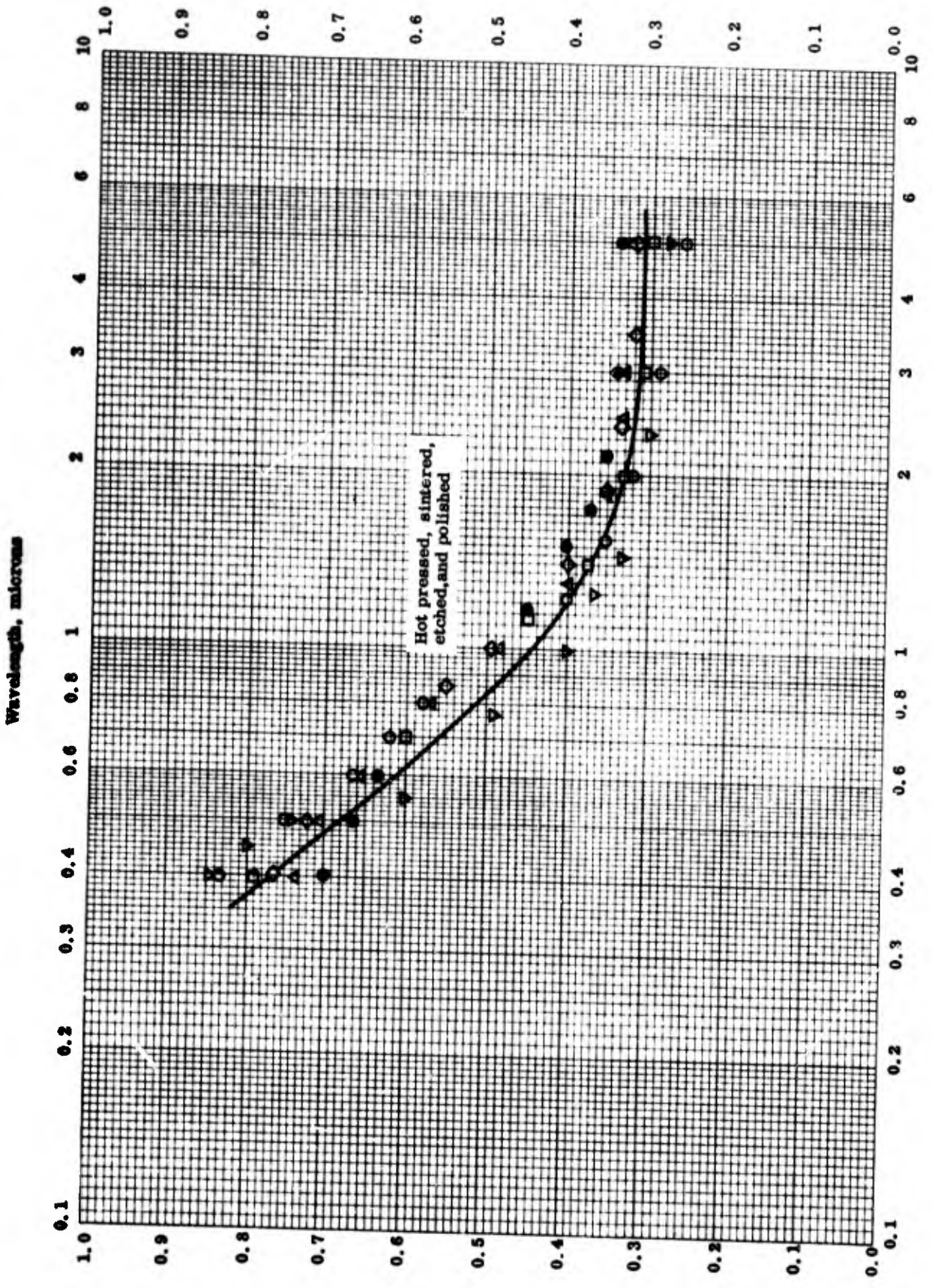
TPRC

NORMAL TOTAL EMITTANCE -- NIOBIUM BORIDE

NORMAL TOTAL EMITTANCE -- NIOBIUM BORIDE

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
○	62-28	1790-2440		NbB_2 with 0.26 Fe and others; from finely divided powder.	Hot-pressed and sintered; etched and polished; measured in argon atmosphere; calculated from spectral data.
□	62-28	1540-2200		Same as above.	Same as above.



NORMAL SPECTRAL EMITTANCE -- NIOBIUM BORIDE

NORMAL SPECTRAL EMITTANCE -- NIOBIUM BORIDE

REFERENCE INFORMATION

Symbol	Ref.	Temp. °K	Wavelength Range, μ	Rept. Error %	Sample Specifications	Remarks
○	62-28	1594	0.4-5.0		NbB_2 with 0.26 Fe and others; from finely divided powder.	Hot-pressed and sintered; etched and polished; measured in argon (1.5-2 atm); data taken from smooth curve.
□	62-28	1821	0.4-5.0		Same as above.	Same as above.
△	62-28	2000	0.4-5.0		Same as above.	Same as above.
▽	62-28	1593	0.4-5.0		Same as above.	Above sample heated to 2415 K.
◇	62-28	1819	0.4-5.0		Same as above.	Same as above.
●	62-28	2415	0.4-5.0		Same as above.	Same as above.

PROPERTIES OF SCANDIUM BORIDE

MOST PROBABLE VALUES

Property	C.G.S. Units	Brit. Eng. Units
Density	3.67	229.0
Melting Point	2523	4541

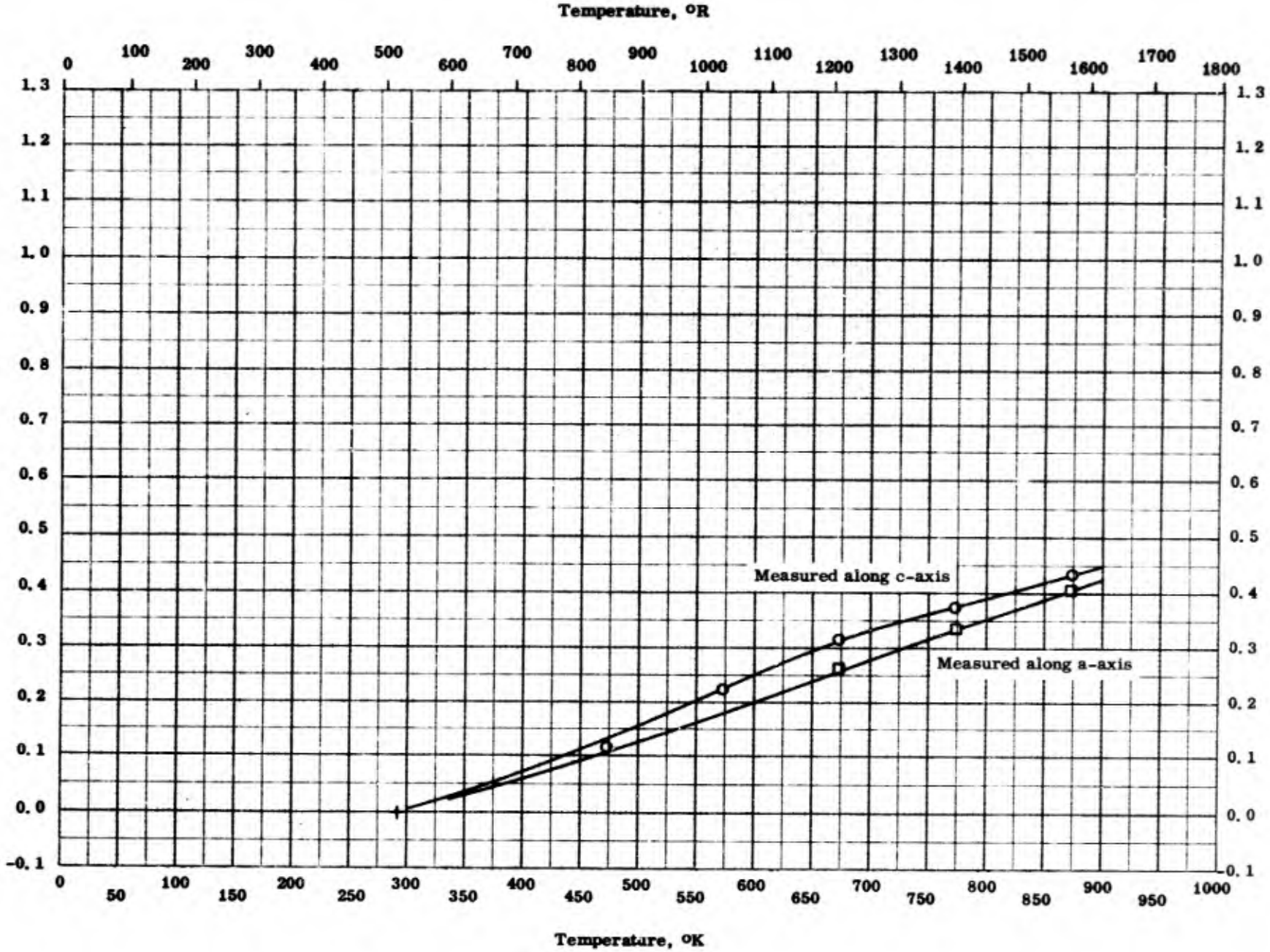
REPORTED VALUES

Density	$g\ cm^{-3}$	$lb\ ft^{-3}$
○ ScB_2	3.67	229.0
Melting Point	K	R
□ ScB_2	2523	4541

PROPERTIES OF SCANDIUM BORIDE

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
○	62-21	298		ScB_2.	
□	60-34	2523		ScB_2.	



TPRC

THERMAL LINEAR EXPANSION -- SCANDIUM BORIDE

THERMAL LINEAR EXPANSION -- SCANDIUM BORIDE

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
O	64-18	293-873		ScB_2.	Powder sample prepared and lent by the IPM Cermet Institute of Ukrainian Academy of Science; x-ray method; copper radiation; data calculated from lattice parameter; measured in c-axis direction.
□	64-18	293-873		ScB_2.	Above specimen measured in a-axis direction.

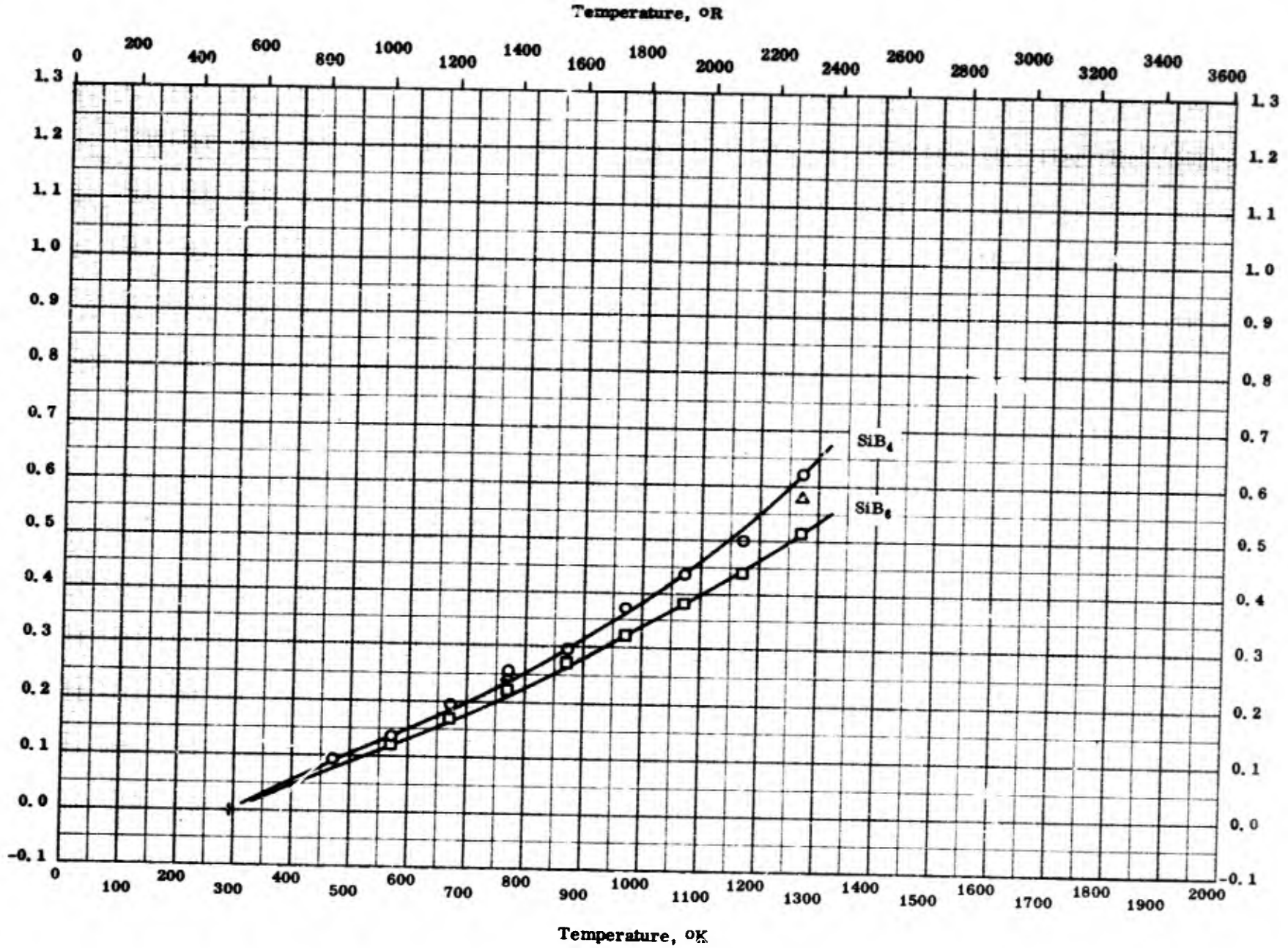
PROPERTIES OF SILICON BORIDES

REPORTED VALUES

Melting Point	K	R
O SiB_6	2223	4001

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
O	60–39	2223		SiB_6.	



THERMAL LINEAR EXPANSION — SILICON BORIDES

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
○	62-37	293-1273		SiB_4; impurity: 1.0 Cu, 0.1-1.0 Fe, Zr each, 0.1 Al, Cr, Mn, Ni each, 0.01-0.1 Mg, Ti each, 0.43 O, 0.072 H and 0.0141 N; specimen 0.142 in. dia by 0.881 in. long; bulk density 2.08 g cm^{-3}.	Sample prepared by pre-pressing to 100,000 psi with 4 carbowax, and hot pressing at 1350 C for 4 hrs at 6000 psi in an unlined graphite die, and then machined with diamond tools; measured in argon with a heating rate of 8 C min^{-1}.
□	62-37	293-1273		SiB_6; 1.0 Cu, 0.1-1.0 Fe, Ni each, 0.1 Al, Cr, Mn, Ti each, 0.01-0.1 Mg, 0.001-0.1 Zr, 0.4 O, 0.0153 N and 0.0647 H; specimen 0.141 in. dia by 0.675 in. long; bulk density 2.32 gcm^{-3}.	Same as above specimen except hot pressing to 1500 C for 2 hrs at 6000 psi.
△	60-27	298-1273		Not given.	

PROPERTIES OF TANTALUM BORIDES

REPORTED VALUES

Density		$g\ cm^{-3}$	$lb\ ft^{-3}$
○	TaB_2	12.6*	787*
□	TaB_2	11.70	730.4
△	TaB_2	12.6	786.6
■	Ta_3B_4	13.5	843
▲	Ta_3B_4	13.6*	849*
▼	TaB	14.29*	892.1*
◆	TaB	14.0	874
●	TaB	12.11	756

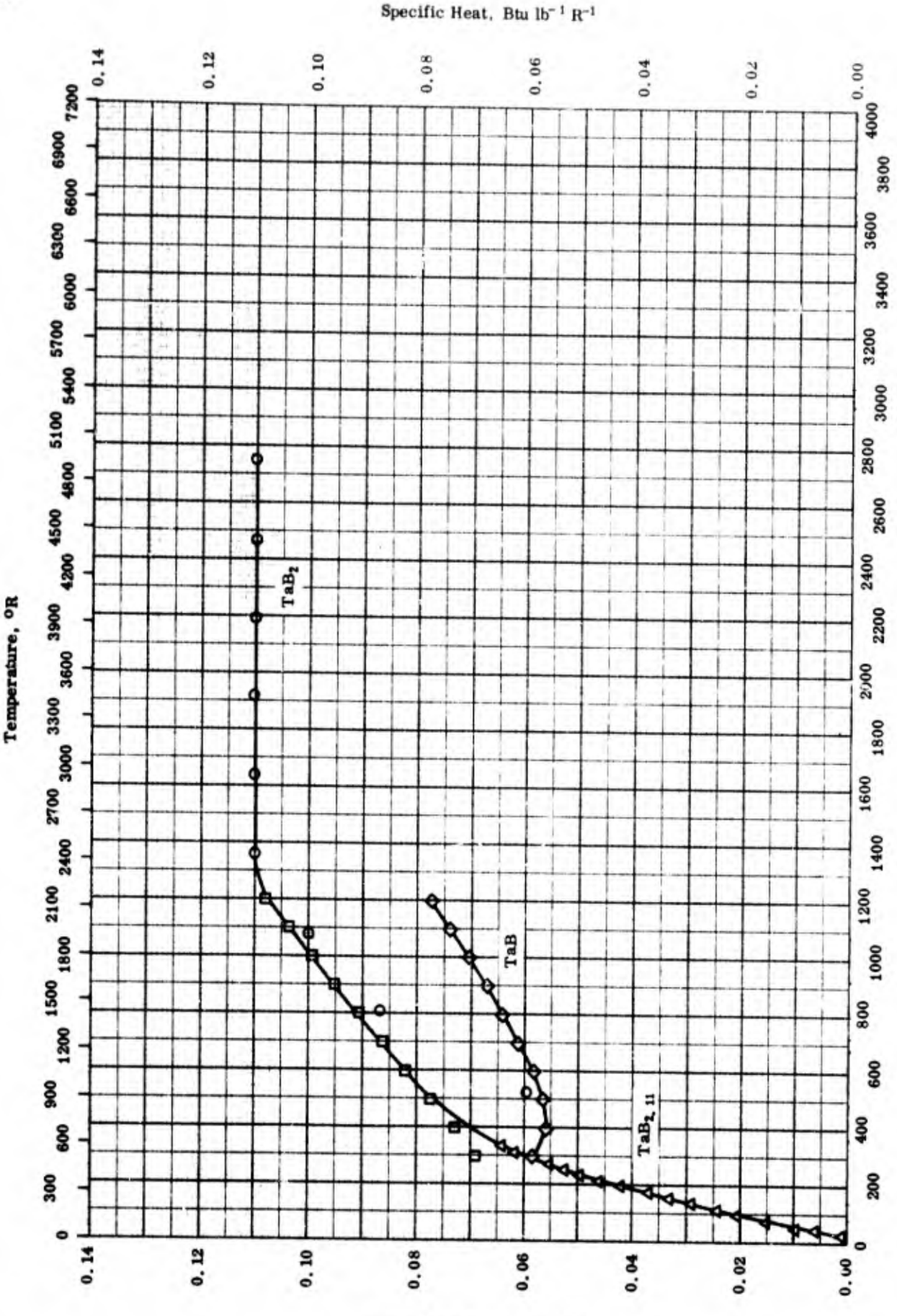
Melting Point		K	R
◇	TaB_2	3373	6072
▽	TaB_2	3473*	6252*
◑	TaB_2	3273	5891
◐	TaB_2	3373	6072
	Ta_3B_4	2923	5261
	TaB	2703	4865
	Ta_3B_2	2393	4307

*Most probable value for this compound.

PROPERTIES OF TANTALUM BORIDES

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
○	56-25	298		TaB_2; range of 2 samples: 82.7 - 87.4 Ta, 9.25 - 9.34 B, 0.09 - 0.51 Fe, and 0.21 C.	Powder produced by carbon reduction of tantalum oxide and B_2O_3 at 2000 C, crushed, milled 24 hrs, mixed, held 1 hr at 1800 C, crushed again, and hot pressed in graphite dies; density computed from x-ray measurements of lattice.
□	49-9	298		TaB_2; 89.2 Ta, and 10.5 B.	Density by pycnometer using ethyl benzene.
△	49-9	298		Same as above.	Density computed from x-ray measurements of lattice.
◇	56-22	3373		TaB_2.	
▽	54-21	3473		TaB_2.	Prepared by direct synthesis.
■	49-12	298		Ta_3B_4; δ phase.	
▲	49-12	298		Same as above.	Density computed from x-ray measurements of lattice.
▼	49-12	298		TaB; γ phase.	Same as above.
◆	49-12	298		Same as above.	Measured.
●	62-7	298		TaB.	Pressed and sintered; maximum exposure temp. 4610 F.
◑	62-42	3272		TaB_2.	
◐	31-1	2393-3373		Series of tantalum borides.	Decomp. temperature for Ta_3B_4 and Ta_3B_2.

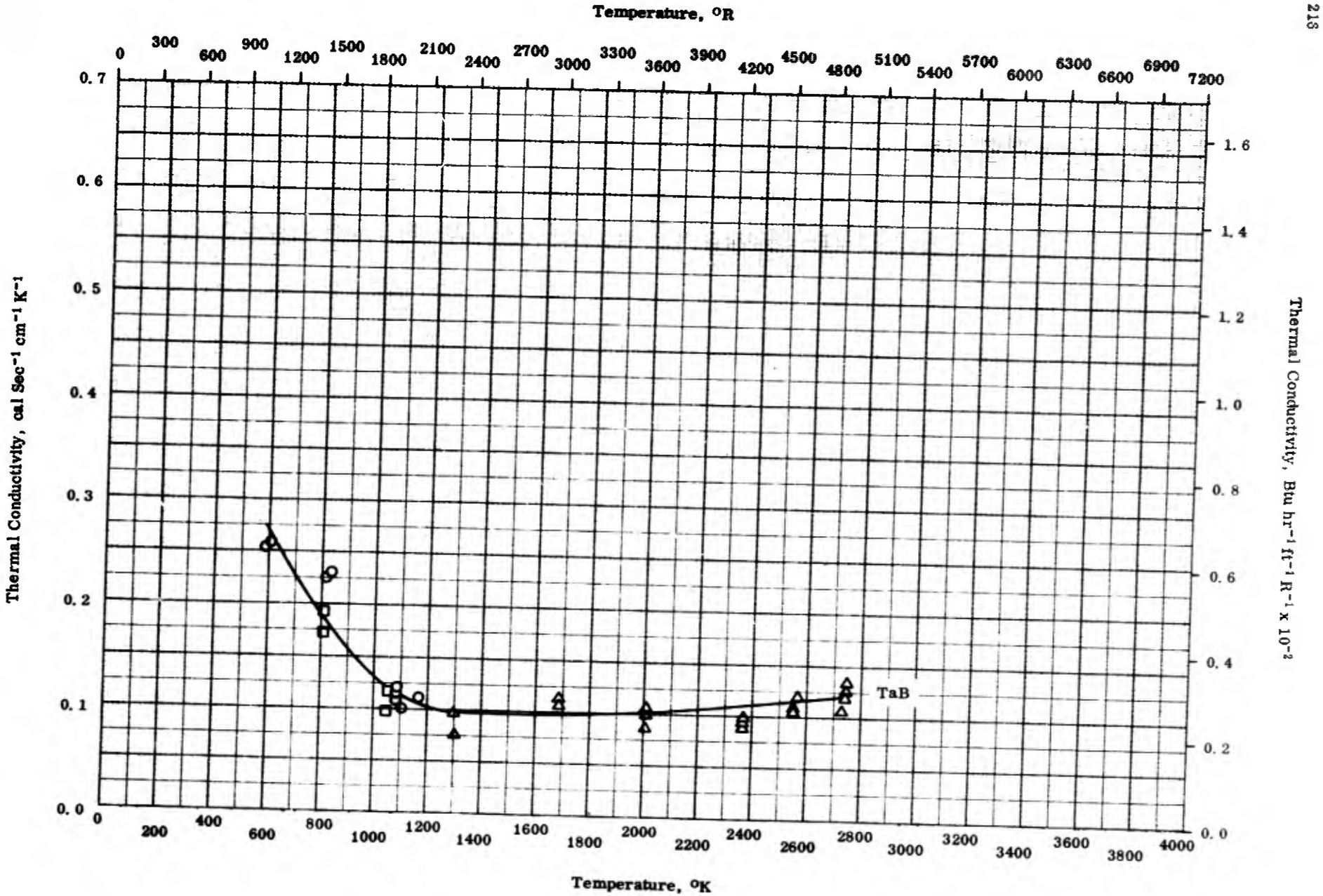


SPECIFIC HEAT -- TANTALUM BORIDES

SPECIFIC HEAT -- TANTALUM BORIDES

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
○	60-17 also 62-7	533-2758	≤5.0	TaB_2; density 756 lb ft^{-3}.	Pressed and sintered.
□	62-20	298-1200	0.5	TaB_2; traces of impurities.	
△	63-7	6-345		$TaB_{2.11}$; 88.80 Ta, 11.21 B, 0.0029 O_2, 0.0022 N_2, and 0.001 - 0.01 Cr, Ti and Si; polycrystalline single phase.	Zone refined.
◇	62-20	298-1200	0.5	TaB; traces of impurities.	

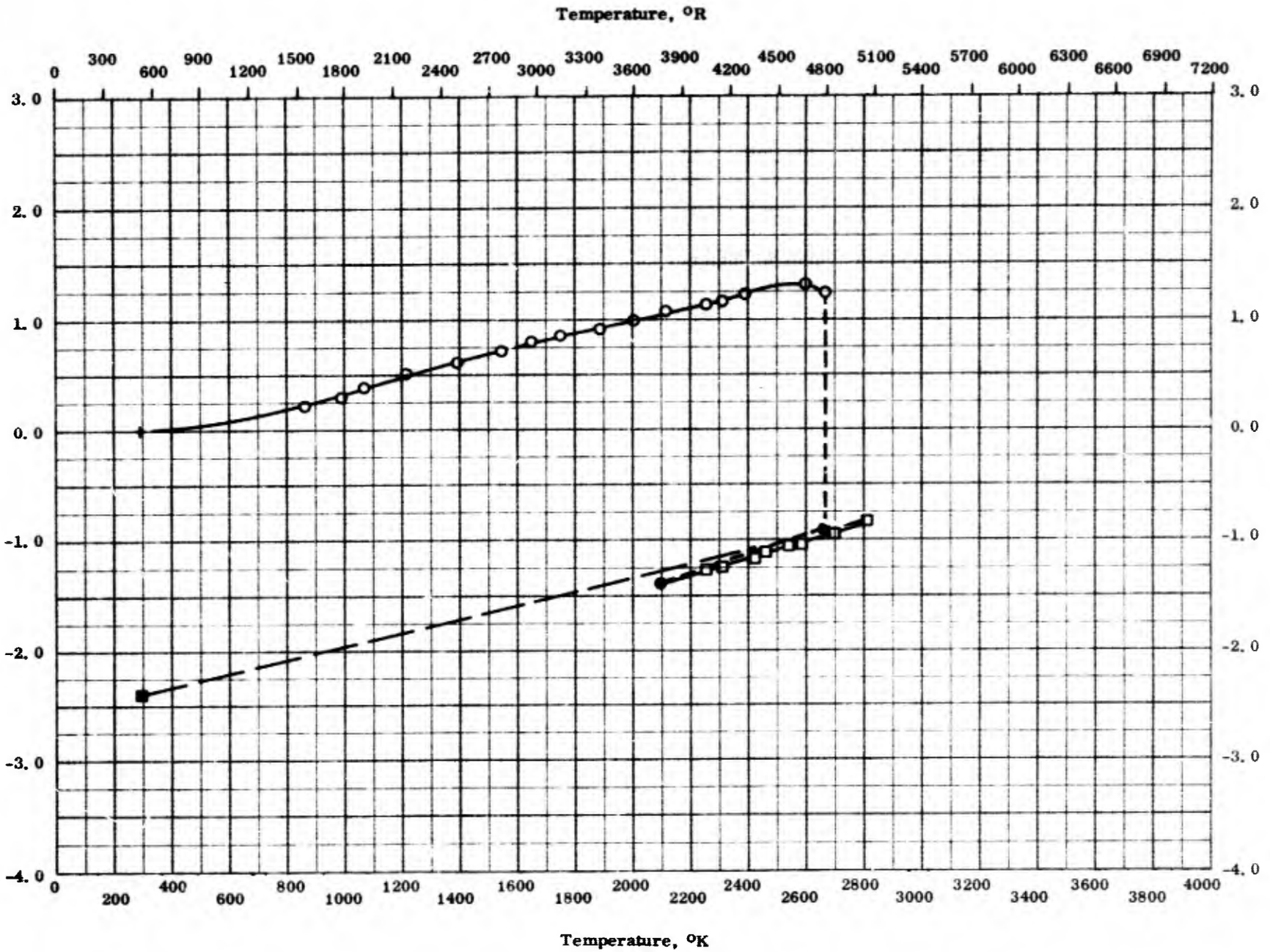


THERMAL CONDUCTIVITY -- TANTALUM BORIDE

THERMAL CONDUCTIVITY -- TANTALUM BORIDE

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
○	62-7	595-1174	6.5	TaB; density 756 lb ft^{-3}.	Pressed and sintered; max exposure temperature 4610 F.
□	62-7	810-1059	6.5	Same as above.	Same as above.
△	62-7	1300-2750	6.5	Same as above	Same as above; sample incipient melted after measurements.

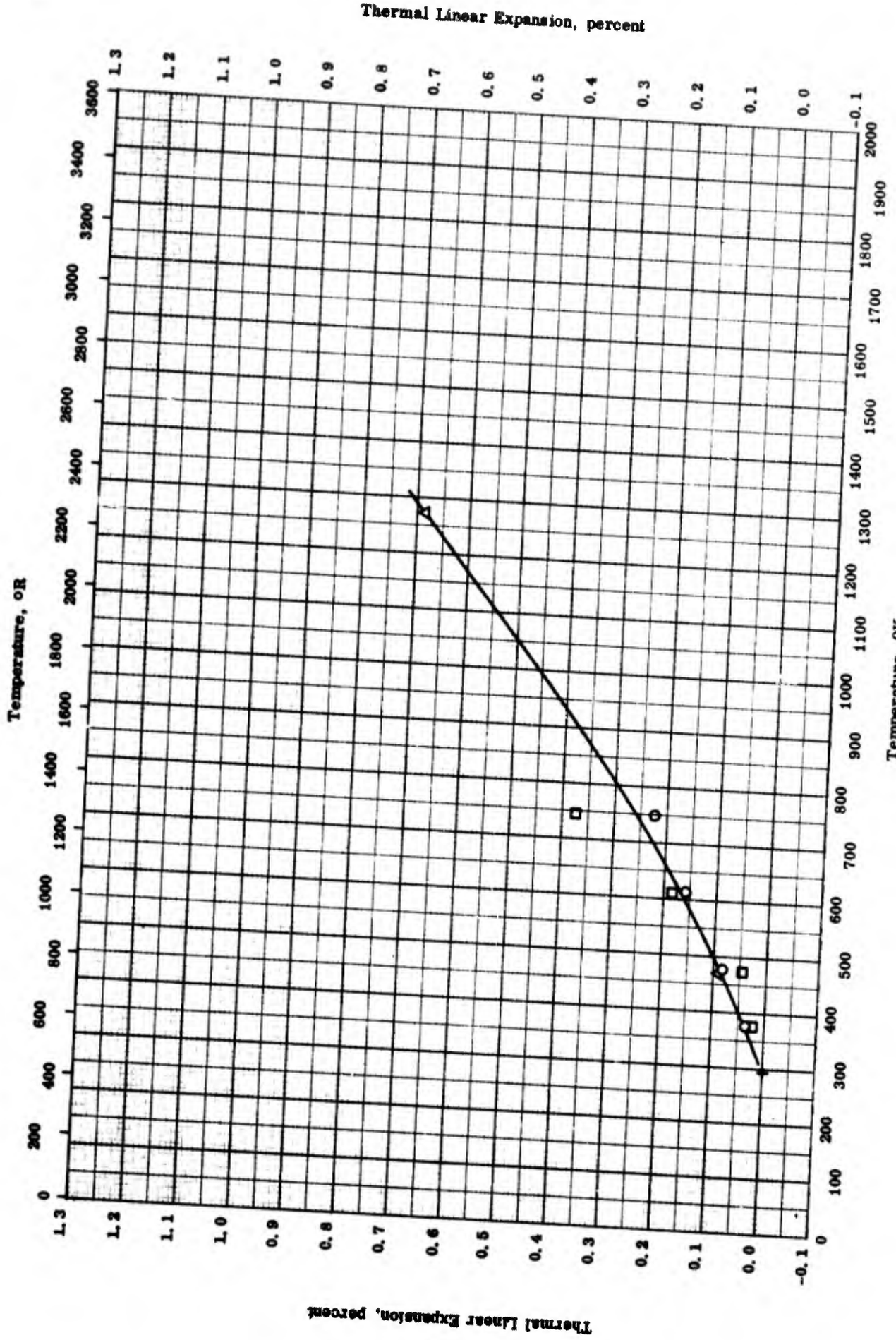


THERMAL LINEAR EXPANSION -- TANTALUM BORIDE

THERMAL LINEAR EXPANSION — TANTALUM BORIDE

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
○	62-7	294-2661	2	TaB from General Electric Co.; may contain considerable diboride; density 756 lb ft^{-3}; initial length 3.1530 in. and final length 3.0940 in. [Author's design; SRI-E 25].	Pressed and sintered; measured in helium; specimen partially melted on post inspection.
●	62-7	2100-2661	2	Same as above.	Cooling curve of above specimen.
□	62-7	2100-2811	2	Same as above.	Reheating of above specimen.
■	62-7	294-2816	2	Same as above.	Cooling of above specimen.



THERMAL LINEAR EXPANSION — TANTALUM DIBORIDE

THERMAL LINEAR EXPANSION — TANTALUM DIBORIDE

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
○	55-17	298-747		TaB_2.	X-ray method; data calculated from lattice parameter; measured along a-axis direction.
□	55-17	298-746		TaB_2.	Same as above except measured along c-axis direction.
△	62-35	293-1273		TaB_2.	

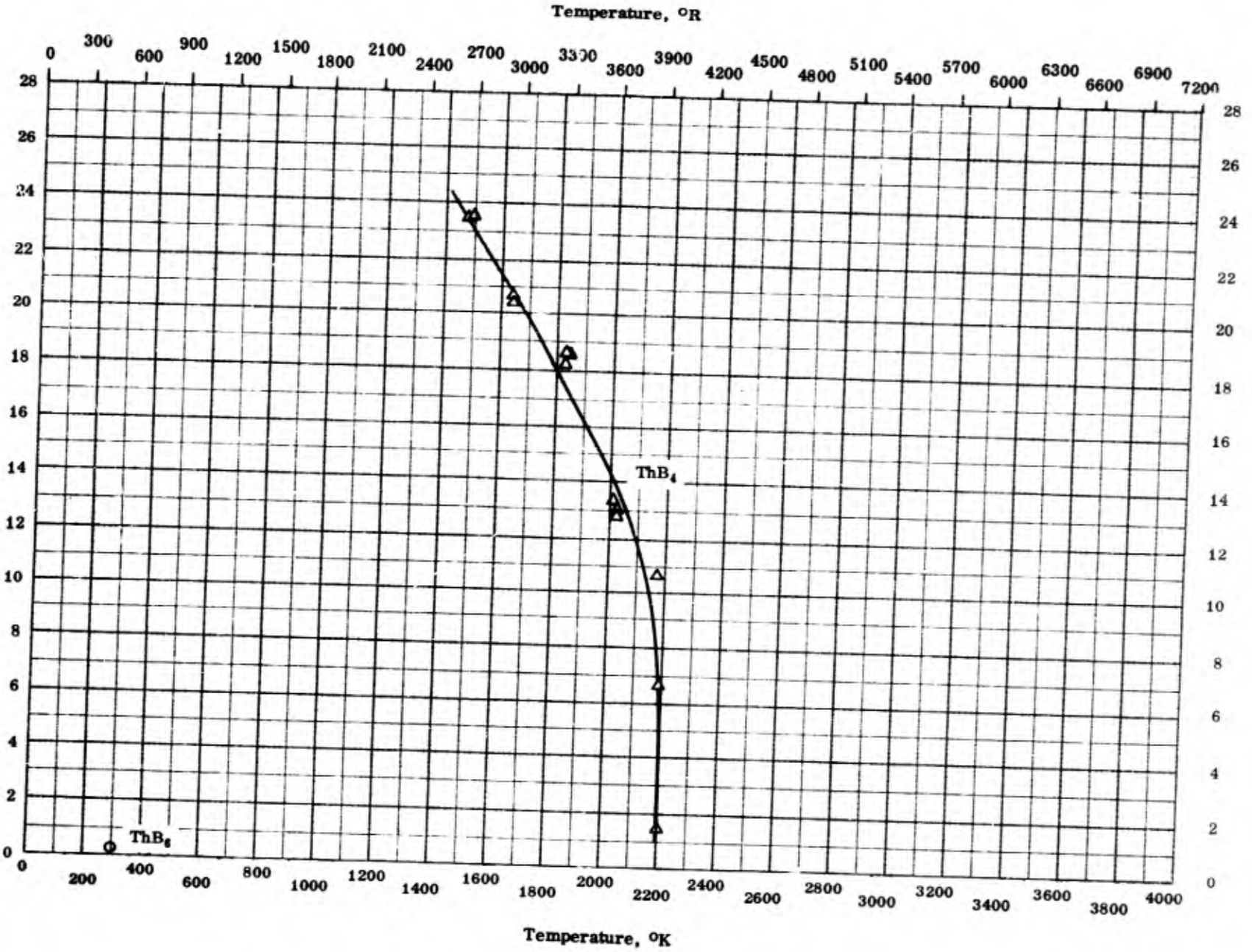
PROPERTIES OF THORIUM BORIDES

REPORTED VALUES

Density		$g\ cm^{-3}$	$lb\ ft^{-3}$
○	ThB_4	8.45	528
Melting Point		K	R
□	ThB_6	2423	4361
△	ThB_4	2483	4469

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
○	49–11	298		ThB_4.	Computed from x-ray measurements of lattice.
□	56–32	2423		ThB_6.	
△	62–43	2483		ThB_4.	



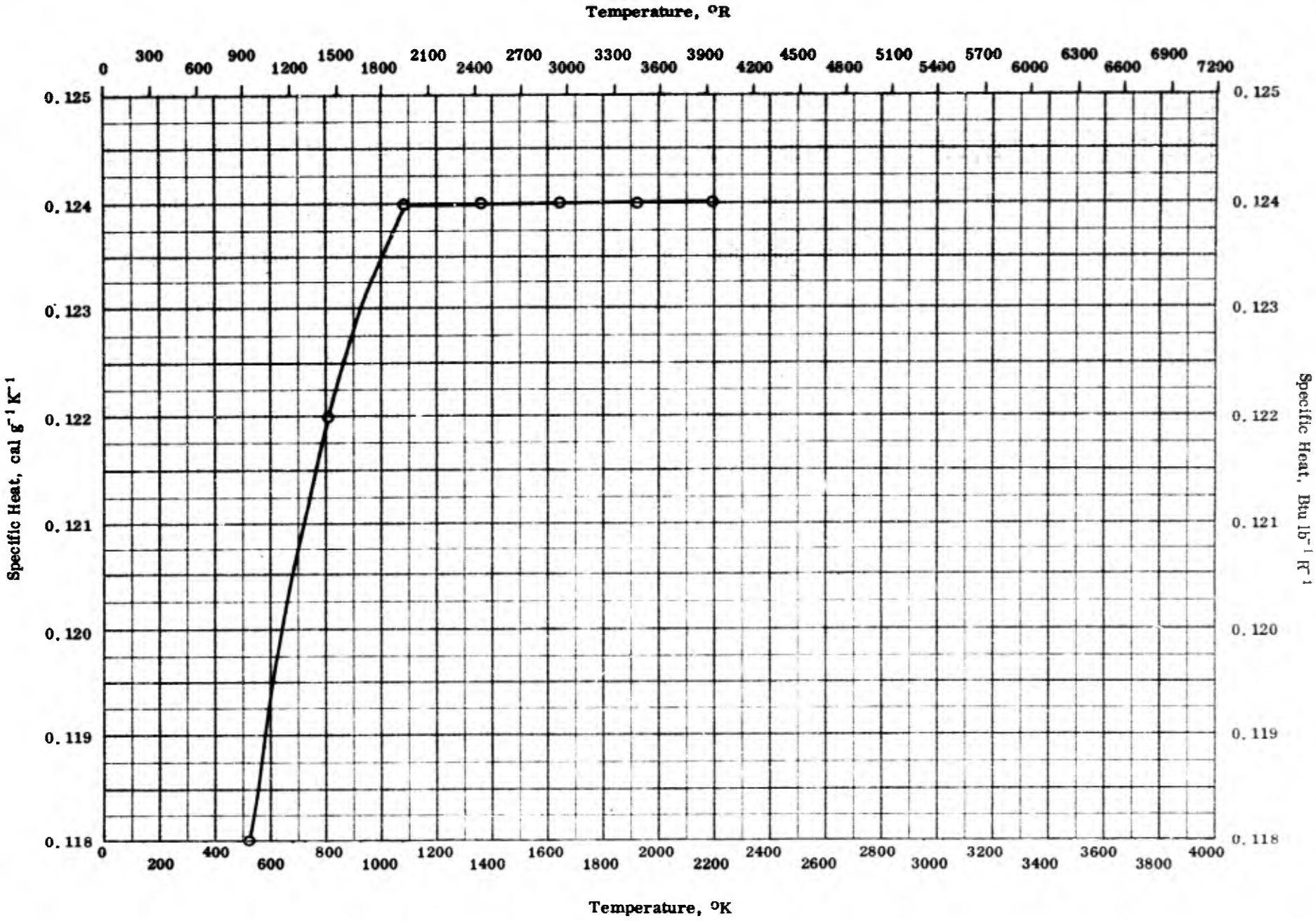
TPRC

ELECTRICAL RESISTIVITY -- THORIUM BORIDES

ELECTRICAL RESISTIVITY -- THORIUM BORIDES

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
△	62-6	1477-2200	2.4	ThB_4.	Hot pressed; maximum exposure temperature 4065 F.
○	62-21	298		ThB_2.	



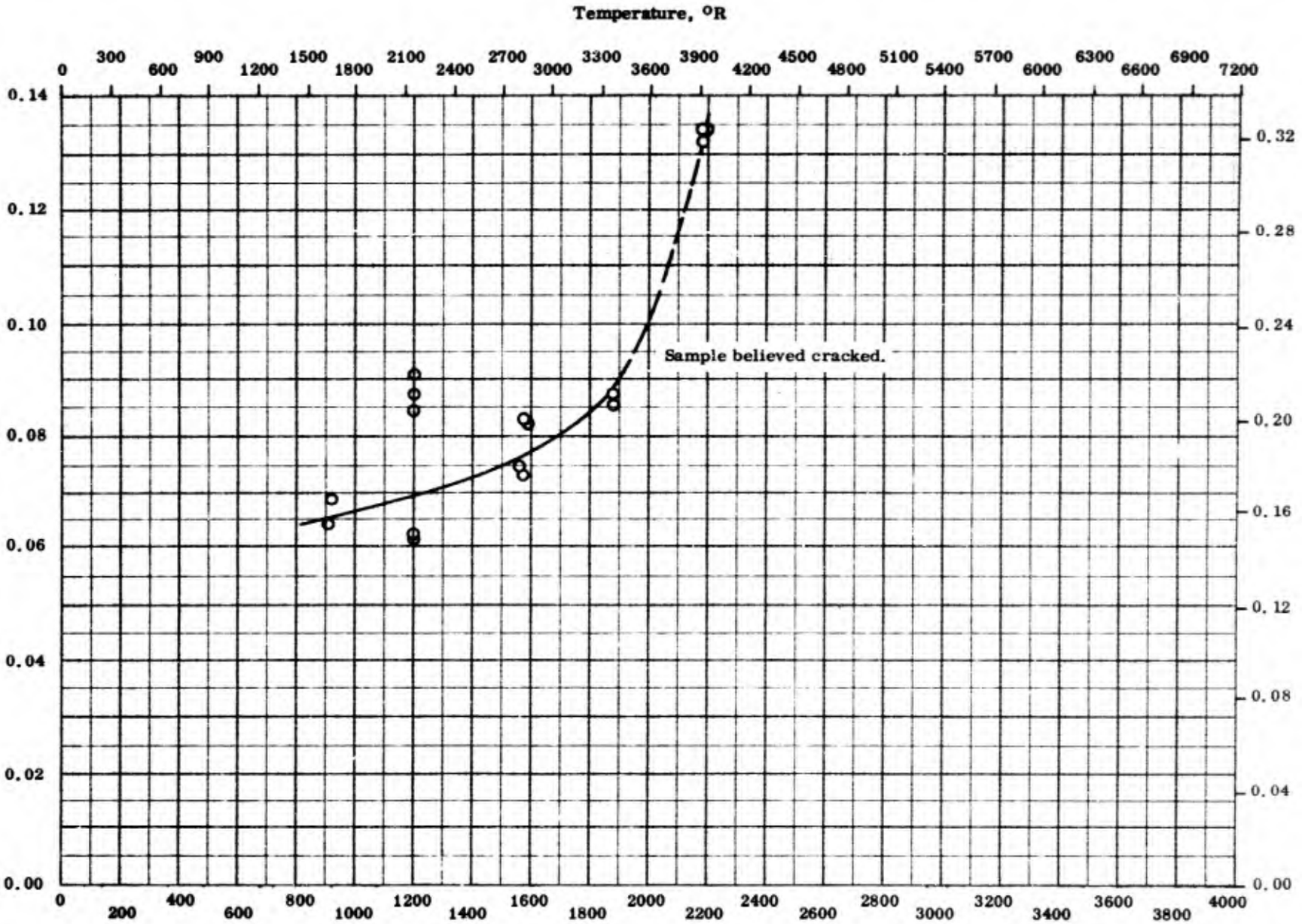
TPRC

SPECIFIC HEAT -- THORIUM TETRABORIDE

SPECIFIC HEAT -- THORIUM TETRABORIDE

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
O	62-6	533-2200	≤5.0	ThB_4; density 510 lb ft^{-3}.	Hot pressed; crushed in hardened still mortal to pass 100-mesh screen.



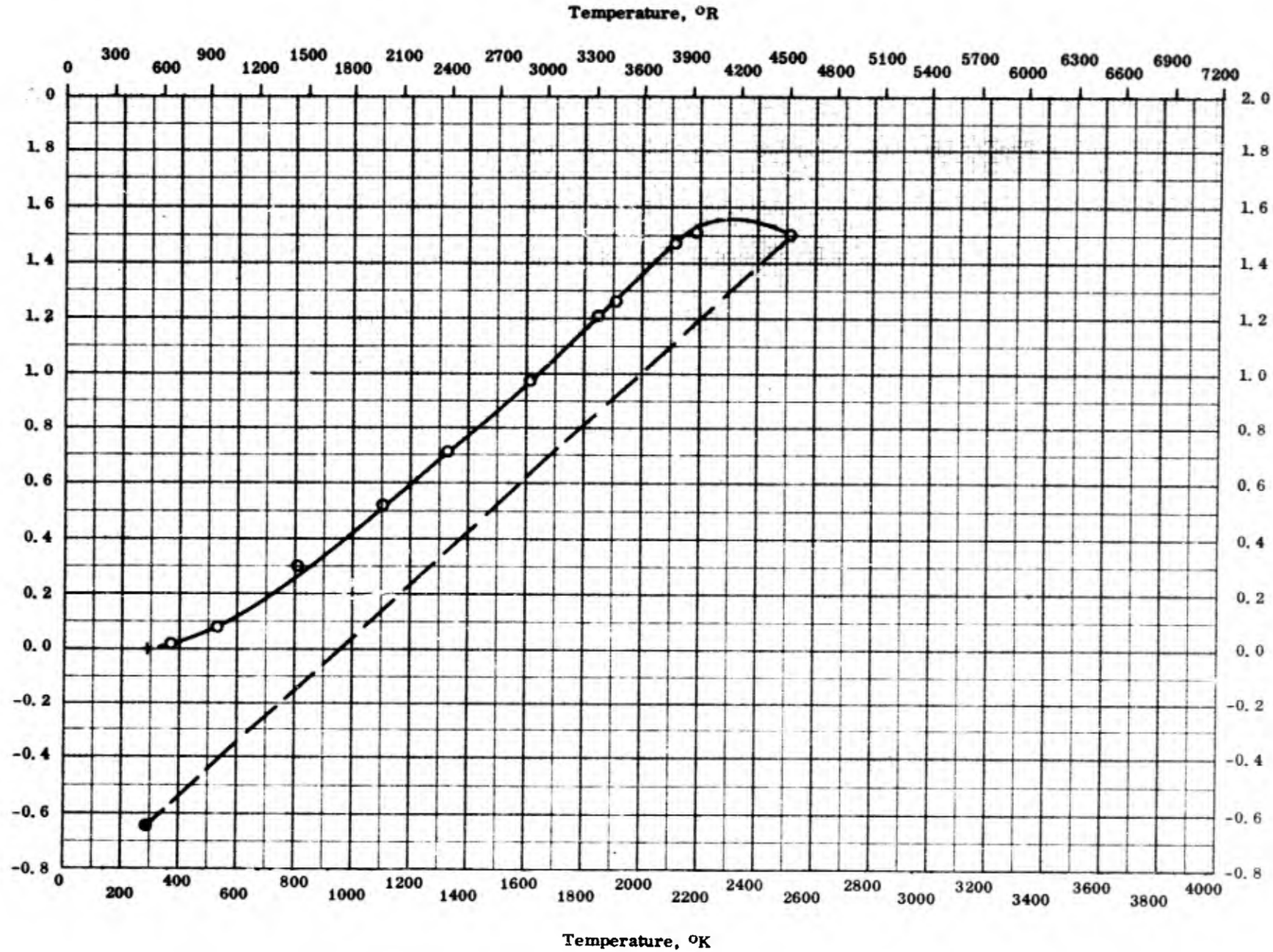
TPRC

THERMAL CONDUCTIVITY -- THORIUM TETRABORIDE

THERMAL CONDUCTIVITY -- THORIUM TETRABORIDE

REFERENCE INFORMATION

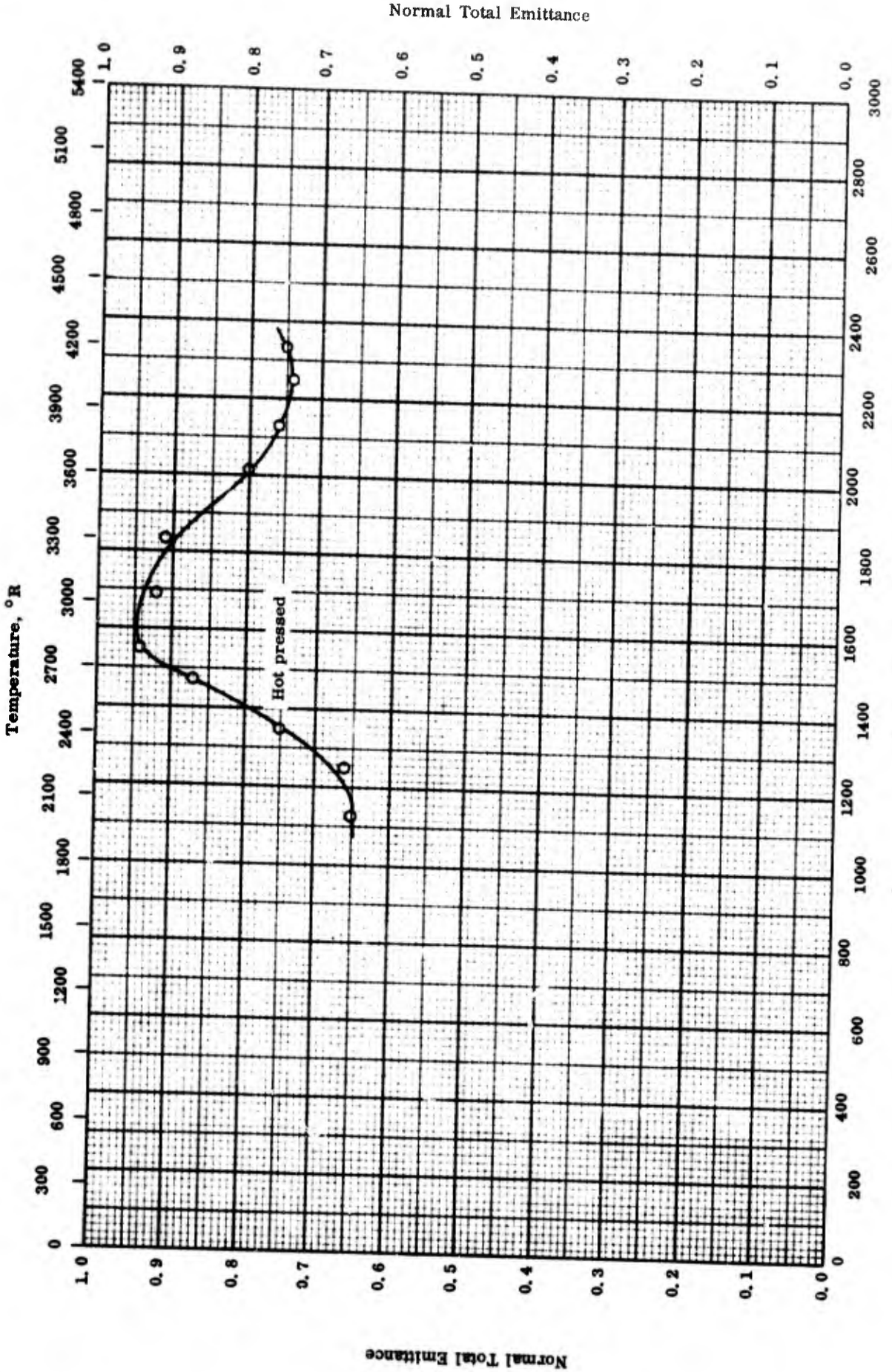
Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
O	62-6	913-2187	5-7	ThB_4.	Ground and polished thoroughly; sample found broken on post inspection.



THERMAL LINEAR EXPANSION -- THORIUM TETRABORIDE

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
O	62-6	294-2514	5	ThB_4 from Carborundum Co.; density 7.78 gcm^{-3}; initial length 2.275 in. and final length 2.265 in. [Author's design: E 20].	Hot-pressed; measured in helium.
●	62-6	294-2514		Same as above.	Cooling data for above specimen.

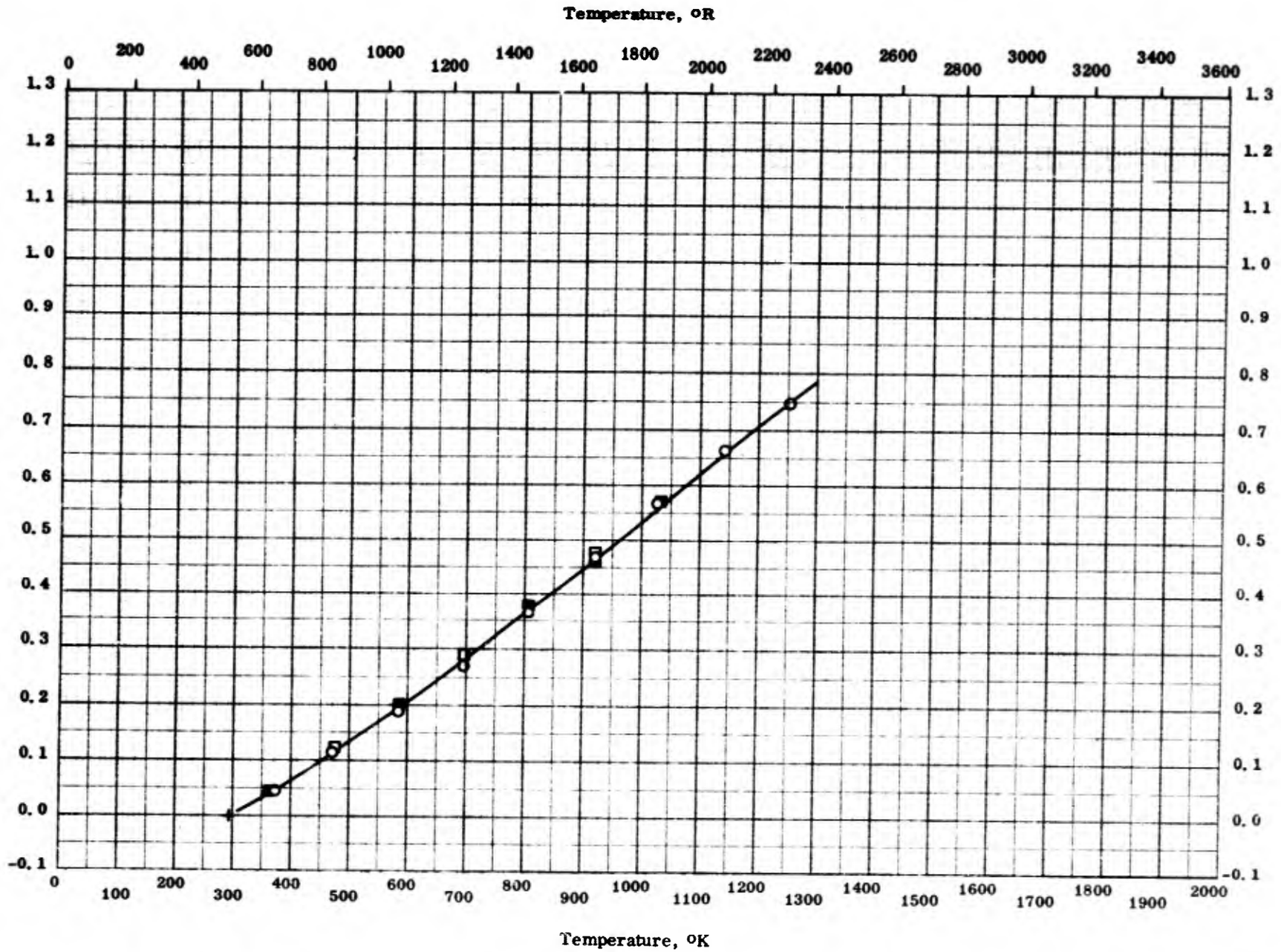


NORMAL TOTAL EMITTANCE -- THORIUM TETRABORIDE

NORMAL TOTAL EMITTANCE -- THORIUM TETRABORIDE

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
O	62-6	1128-2332	10	ThB_4; density 8.17 g cm^{-3}.	Hot-pressed; measured in dry argon atmosphere.



THERMAL LINEAR EXPANSION -- THORIUM URANIUM BORIDE

THERMAL LINEAR EXPANSION — THORIUM URANIUM BORIDE

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
○	64-16	293-1253	2	[Author's design: $(90Th-10\ U)\ B_4$].	Specimen prepared by arc melting button materials and drop casting through a hole in the hearth into a graphite mold; measured under a vac of approx 5×10^{-5} mm Hg.
□	62-38	293-1144		[Author's design: $(Th_9U)B_4$].	Heating.
■	62-38	293-1144		Same as above.	Cooling of above specimen.

PROPERTIES OF TITANIUM BORIDES

REPORTED VALUES

Density		g cm^{-3}	lb ft^{-3}
□	TiB_2	4.38	273
△	TiB	5.09	318
▽	TiB_2	4.56*	285*
◁	TiB_2	4.52	282
▷	TiB_2	4.52	282

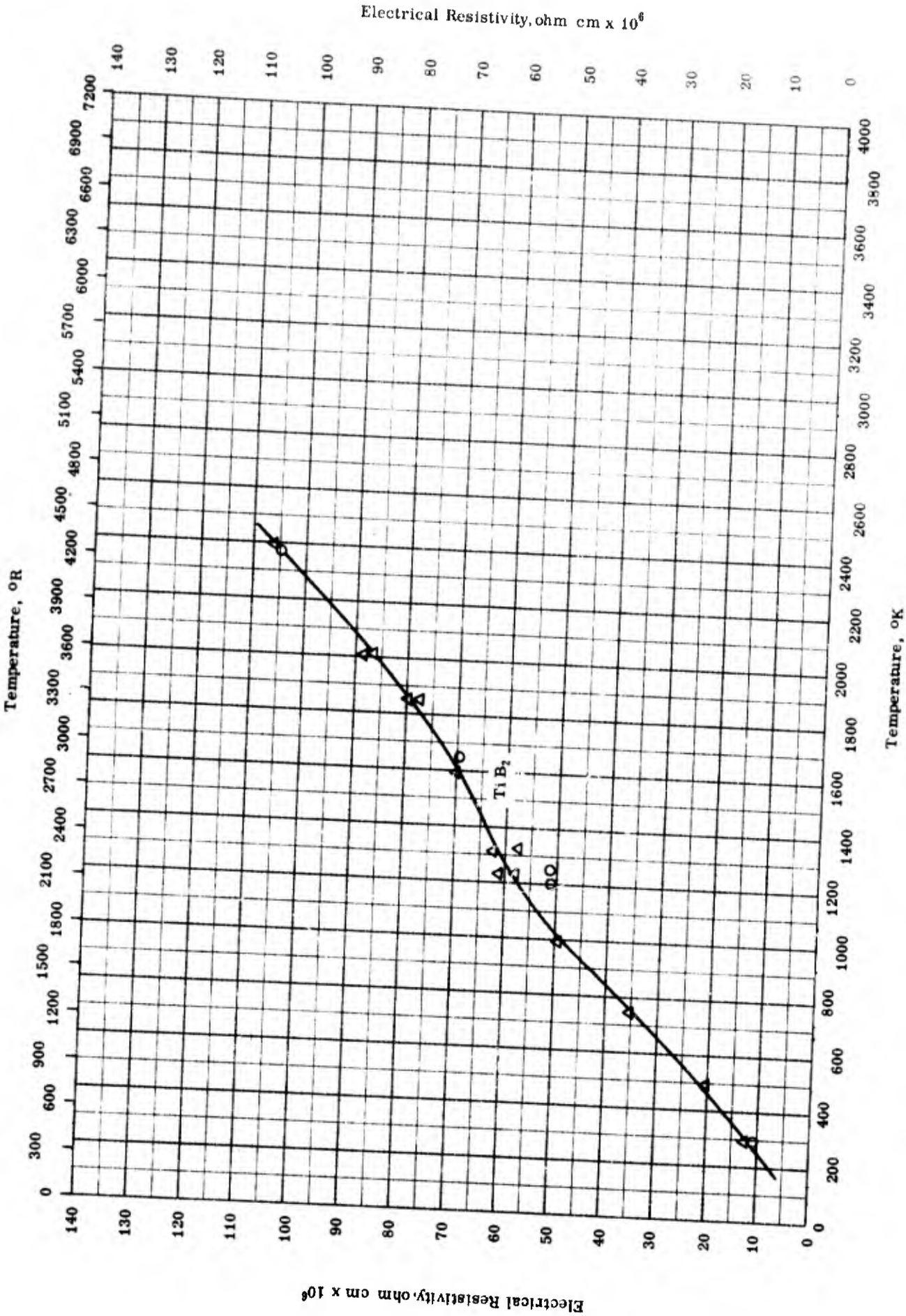
Melting Point		K	R
○	TiB_2	3193	5748
◇	TiB_2	3193	5748
●	TiB_2	3253*	5855*
	Ti_2B	2473	4451

*Most probable value for this compound.

PROPERTIES OF TITANIUM BORIDES

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
○	54-21	3193		TiB_2.	Prepared by direct synthesis.
□	49-5	298	±0.5	TiB_2; prepared from 99.9 pure Ti.	Sintered at 1900-2000 C.
△	49-5	298		TiB ; prepared from 99.9 pure Ti.	Same as above.
◇	56-22	3193		TiB_2.	
▽	56-25	298		TiB_2; range of 8 samples: 65.6 - 69.5 Ti, 28.8 - 30.5 B, 0.4 - 1.48 O_2, 0.01 - 0.4 C, and 0.02 - 0.23 Fe.	Powder produced by carbon reduction of Ti oxide and B_2O_3 at 2000 C; crushed; milled 24 hr; mixed; heated 1 hr at 1800 C; crushed and hot pressed in graphite dies; density from x-ray measurement of lattice.
◁	49-9	298		TiB_2; 68.9 Ti, and 30.1 B.	Density from x-ray measurement of lattice.
▷	49-9	298		Same as above.	Density by pycnometer using ethyl benzene.
●	54-27	2473-3253		TiB_2 and Ti_2B.	



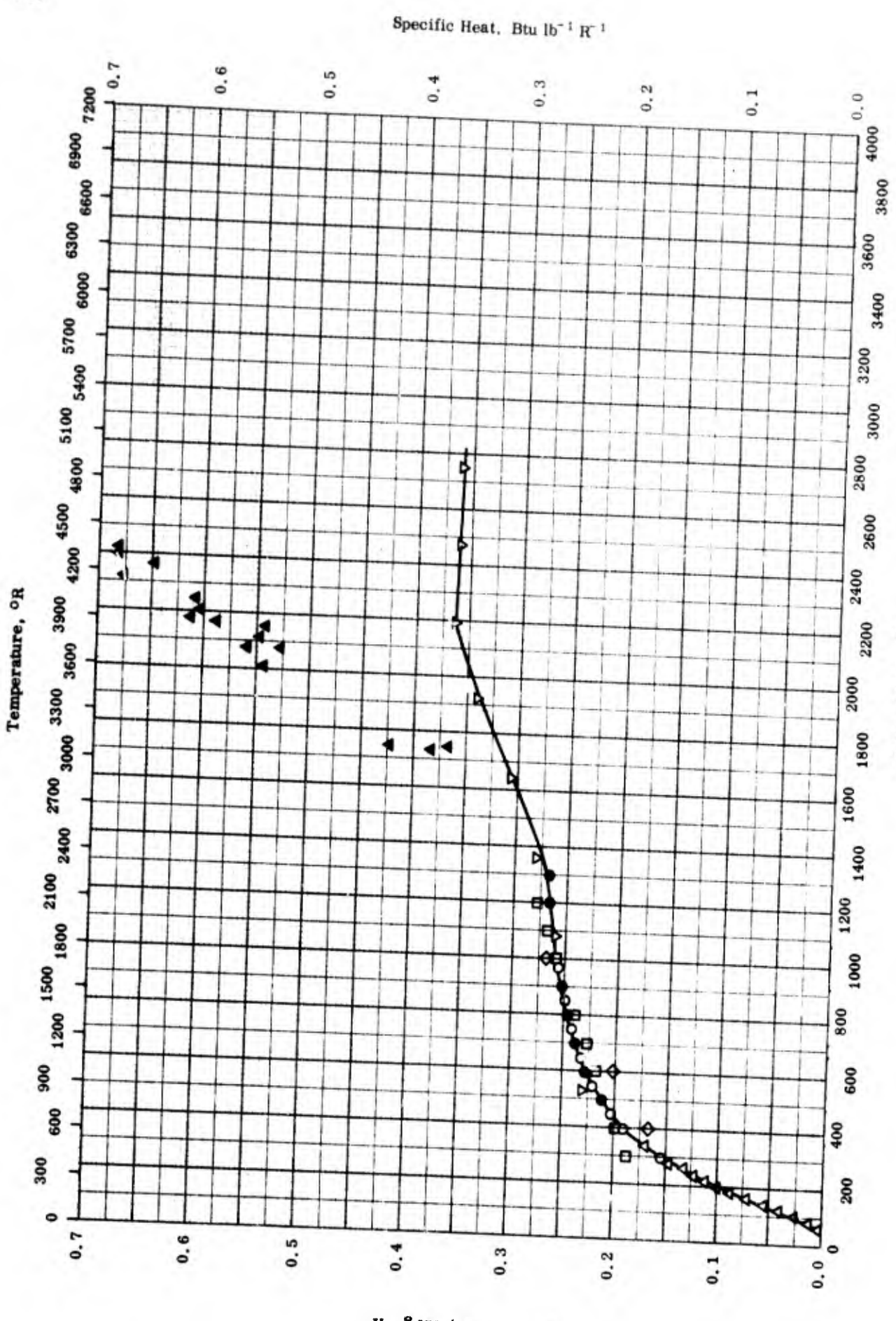
ELECTRICAL RESISTIVITY - TITANIUM DIBORIDE

ELECTRICAL RESISTIVITY -- TITANIUM DIBORIDE

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
Δ	62-6	296-2383	2.4	TiB_2; 69.8 Ti, 29.5 B, 0.6 N, and 0.2 C.	Hot pressed; maximum exposure temperature 4900 F.
ↄ	62-6	300-2363	2.4	Same as above.	Same as above; cooling curve.

TPRC

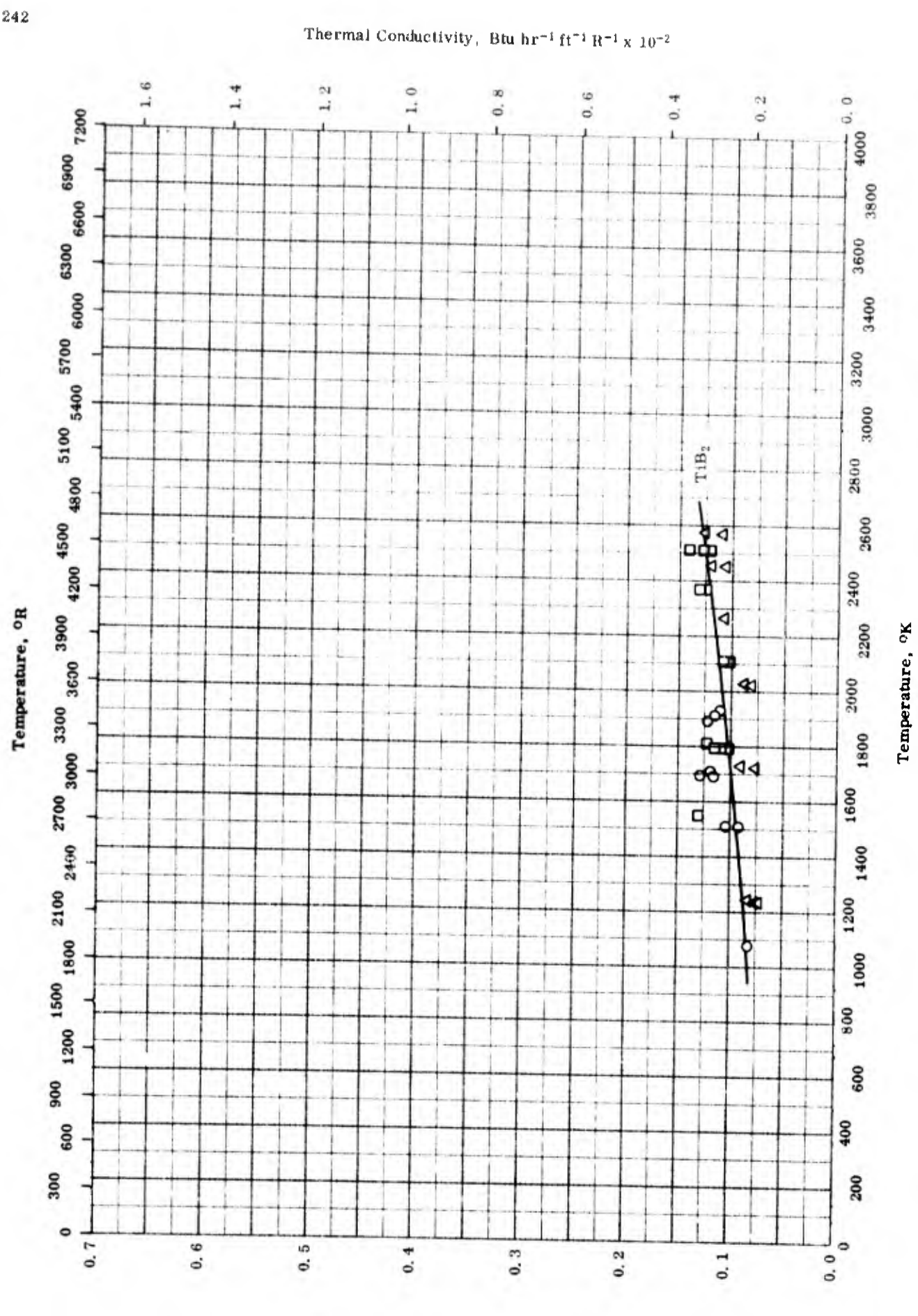


SPECIFIC HEAT -- TITANIUM DIBORIDE

SPECIFIC HEAT -- TITANIUM DIBORIDE

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
○	57-12	303-973	1	TiB_2; 99.7 TiB_2, 0.2 B, 0.1 Fe.	
□	62-20	298-1200	0.1	TiB_2; traces of impurities.	
△	63-7	6-347		TiB_2; 68.85 Ti, 30.48 B, 0.12 C, 0.11 O_2, 0.10 N_2, 0.10 Co and Cr, 0.06 Fe, 0.01 Ni and Si, 0.001-0.01 Al, Mg, and Mo, 0.001 others.	Zone refined.
◇	59-12	300-1000		TiB_2; composition not given.	
▽	62-6	533-2755	≤5	TiB_2; before test: 69.8 Ti, 29.5 B, 0.6 N_2, 0.4 Fe, 0.3 V, 0.2 C; density 285 lb ft^{-3}; after test: 69.3 Ti, 28.7 B, 0.32 C, 0.3 N_2; density 264 lb ft^{-3}.	Hot pressed; under argon atmosphere
●	64-4	273-1300		TiB_2; 69.6 Ti, 28.0 B, 0.97 C; monoclinic.	
▲	62-19	1733-2417	5	TiB_2; 64.40 Ti, 26.61 B, 1.24 C, 0.77 O_2, 0.51 Zr, 0.17 Fe, 0.10> Al, 0.10> Hf, 0.09 Nb, and 0.001 > Mg.	Machined to specifications using diamond tools and electric discharge techniques.

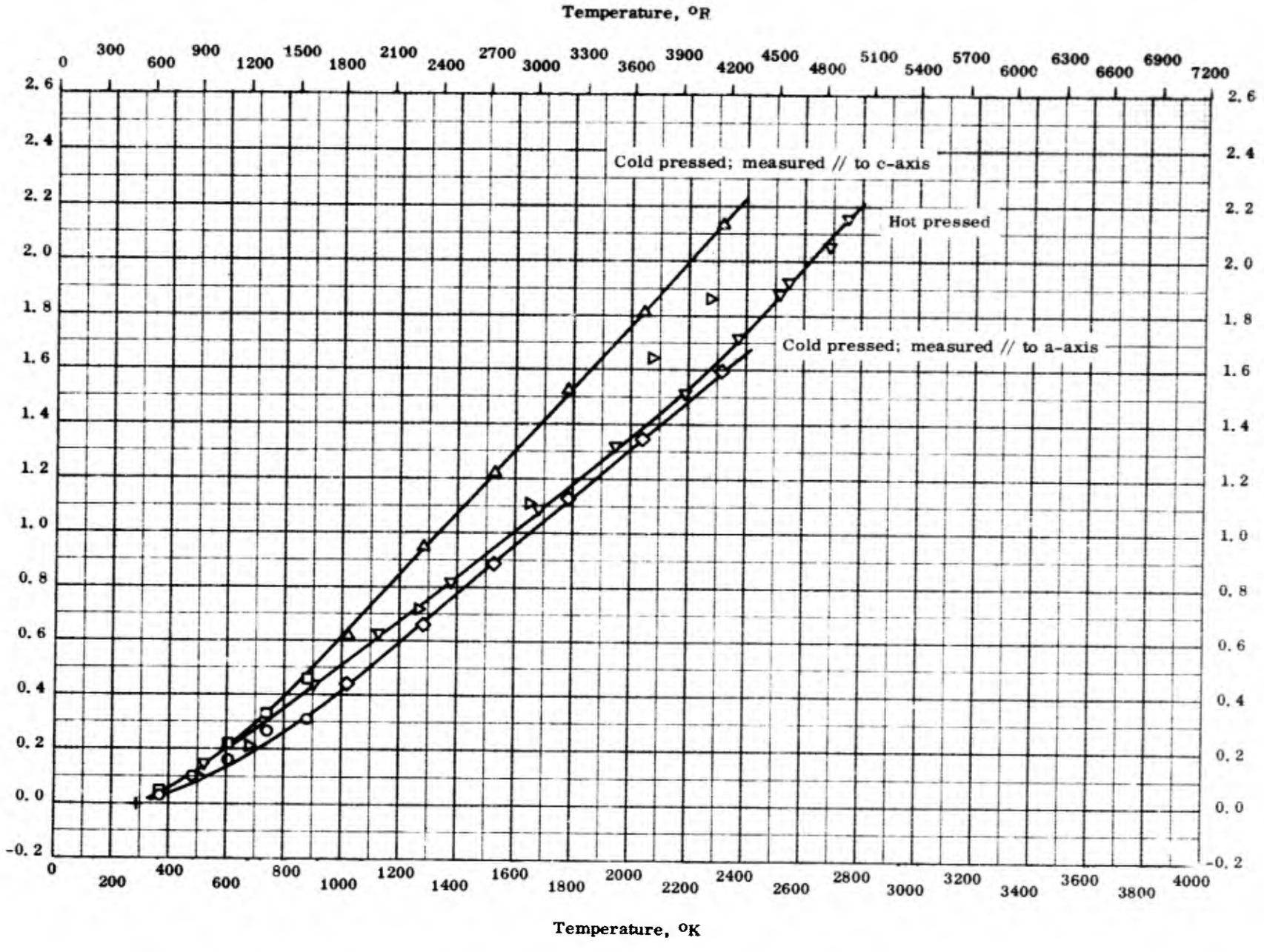


THERMAL CONDUCTIVITY -- TITANIUM DIBORIDE

THERMAL CONDUCTIVITY -- TITANIUM DIBORIDE

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
O	62-6	1075-1937	5-7	TiB_2.	Ground and then polished thoroughly; heat-soaked at 3800 F; sample found cracked on post inspection.
□	62-6	1542-2516	5-7	TiB_2.	Same as above; heat-soaked at 3500 F; sample found cracked on post inspection.
△	62-6	1239-2578	5-7	TiB_2.	Same as above.

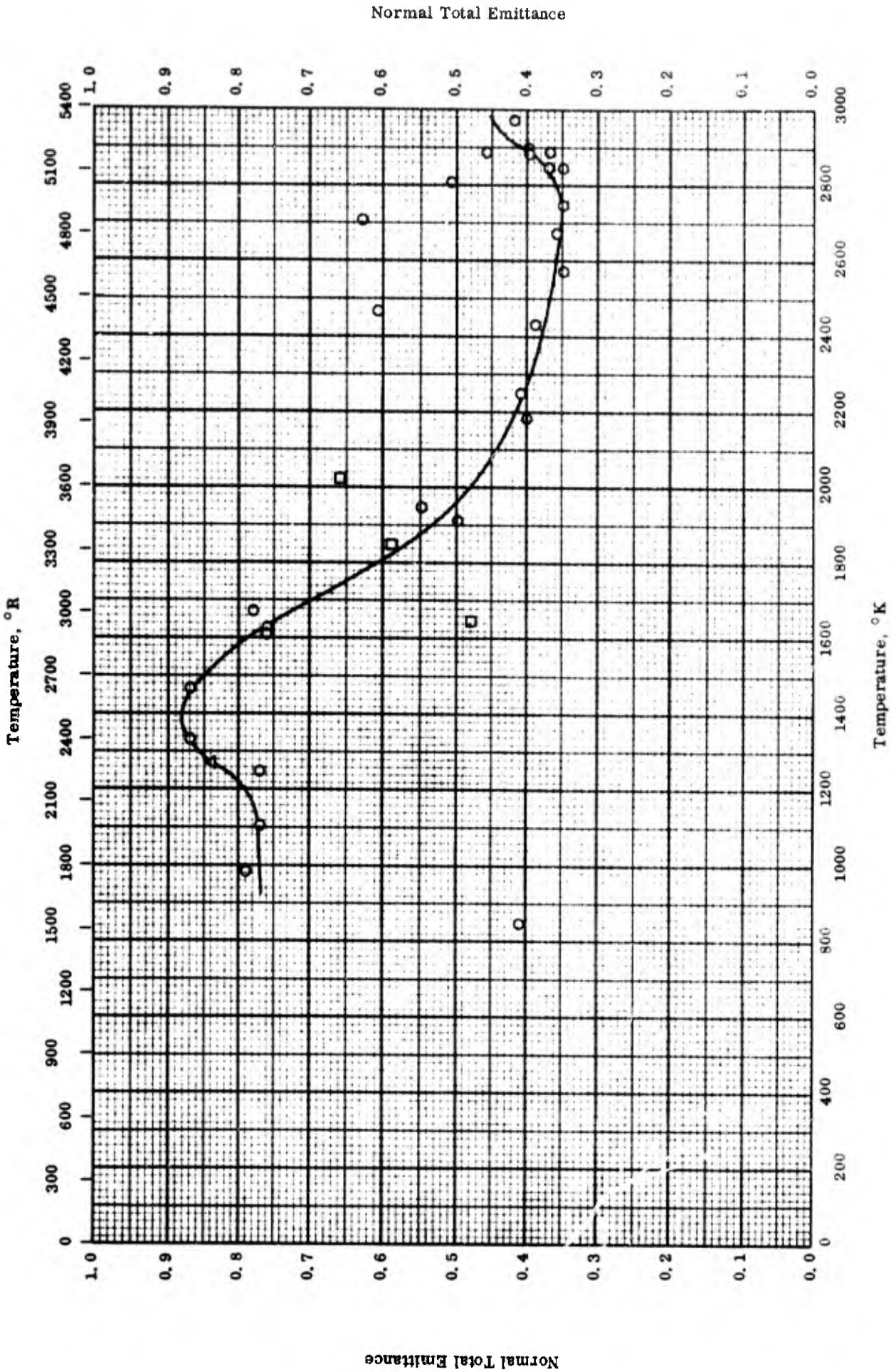


THERMAL LINEAR EXPANSION -- TITANIUM DIBORIDE

THERMAL LINEAR EXPANSION -- TITANIUM DIBORIDE

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
○	55-17	298-885		TiB_2.	X-ray method; measured parallel to a-axis direction; calculated from lattice parameter.
□	55-17	298-884		TiB_2.	Same as above specimen except measured parallel to c-axis direction.
◇	63-26	298-2314		TiB_2; 68.50 Ti, 31.05 B, 0.147 O, 0.085 Fe, 0.07 C, 0.02 N, 0.01 Cu, 0.002 Al, 0.002 Cr, 0.001 Mn, 0.0006 Si, and 0.00005 Mg; total impurity 0.34 and total analysis 99.89; specimen dimension 1-1/8 by 1/2 by 3/16 in.[2] [Author's design: lot V-126].	Cold pressed -200 mesh powder with camphor and pre-sintered in vacuum at 1650 C; x-ray method; measured parallel to a-axis direction.
◇	63-26	298-2314		Same as above.	Same as above except measured parallel to c-axis direction.
▽	62-6	294-2756		TiB_2 from Carborundum Co.; composition before exposure: 69.8 Ti, 29.5 B, 0.6 N, 0.2 C, and elements found by semi-quantitative emission spectrography (0.3 V and 0.4 Fe); after exposure: 69.3 Ti, 28.7 B, 0.32 C, 0.3 N; density before exposure 4.52 g cm^{-3} and after exposure 4.17 g cm^{-3}; initial length 2.271 in.	Hot pressed; measured in helium; specimen melted at 4500° F.
▷	63-29	293-2273		TiB_2; dimension 5 by 1/2 by 1/2 in.[3]	Hot pressed and sintered; heated under argon in a 2-1/2 in. dia horizontal graphite tube furnace.

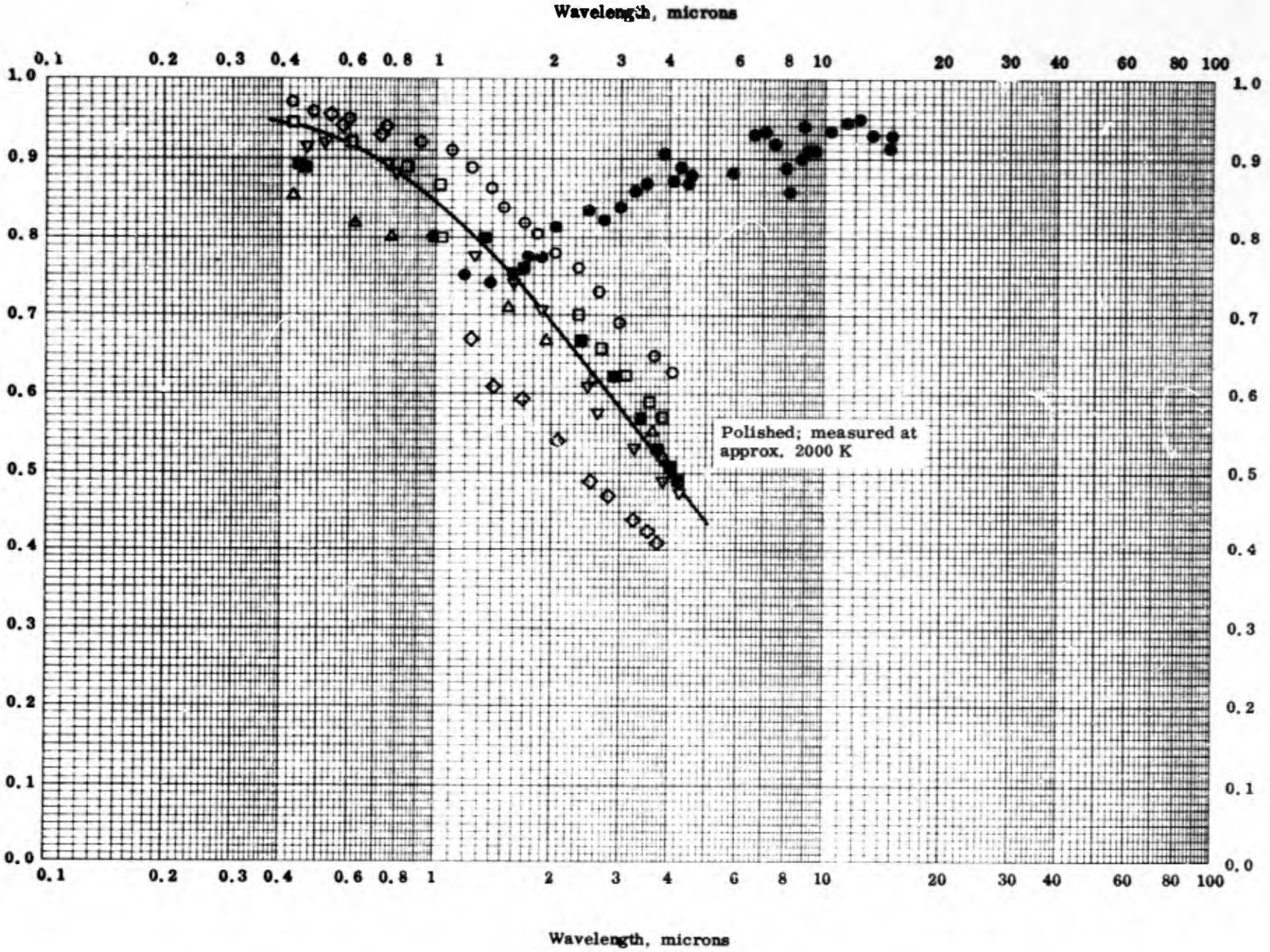


NORMAL TOTAL EMITTANCE -- TITANIUM DIBORIDE

NORMAL TOTAL EMITTANCE -- TITANIUM DIBORIDE

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
□	64-9	1648-2022		TiB_2, from finely divided powder.	Hot-pressed and sintered; etched and polished; measured in argon at 1.5 - 2.0 atm.
○	62-6	847-2977	10	TiB_2; density 4.57 g cm^{-3}.	Hot-pressed; measured in argon.
△	63-16	1273	± 8	99.5 TiB_2; 0.055 in. thickness; density 2.79 g cm^{-3}.	Sintered at 2073 K for 1 hr; measured in argon; computed from spectral data.



NORMAL SPECTRAL EMITTANCE -- TITANIUM DIBORIDE

NORMAL SPECTRAL EMITTANCE -- TITANIUM DIBORIDE

REFERENCE INFORMATION

Symbol	Ref.	Temp. °K	Wavelength Range, μ	Rept. Error%	Sample Specifications	Remarks
○	64-9	1573	0.43-4.1		TiB_2; from finely divided powder.	Hot-pressed and sintered; etched and polished; measured in argon atmosphere at 1.5-2.0 atm.
□	64-9	1813	0.43-3.9		Same as above.	Same as above.
△	64-9	2021	0.43-3.9		Same as above.	Same as above.
◇	64-9	1648	0.48-3.8		Same as above.	Same as above; another sample.
▽	64-9	1850	0.47-4.3		Same as above.	Same as above.
■	64-9	2022	0.45-4.3		Same as above.	Same as above.
●	63-16	1273	1-15		99.5 TiB_2; 0.055 in. thickness; density 2.79 g cm^{-3}.	Sintered at 2073 K for 1 hr; measured in argon atmosphere; data taken from a curve.

PROPERTIES OF TUNGSTEN BORIDES

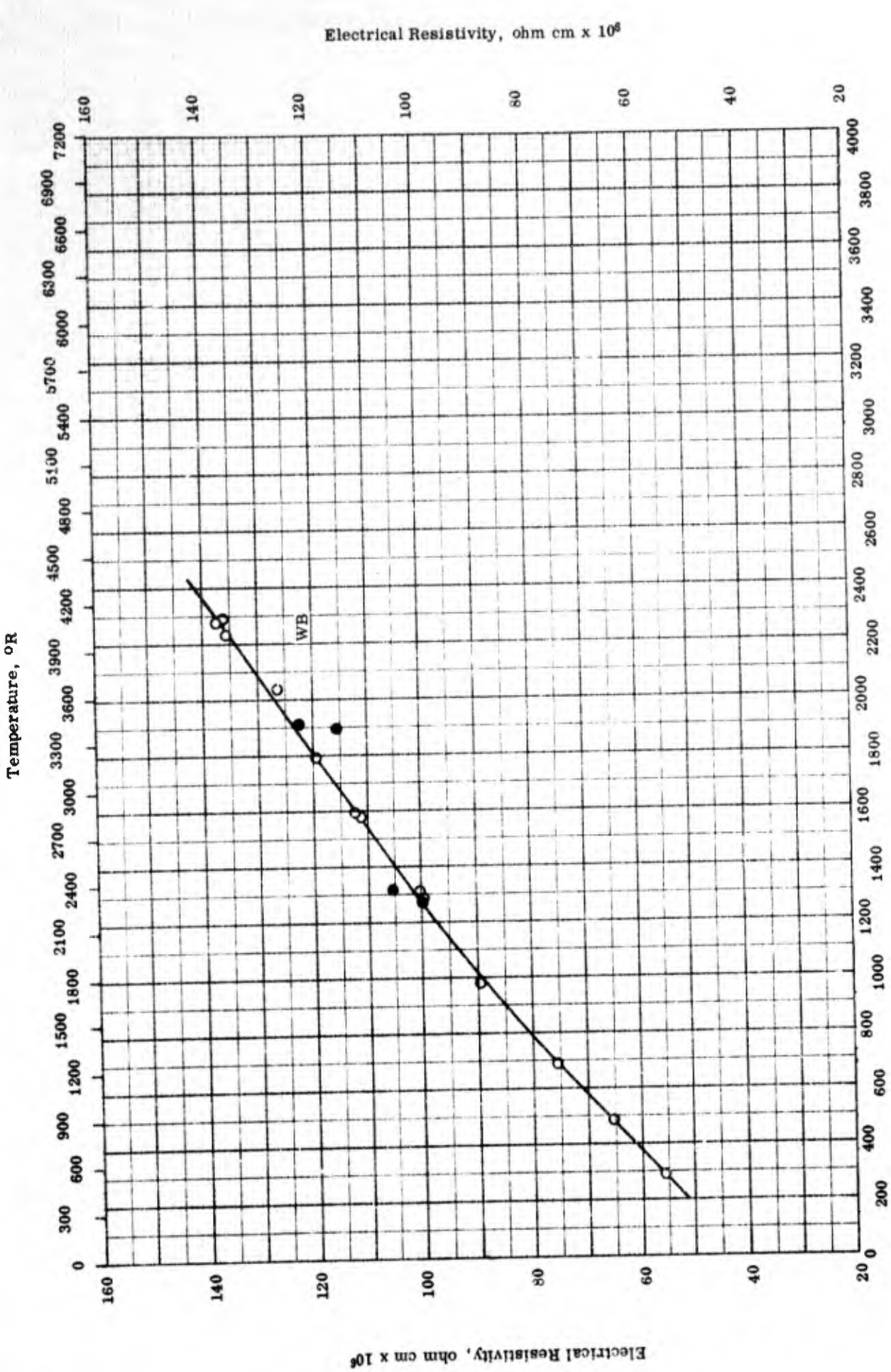
REPORTED VALUES

Melting Point		K	R
◇	W_2B_5	2473	4452
▽	W_2B_5	3153*	5676*
○	WB_2	3073	5531
	WB	3133	5639
	W_2B	3043	5477
□	WB	3193*	5747*
△	α-WB	2673 ± 100	4811 ± 180
◁	W_2B_5	2573 ± 50	4631 ± 90
▷	W_2B	3043 ± 80*	5477 ± 144*

*Most probable value for this compound.

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
◇	54-21	2473		W_2B_5.	Prepared by direct synthesis; author believes W_2B_5 probably transforms to WB_2 near M. P.
▽	56-22	3153		W_2B_5.	
○	60-17	3043-3133		Series of tungsten borides.	
□	62-42	3193		WB.	
△	53-22	2573-2773		α-WB.	
◁	57-34	2523-2623		W_2B_5.	
▷	57-33	2963-3123		W_2B.	

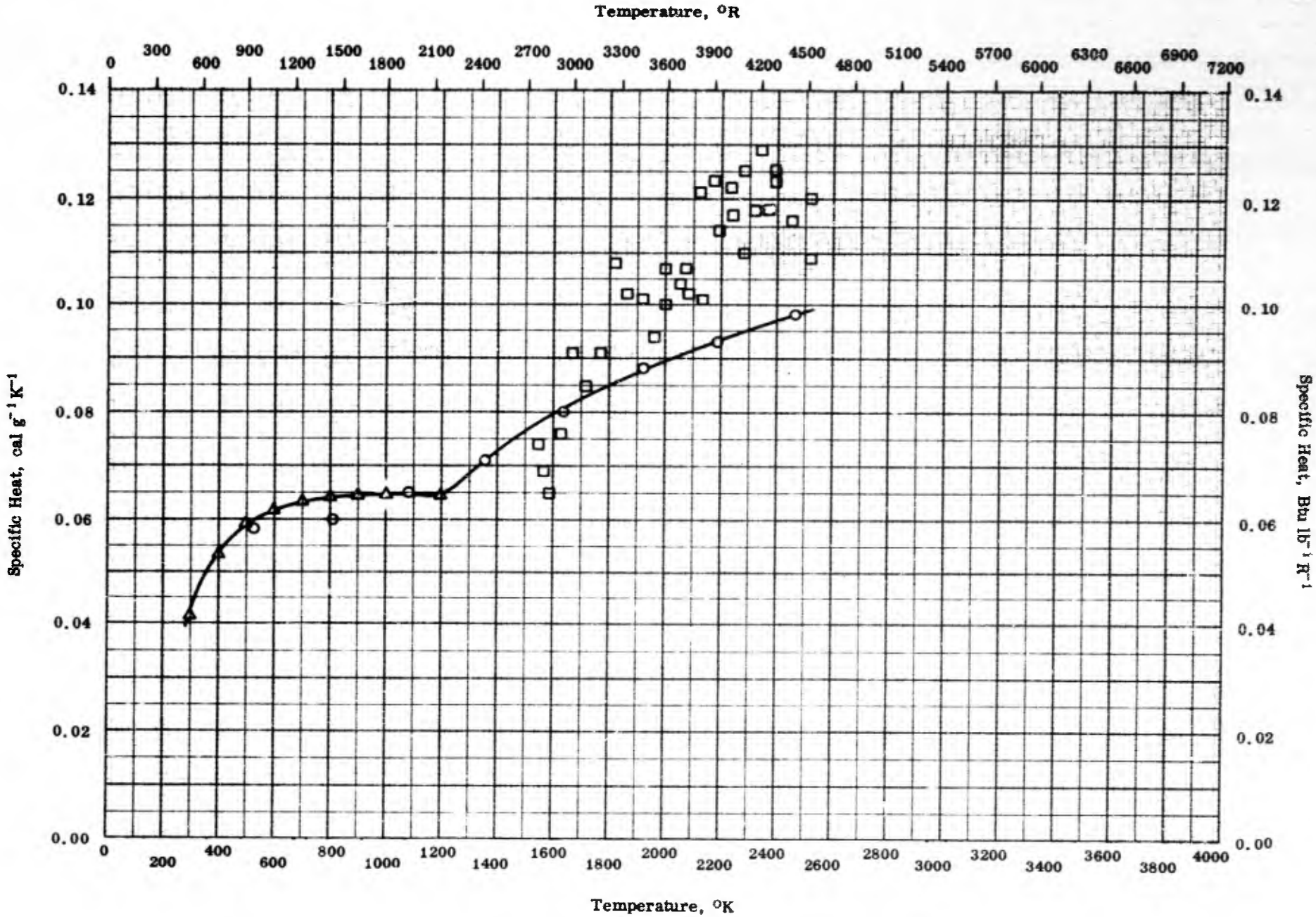


ELECTRICAL RESISTIVITY -- TUNGSTEN BORIDE

ELECTRICAL RESISTIVITY -- TUNGSTEN BORIDE

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
O	62-6	297-2383	2.4	WB; 95.3 W and 4.7 B.	Hot-pressed; max exposure temperature 4430 F.
●	62-6	1266-2383	2.4	Same as above.	Same as above; cooling curve.



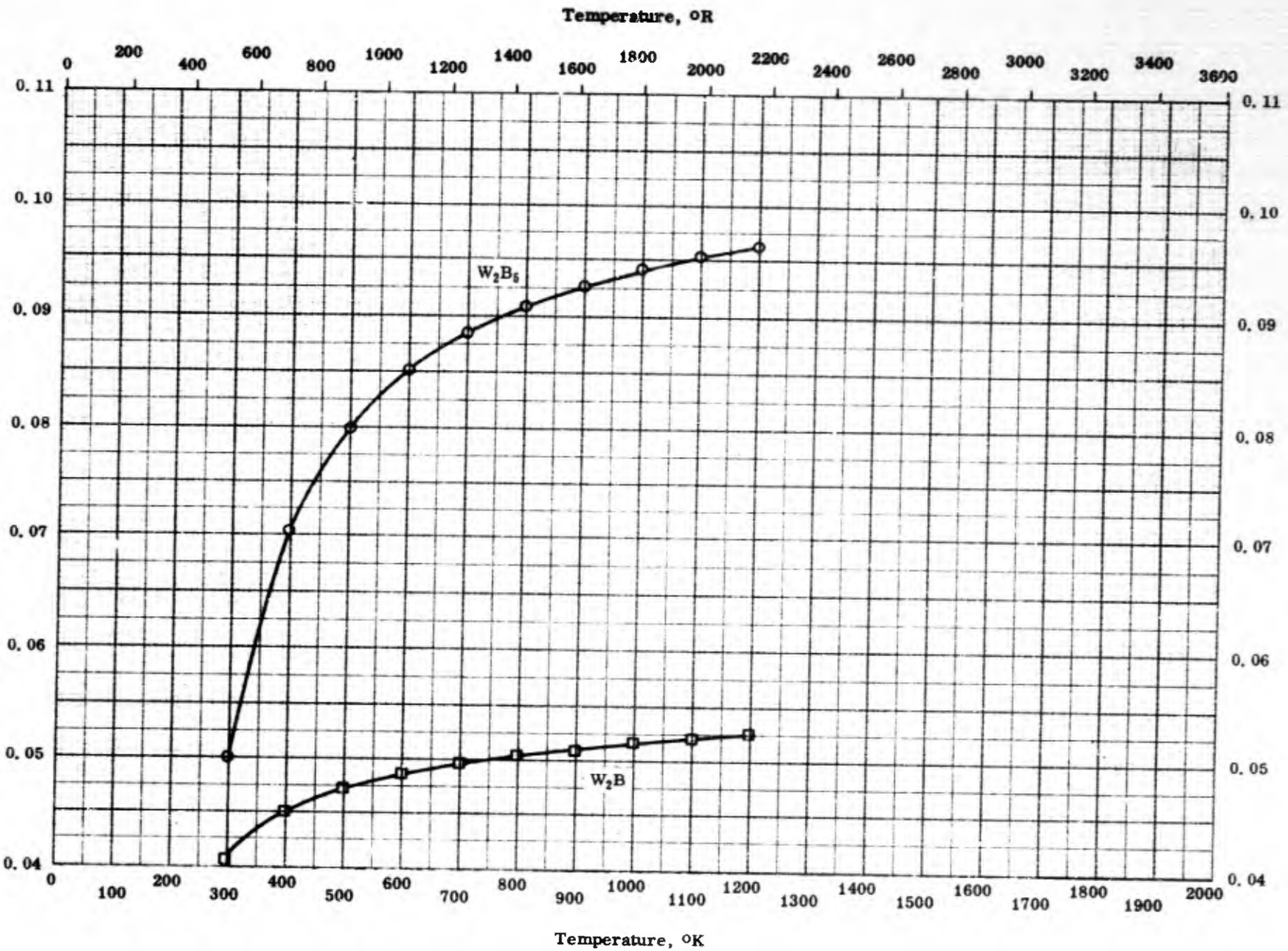
TPRC

SPECIFIC HEAT -- TUNGSTEN BORIDE

SPECIFIC HEAT -- TUNGSTEN BORIDE

REFERENCE INFORMATION

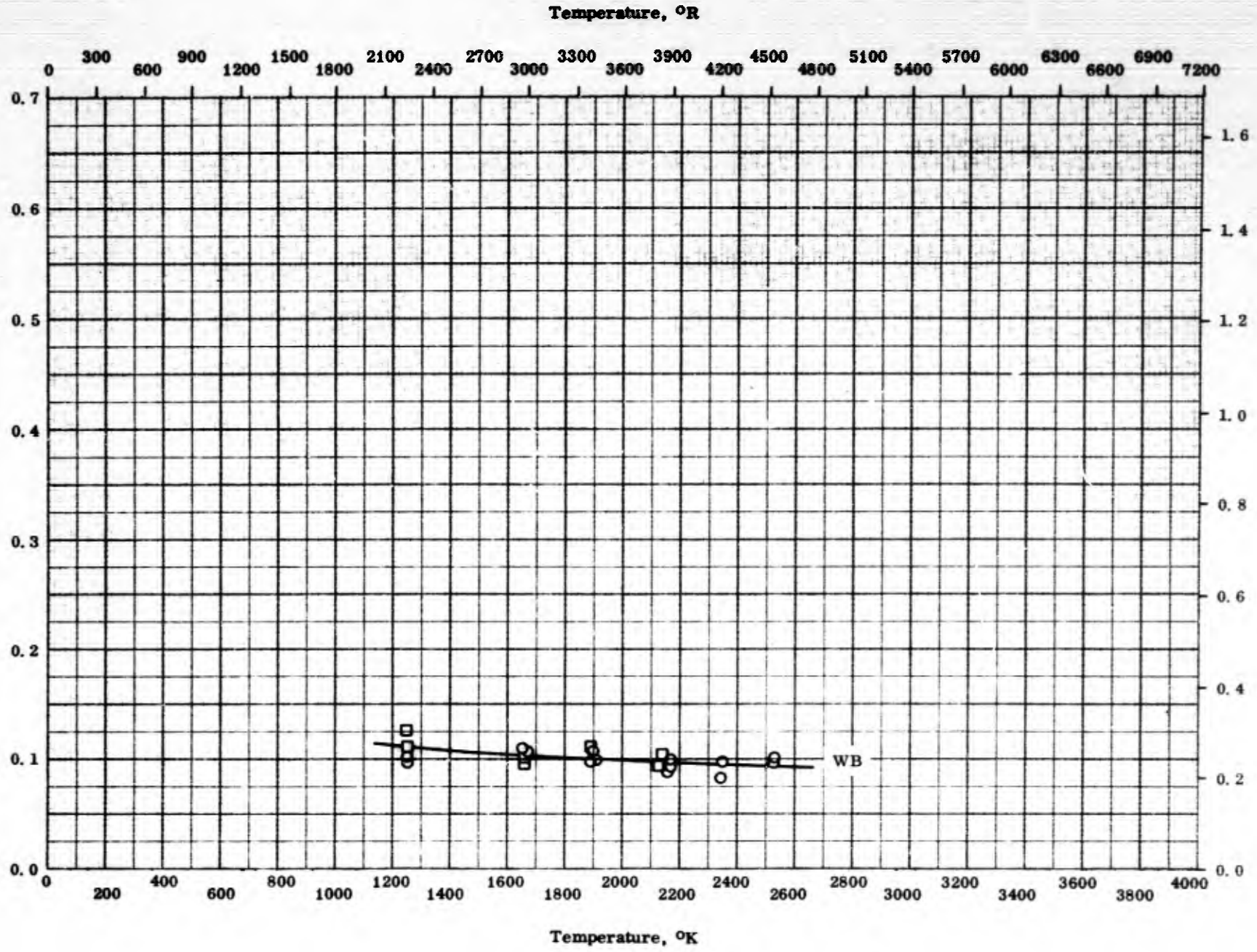
Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
○	62-6	533-2478	≤5	WB; before test: 95.3 W, 4.7 B, 0.2 Fe, Nb, Si and V, and 0.1 Zr; density 955 lb ft^{-3}; after test: 94.8 W, 5.2 B, and 0.09 C; density 924 lb ft^{-3}.	Hot pressed after crushed in hardened steel mortar to pass 100-mesh screen.
□	62-19	1556-2518	±5	WB; 93.7 W, 5.16 B, 0.16 O_2, 0.09 [illegible], 0.01 N_2 and 0.88 others.	Hot pressed.
△	62-20	298-1200	0.5	WB; traces of impurities.	



SPECIFIC HEAT -- TUNGSTEN BORIDES

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
○	62-20	298-1200	0.5	W_2B_5; traces of impurities.	
□	62-20	298-1200	0.5	W_2B; traces of impurities.	



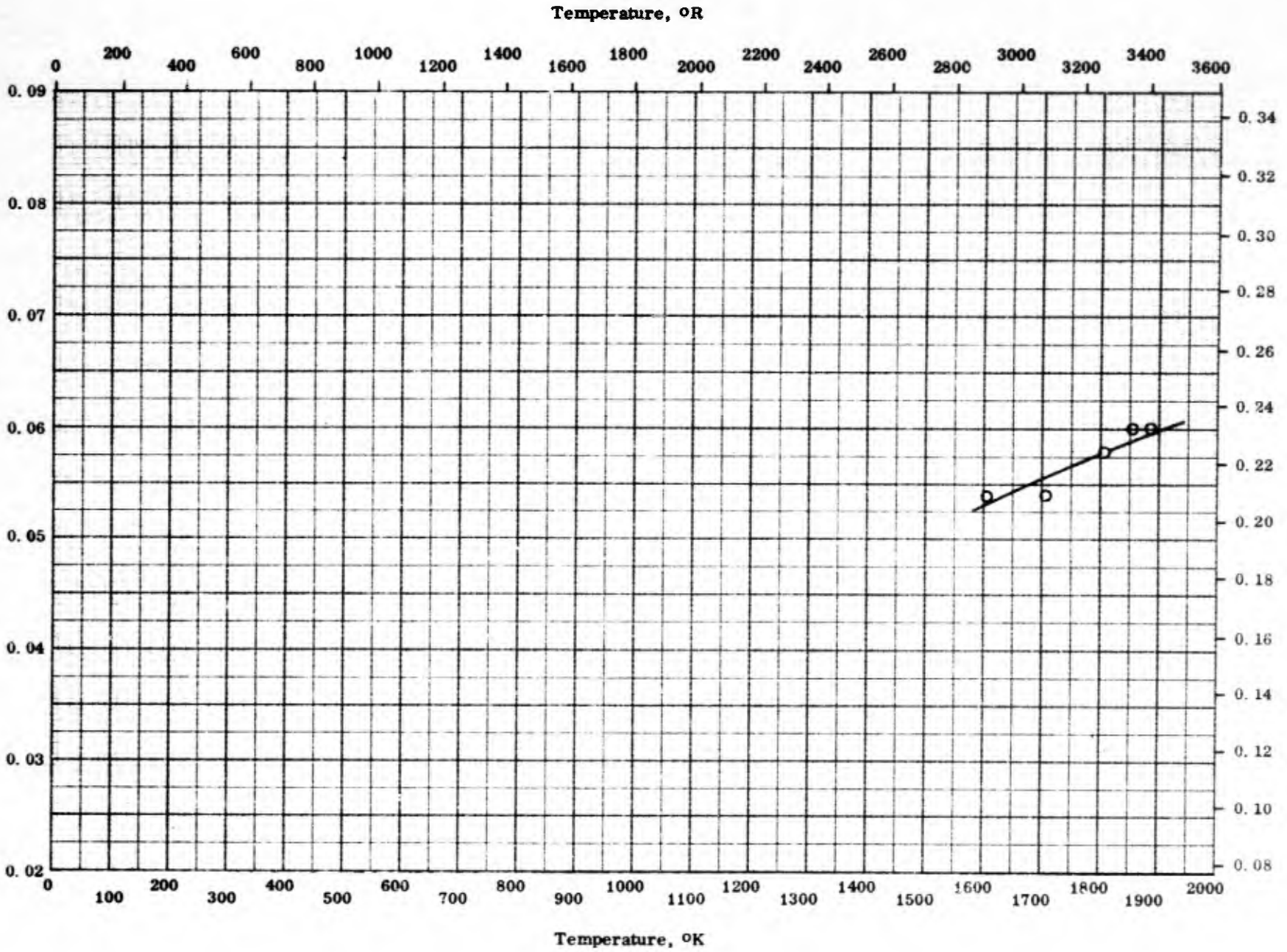
TPRC

THERMAL CONDUCTIVITY -- TUNGSTEN BORIDE

THERMAL CONDUCTIVITY -- TUNGSTEN BORIDE

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
O	62-6	1255-2540	5-7	WB.	Ground and then polished thoroughly; heat-soaked at 3300 F; sample found broken on post inspection.
□	62-6	1253-2150	5-7	WB.	Same as above except heat-soaked at 3350 F; sample found cracked on post inspection.

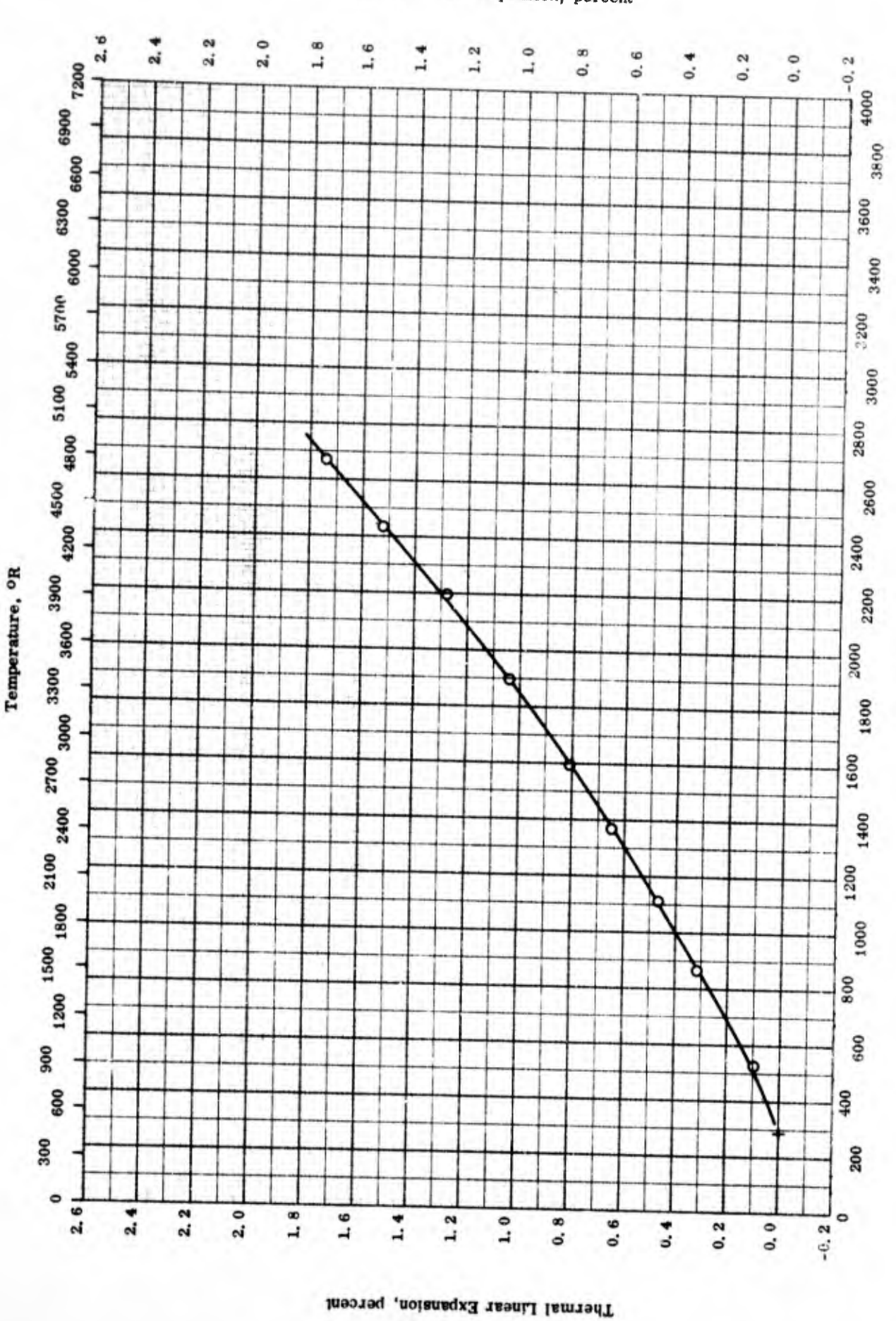


THERMAL DIFFUSIVITY -- TUNGSTEN BORIDE

THERMAL DIFFUSIVITY -- TUNGSTEN BORIDE

REFERENCE INFORMATION

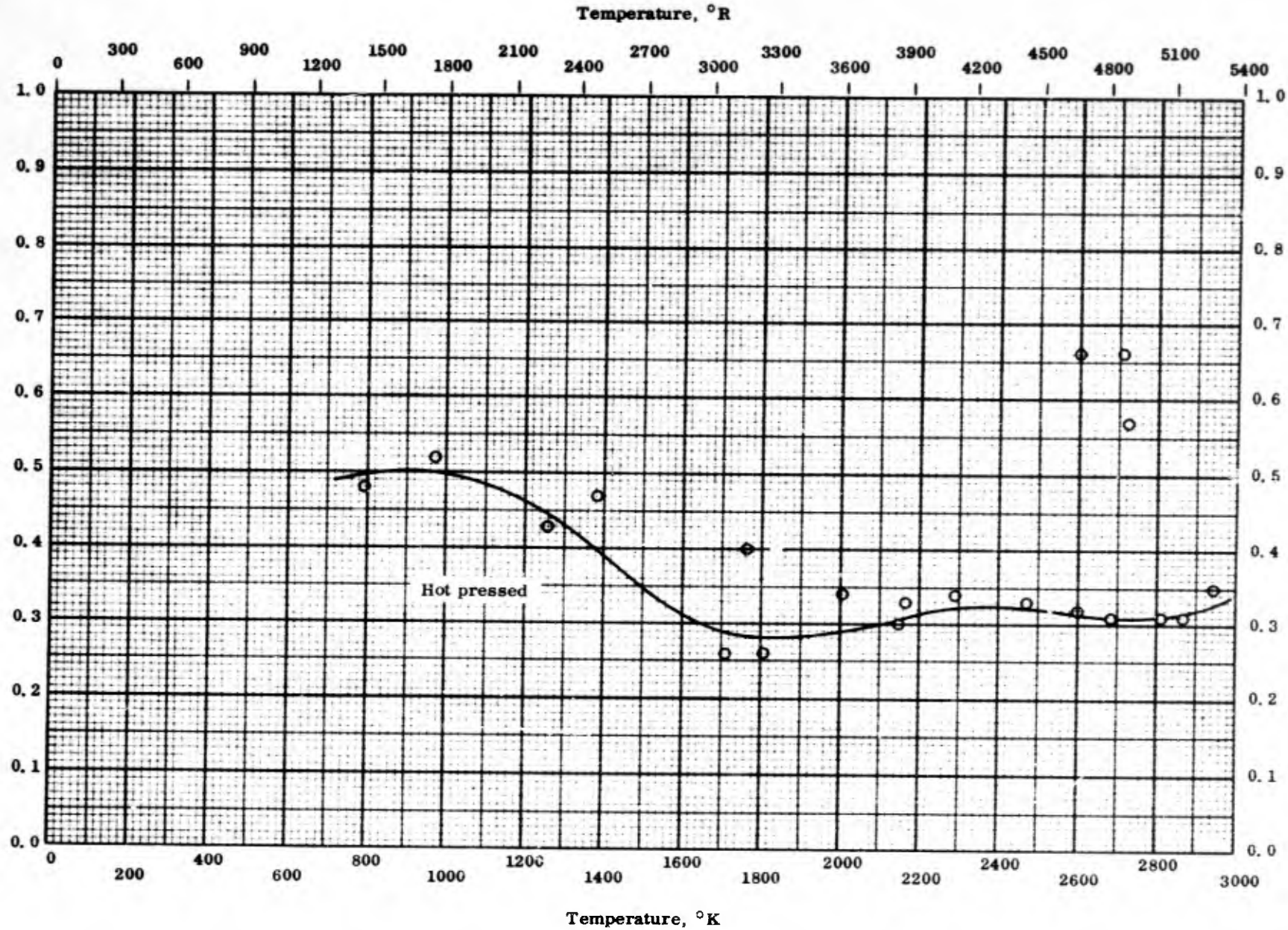
Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
O	62-17	1603-1888		WB.	



THERMAL LINEAR EXPANSION -- TUNGSTEN BORIDE

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
O	62-6	294-2672	5	WB from Carborundum Co.; composition before exposure: 95.3 W, 4.7 B, and elements found by semi-quantitative emission spectrography (0.2 Si, 0.2 V, 0.2 Fe, 0.2 Nb and 0.1 Zr); after exposure: 94.8 W, 5.2 B, and 0.09 C; density before exposure 15.2 g cm^{-3} and after exposure 14.7 g cm^{-3}; initial length 2.332 in.	Hot pressed; measured in helium; specimen melted at 4350^{+} F.



TPRC

NORMAL TOTAL EMITTANCE -- TUNGSTEN BORIDE

NORMAL TOTAL EMITTANCE -- TUNGSTEN BORIDE

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specificatic s	Remarks
O	62-6	797-2716	10	WB; density 15.3 g cm^{-3}.	Hot-pressed; measured in argon atmosphere.

PROPERTIES OF URANIUM BORIDES

REPORTED VALUES

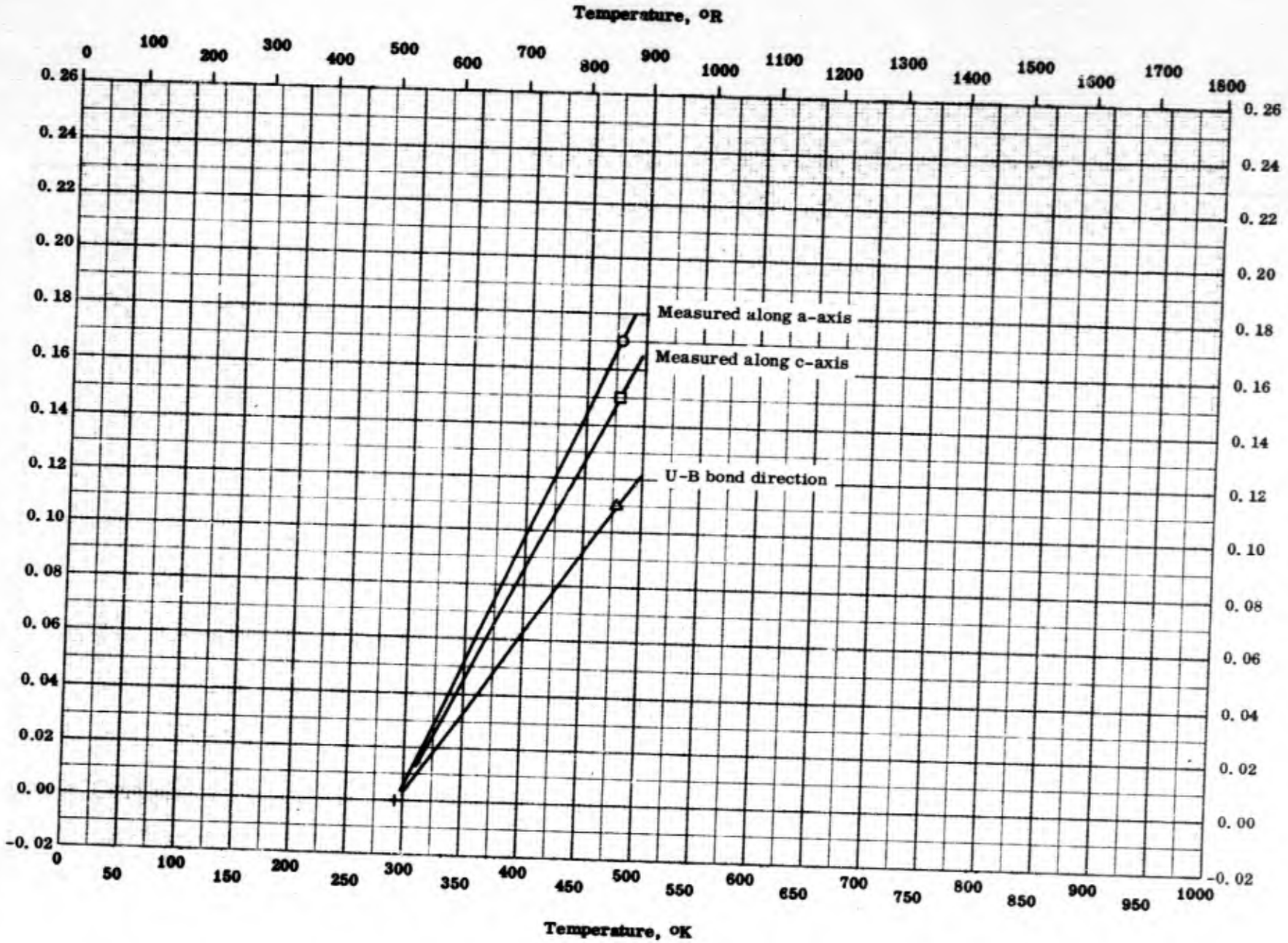
Density		g cm^{-3}	lb ft^{-3}
○	UB_4	9.38	586

Melting Point		K	R
□	UB_{12}	2508	4514
	UB_4	2768	4982
	UB_2	2658	4784

PROPERTIES OF URANIUM BORIDES

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
○	49-11	298		UB_4.	Computed from x-ray measurements of lattice.
□	60-36	2508-2768		Series of uranium borides.	



THERMAL LINEAR EXPANSION -- URANIUM DIBORIDE

THERMAL LINEAR EXPANSION -- URANIUM DIBORIDE

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
O	56-14	293-478		UB_2.	X-ray powder diffraction method; measured along a-axis.
□	56-14	293-478		Same as above.	Same as above; measured along c-axis.
△	56-14	293-478		Same as above.	Same as above; measured in the U-B bond direction.

PROPERTIES OF VANADIUM BORIDES

REPORTED VALUES

Density		g cm^{-3}	lb ft^{-3}
○	VB_2	5.07*	316*
□	VB_2	4.61	288
△	VB_2	5.10	318

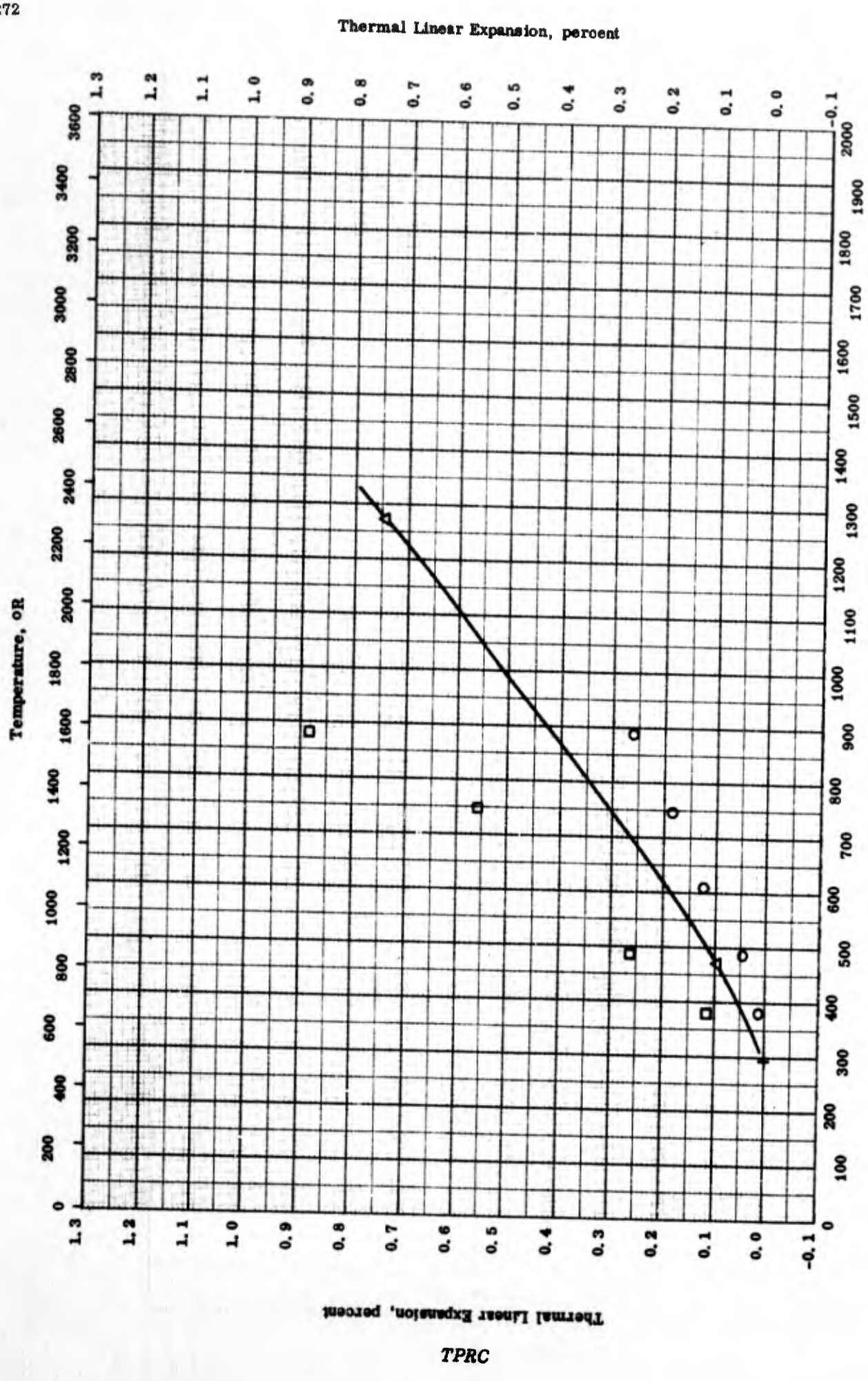
Melting Point		K	R
◇	VB_2	2673	4812
▽	VB_2	2673	4812
●	VB_2	2673 ± 50*	4811 ± 90*
	V_3B_4	2653	4775
	V_3B_2	2343	4217
■	VB	2523	4541

*Most probable value for this compound.

PROPERTIES OF VANADIUM BORIDES

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
○	56-25	298		VB_2; range of 5 samples: 55.4 - 68.1 V, 29.9 - 34.3 B, 0.26 - 1.31 C, and 0.01 - 0.68 Fe.	Powder produced by carbon reduction of vanadium oxide and B_2O_3 at 2000 C, crushed, milled 24 hrs, mixed, heat 1 hr at 1800 C, crushed again, and hot pressed in graphite dies; density computed from x-ray measurements of lattice.
□	49-9	298		VB_2; 68.9 V and 25.3 B.	Density by pycnometer using ethyl benzene.
△	49-9	298		Same as above.	Density computed from x-ray measurements of lattice.
◇	56-21	2673		VB_2.	
▽	54-21	2673		VB_2.	Prepared by direct synthesis; tested in He atm.
●	59-24	2343-2723		Series of vanadium borides.	
■	58-19	2523		VB.	



THERMAL LINEAR EXPANSION -- VANADIUM DIBORIDE

THERMAL LINEAR EXPANSION -- VANADIUM DIBORIDE

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
○	55-17	298-888		VB_2.	X-ray method; measured parallel to a-axis direction.
□	55-17	298-883		Same as above.	X-ray method; measured parallel to c-axis direction.
△	62-35	293-1273		VB_2.	

PROPERTIES OF ZIRCONIUM BORIDES

REPORTED VALUES

Density		g cm^{-3}	lb ft^{-3}
○	ZrB_{12}	3.63*	227*
□	ZrB_{12}	3.7	231
▽	ZrB_2	6.17	385
▲	ZrB_2	6.09	380
■	ZrB_2	6.13*	383*
●	ZrB_2	4.14	258

Melting Point		K	R
△	ZrB_2	3323	5982
◇	ZrB_2	3410	6140
◆	ZrB_{12}	2953	5315
◁	ZrB_2	3268*	5882*
▷	ZrB_2	3313 ± 100	5963 ± 180
◀	ZrB_2	3253	5855

Heat of Vaporization		cal g^{-1}	Btu lb^{-1}
▼	ZrB_2	1770	3186

*Most probable value for this compound.

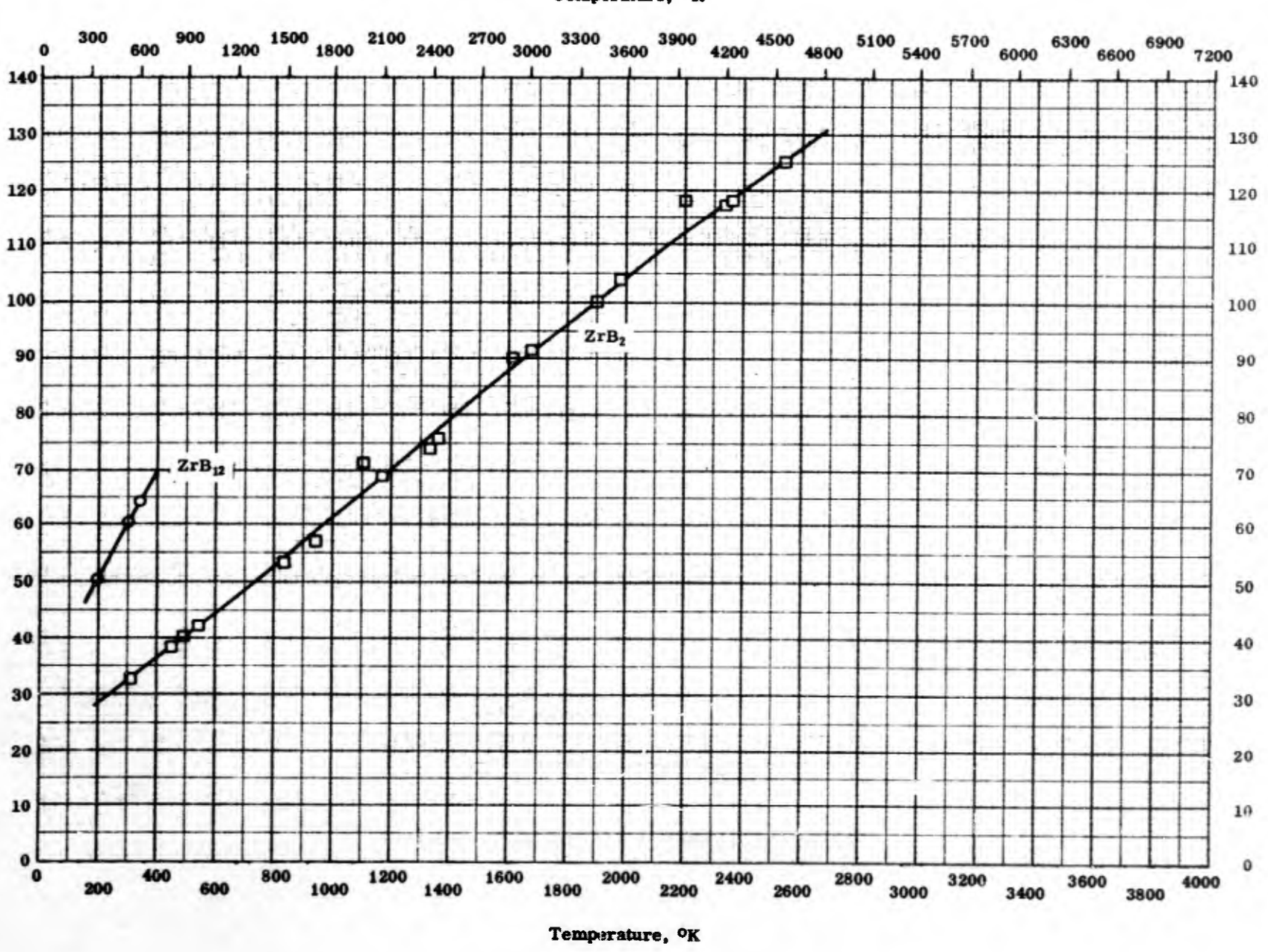
REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
○	52-1 also 52-2	298		ZrB_{12}.	Apparently face-centered cubic unit cell of 4 ZrB_{12} molecules although this leads to a theoretical density lower than measured by liquid displacement; density computed from x-ray measurements of lattice.
□	52-1	298		ZrB_{12}.	Density from weight in air and in liquid.
△	52-21	3323		ZrB_2.	Prepared by direct synthesis.
◇	56-22	3413		ZrB_2.	
▽	49-9	298		ZrB_2: 80 Zr and 18.9 B.	Density from pycnometer using ethyl benzene.
▲	49-9	298		Same as above.	Density computed from x-ray measurements of lattice.
■	56-25	298		ZrB_2; range of 4 samples: 77.0 - 80.5 Zr, 17.7 - 18.95 B, 0.06 - 1.35 C, 0.13 - 0.65 Fe.	Powder produced by carbon reduction of Zr oxide and B_2O_3 at 2000 C, crushed, milled 24 hrs, mixed, heated 1 hr at 2250 C, crushed, and hot pressed in graphite dies; density computed from x-ray measurements of lattice.
●	62-7	298		ZrB_2; 78.7 Zr, 17.6 B, 0.36 C, and trace of Ti, Fe, Ni, Ca, Al and Si.	Hot pressed; maximum exposure temperature 4750 F.
▼	62-41	298		ZrB_2.	
◆	53-20	2953		ZrB_{12}.	
				(Continued onto next page)	

PROPERTIES OF ZIRCONIUM BORIDES (Continued)

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
◁	62-42	3268		ZrB_2.	
▷	53-20	3213-3413		ZrB_2.	
◀	62-44	3253		ZrB_2.	

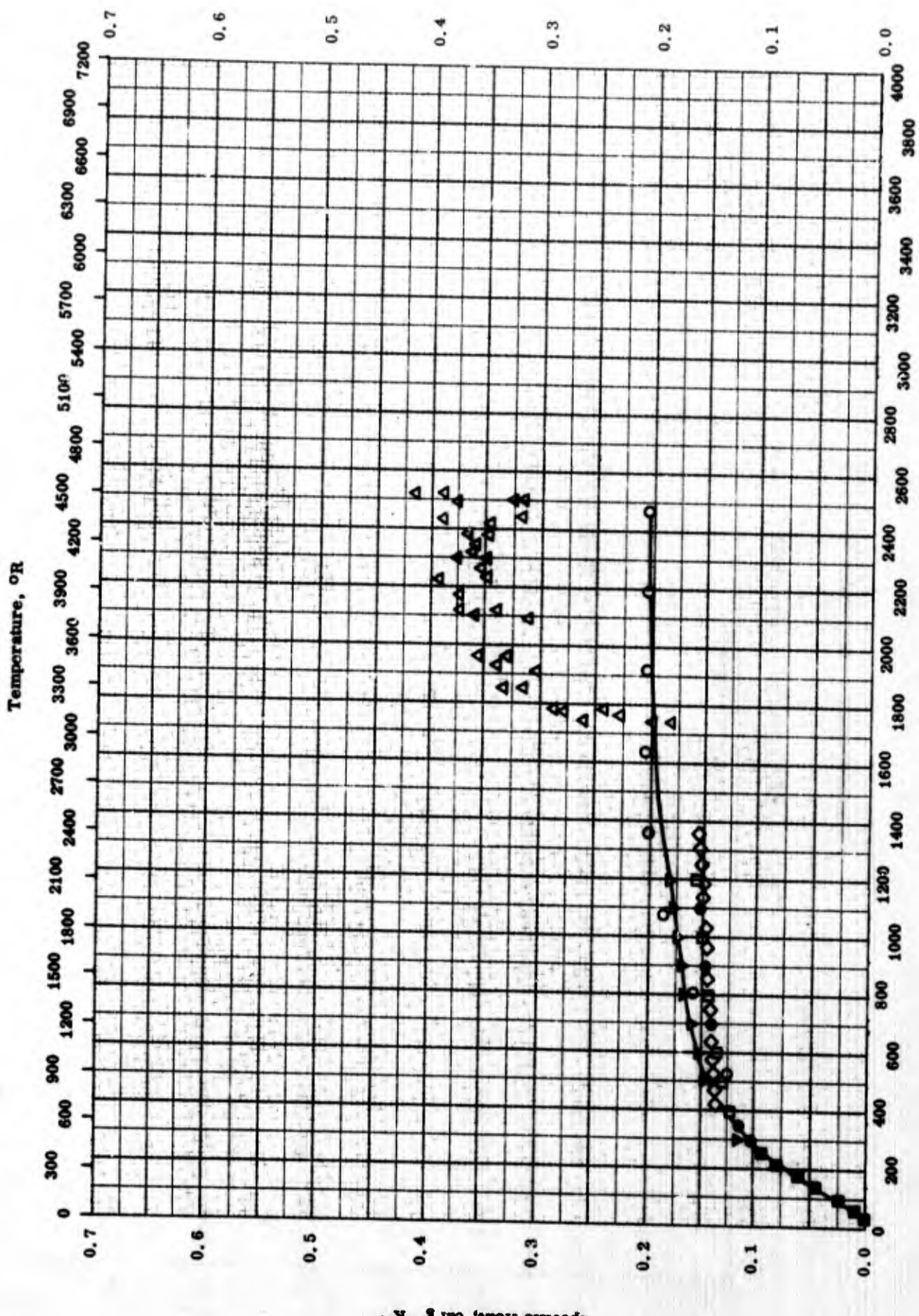


ELECTRICAL RESISTIVITY -- ZIRCONIUM BORIDES

ELECTRICAL RESISTIVITY -- ZIRCONIUM BORIDES

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
○	52-1 also 52-2	195-337		ZrB_{12} (Zirconium Dodecaboride).	Hot pressed; average value for samples "not always high density specimens".
□	62-6	296-633	2.4	ZrB_2 (Zirconium Diboride); 78.0 Zr, 18.9 B, 0.58 C, and 0.1 N.	Hot-pressed; max exposure temperature 5000 F.

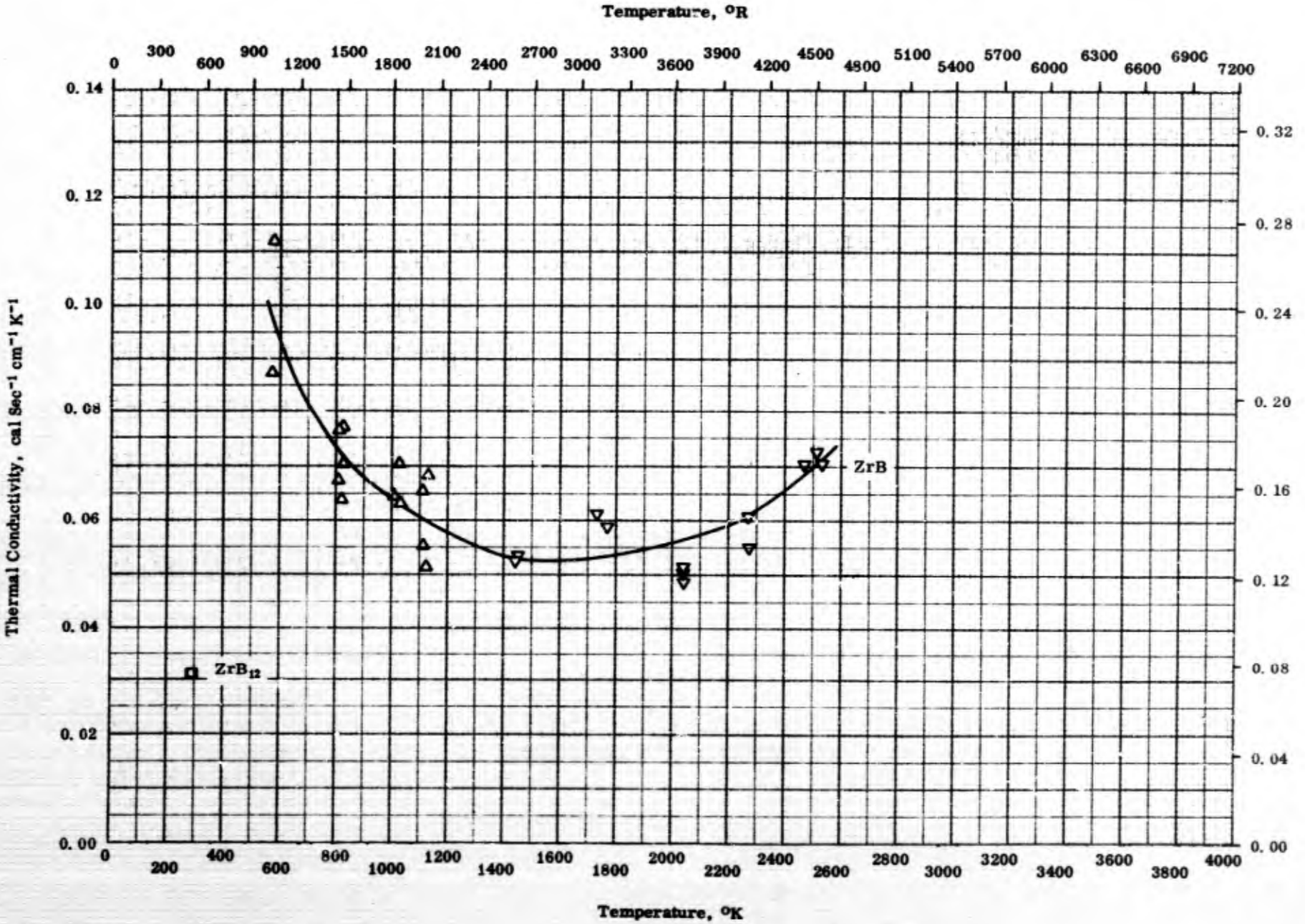


SPECIFIC HEAT -- ZIRCONIUM DIBORIDE

SPECIFIC HEAT — ZIRCONIUM DIBORIDE

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
○	60-17 also 62-7	533-2478	≤5.0	ZrB_2; 78.7 Zr, 17.6 B, 0.36 C, and rest Al, Cu, Fe, Ni, Si, and Ti; density 258 lb ft^{-3}.	Hot pressed.
□	64-5	400-1200		ZrB_2; 99.3 ZrB_2, 0.01 - 0.1 Si, 0.001 - 0.1 Hf and Fe, 0.0215 C, 0.0134 N_2, 0.001 - 0.01 Mg, 0.0052 O_2, and 0.0010 Ag, Ca, Cr, Cu, Mn, Ti and V.	Zone refined.
△	62-19	1739-2521	±5	ZrB_2; 78.94 Zr, 16.86 B, 1.36 O_2, 0.5> Ni, 0.37 total C, 0.3> Al, 0.25> Hf, 0.2> V, 0.18 Fe, 0.14 N_2, 0.14 Ti, 0.1 Cr, 0.05> Cu, and 0.01> Mg, Mn, and Nb.	
◇	61-15	422-1366	5.0	ZrB_2; 97.0 ZrB_2, 1.6 O_2, and 1.4 N_2.	Made by spraying powdered HfC using powder gun with 80 ft^3 hr^{-1} N_2 - plasma gas and 10 ft^3 hr^{-1} N_2 carrier gas.
▽	62-18 also 62-20	298-1200	0.5	ZrB_2; traces of impurities.	
●	63-8	300-1200		ZrB_2; 0.01 - 0.10 Si, 0.001 - 0.10 Hf and Fe, 0.0215 C, 0.0134 N_2, 0.001 - 0.010 Mg, 0.0052 O_2, and 0.0010 Ag, Ca, Cr, Cu, Mn, Ti and V.	
■	62-18	5-345	0.1-1	ZrB_2; 99.61 ZrB_2, 0.001 - 0.10 Hf and Fe, 0.01 - 0.10 Si, 0.001 - 0.01 Al and Mg, 0.001 Ag, Cu, Cr, Mn, Ti and V.	Zone refined.



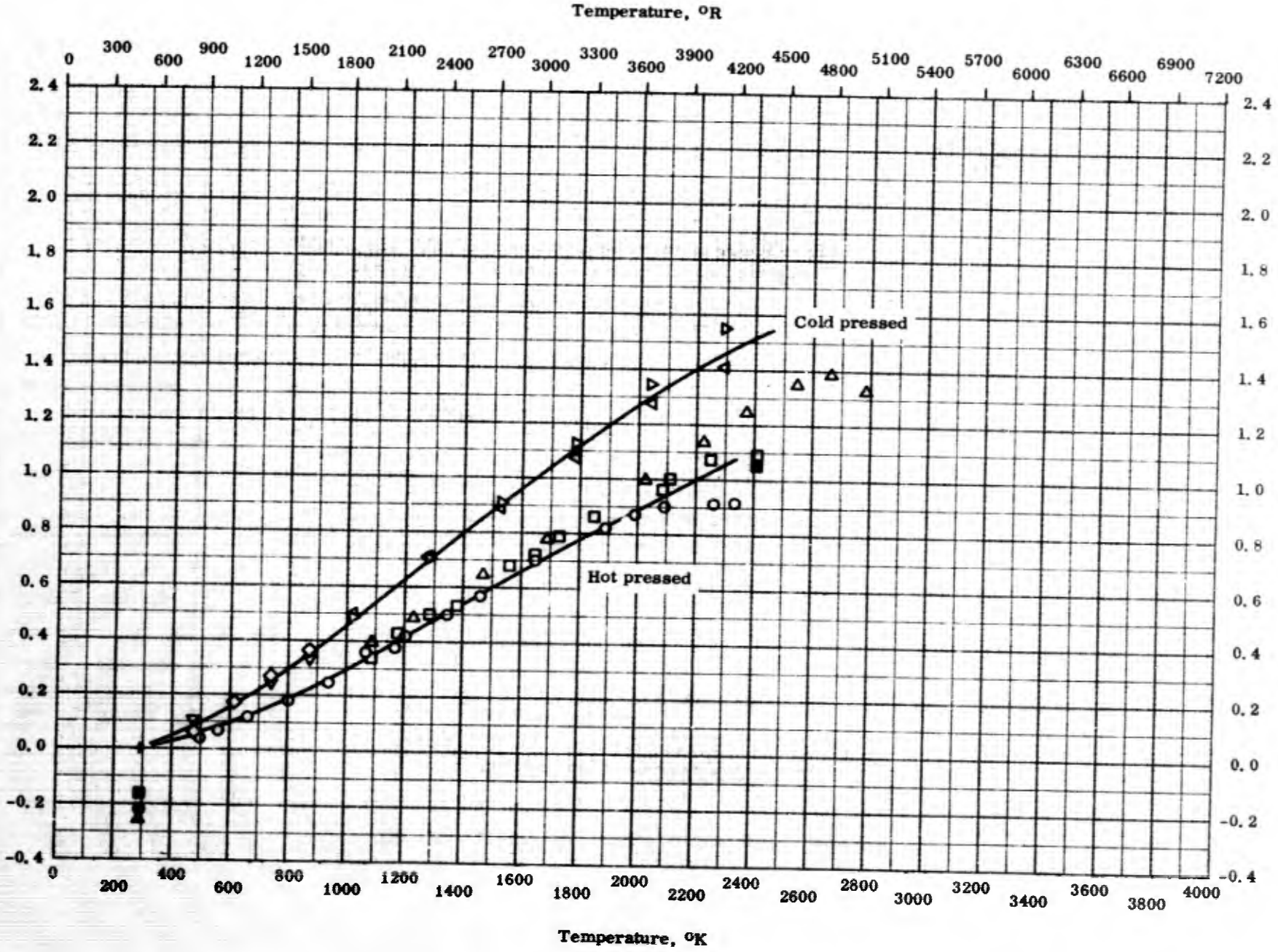
THERMAL CONDUCTIVITY -- ZIRCONIUM BORIDES

TPRC

THERMAL CONDUCTIVITY -- ZIRCONIUM BORIDES

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
○	52-1	293		ZrB_{12}.	Hot pressed; not always high density specimens.
□	52-2	293		ZrB_{12}; 56 B and 44 Zr (compared to theoretical composition of 59 B; 41 Zr).	Same as above; probably same work as above.
△	62-7	568-1134	3	ZrB; 78.7 Zr, 17.6 B, 0.36 C, and remainder Ti, Fe, Ni, Ca, Al, and Si; density 258 lb ft^{-3} (70-75% of theoretical); considerable ZrB_2 present.	Hot pressed; max. exposure temperature 4750 F.
▽	62-7	1442-2528		Same as above.	Same as above; sample found melted after measurements



THERMAL LINEAR EXPANSION -- ZIRCONIUM DIBORIDE

Thermal Linear Expansion, percent

THERMAL LINEAR EXPANSION -- ZIRCONIUM DIBORIDE

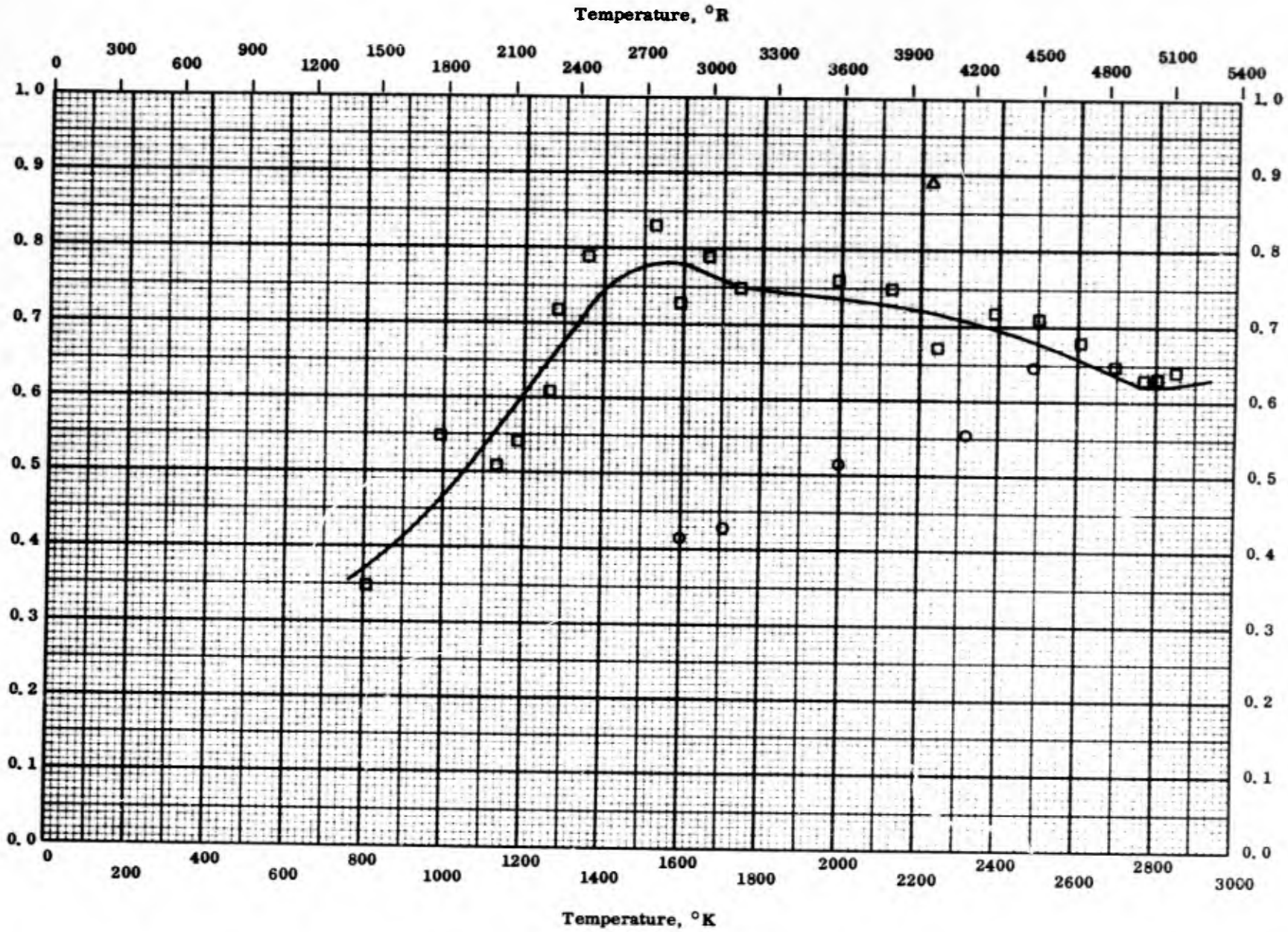
REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
◇	55-17	298-878		ZrB_2.	X-ray method; measured parallel to a-axis direction.
▽	55-17	298-879		ZrB_2.	The above specimen measured parallel to c-axis direction.
▷	63-26	298-2293		ZrB_2; 80.81 Zr, 19.26 B, 0.076 Cr, 0.06 C, 0.05 Fe, 0.04 N, 0.028 O, 0.01 Ti, 0.004 Al, 0.001 Si, 0.0004 Mn, and 0.0002 Mg; total impurity 0.27 and total analysis 100.34; specimen dimension 1-1/8 x 1/2 x 3/16 in.^{3} [Author's design.: lot V-125].	Cold pressed -200 mesh powder using camphor as lubricant, and pre-sintered in vacuum at 1500 C; x-ray method; measured parallel to "a" direction of the hexagonal basal-plane (a-b plane).
◁	63-26	298-2293		Same as above.	Same as above except measured parallel to the "c" direction.
○	62-7	294-2339	2	ZrB_2 from Norton Co.; composition before exposure: 78.0 Zr, 18.9 B, and elements found by semi-quantitative emission spectrography (0.8 Fe, 0.3 Cr, 0.1 Ca, and 0.1 others); after exposure: 78.6 Zr, 17.3 B, 0.57 C, and <0.1 N; density before exposure 5.62 g cm^{-3} and after exposure 5.44 g cm^{-3}; initial length 2.947 in. [Author's design.: Run SRI-E3].	Hot pressed; measured in helium atmosphere; heating.
●	62-7	294-2339	2	Same as above.	Cooling data of above specimen.
□	62-7	294-2411	2	ZrB_2; initial length 2.945 in. and final length 2.9463 in. [Author's design.: SRI-E4].	Second exposure of SRI-E3; heating.
■	62-7	294-2411	2		Cooling data of above specimen.

(Continued onto next page)

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
△	62-7	294-2783	2	ZrB_2; initial length 2.9463 in. and final length 2.9416 in. [Author's design.: SRI-E21].	Final exposure of SRI-E3; heating.
▲	62-7	294-2783	2	Same as above.	Cooling data of above specimen.

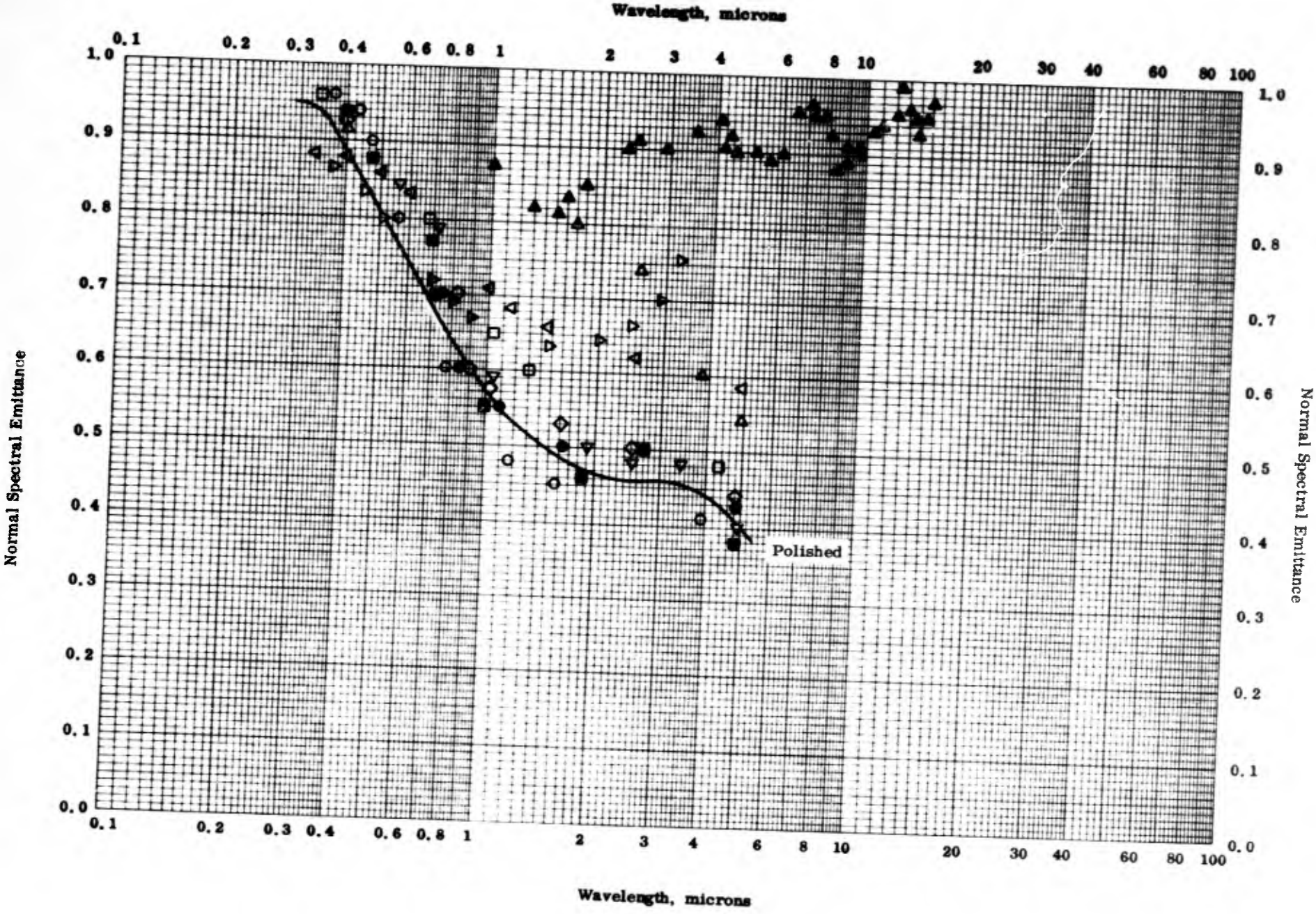


NORMAL TOTAL EMITTANCE -- ZIRCONIUM DIBORIDE

NORMAL TOTAL EMITTANCE -- ZIRCONIUM DIBORIDE

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
○	62-28	1600-2490		ZrB_2, from powder of 1 μ size.	Hot-pressed at temperature > 2273 K; etched and polished; measured in argon atmosphere; calculated from spectral data.
□	62-6	805-2850	10	ZrB_2; density 5.69 g cm^{-3}.	Hot-pressed; measured in argon atmosphere.
△	63-16	1223	± 8	99 ZrB_2; 0.051 in. thickness; density 3.34 g cm^{-3}.	Sintered at 2073 K for 1 hr; measured in argon atmosphere; calculated from spectral data.



TPRC

NORMAL SPECTRAL EMITTANCE -- ZIRCONIUM DIBORIDE

NORMAL SPECTRAL EMITTANCE -- ZIRCONIUM DIBORIDE

REFERENCE INFORMATION

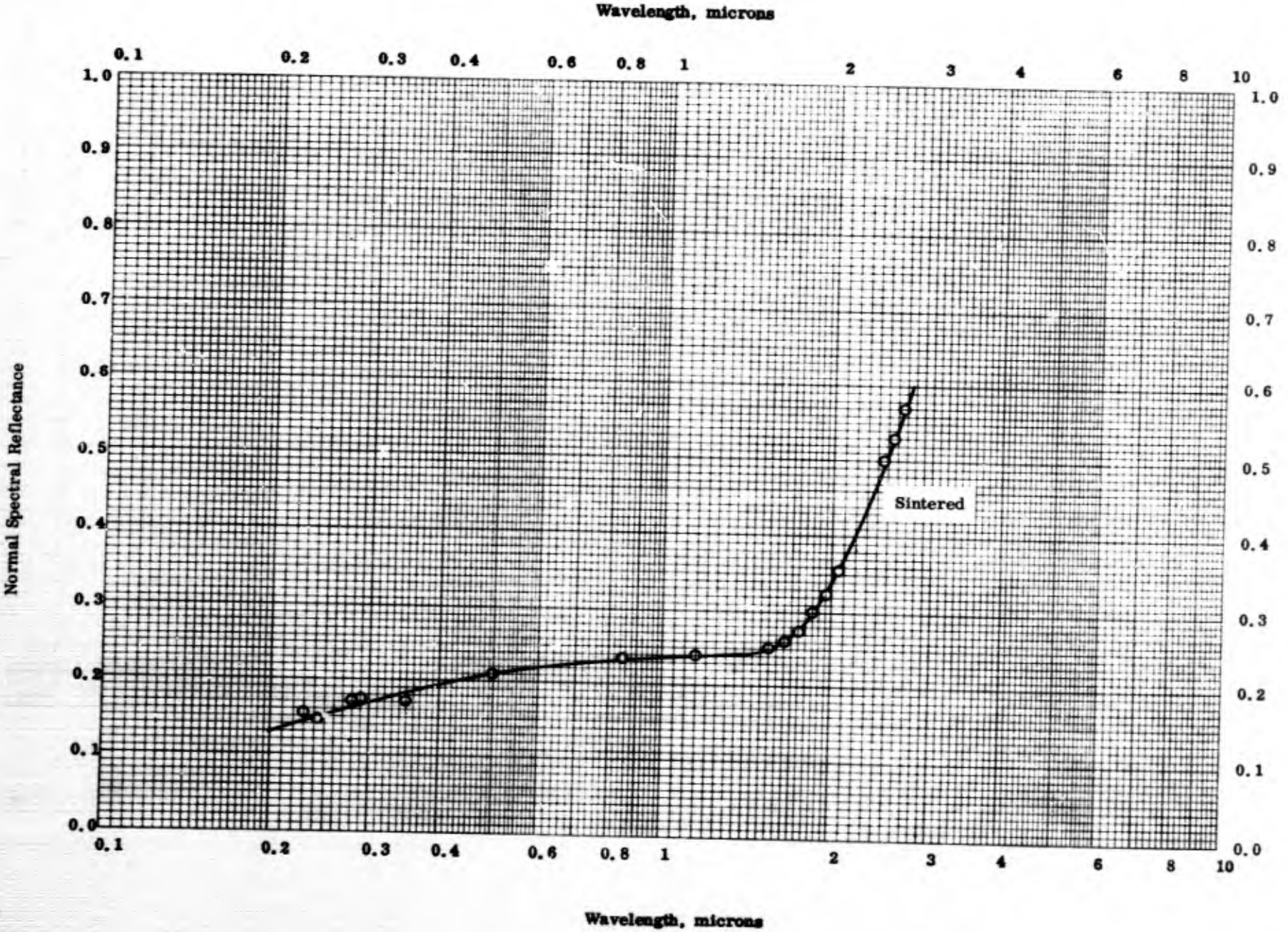
Symbol	Ref.	Temp. °K	Wavelength Range, μ	Rept. Error%	Sample Specifications	Remarks
○	64-9	1704	0.37-3.9		ZrB_2, from finely divided powder.	Hot-pressed and sintered, etched and polished; measured in argon at 1.5 atm.
□	64-9	2032	0.34-4.3		Same as above.	Same as above.
△	64-9	2000	0.4-4.9		Same as above.	Same as above; first measurement.
◇	64-9	2000	0.4-4.8		Same as above.	Same as above; second measurement taken about 1 hr later than the first.
▽	64-9	2000	0.4-4.9		Same as above.	Same as above; third measurement taken about 1 hr later than the second.
●	64-9	2000	0.4-4.8		Same as above.	Same as above; fourth measurement taken about 1 hr later than the third.
■	64-9	2000	0.4-4.8		Same as above.	Same as above; fifth measurement taken about 1 hr later than the fourth.
▷	62-28	2389	0.37-3.28		ZrB_2, from powder of size 1μ.	Hot-pressed at temperature > 2273 K; etched and polished; measured in argon at 1.5 atm; data taken from smooth curve; x-ray after measurements showed conversion to ZrN.
◁	62-28	2480	0.33-4.9		Same as above.	Same as above; stabilized at 2000 K for 8 hrs; measured in argon atmosphere; data taken from smooth curve.

(Continued onto next page)

NORMAL SPECTRAL EMITTANCE -- ZIRCONIUM DIBORIDE (continued)

REFERENCE INFORMATION

Symbol	Ref.	Temp. °K	Wavelength Range, μ	Rept. Error %	Sample Specifications	Remarks
▲	63-16	1223	1-15		99 ZrB_2; 0.051 in. thickness; density 3.34 g cm^{-3}.	Sintered at 2073 K for 1 hr; measured in argon atmosphere; data taken from a curve.



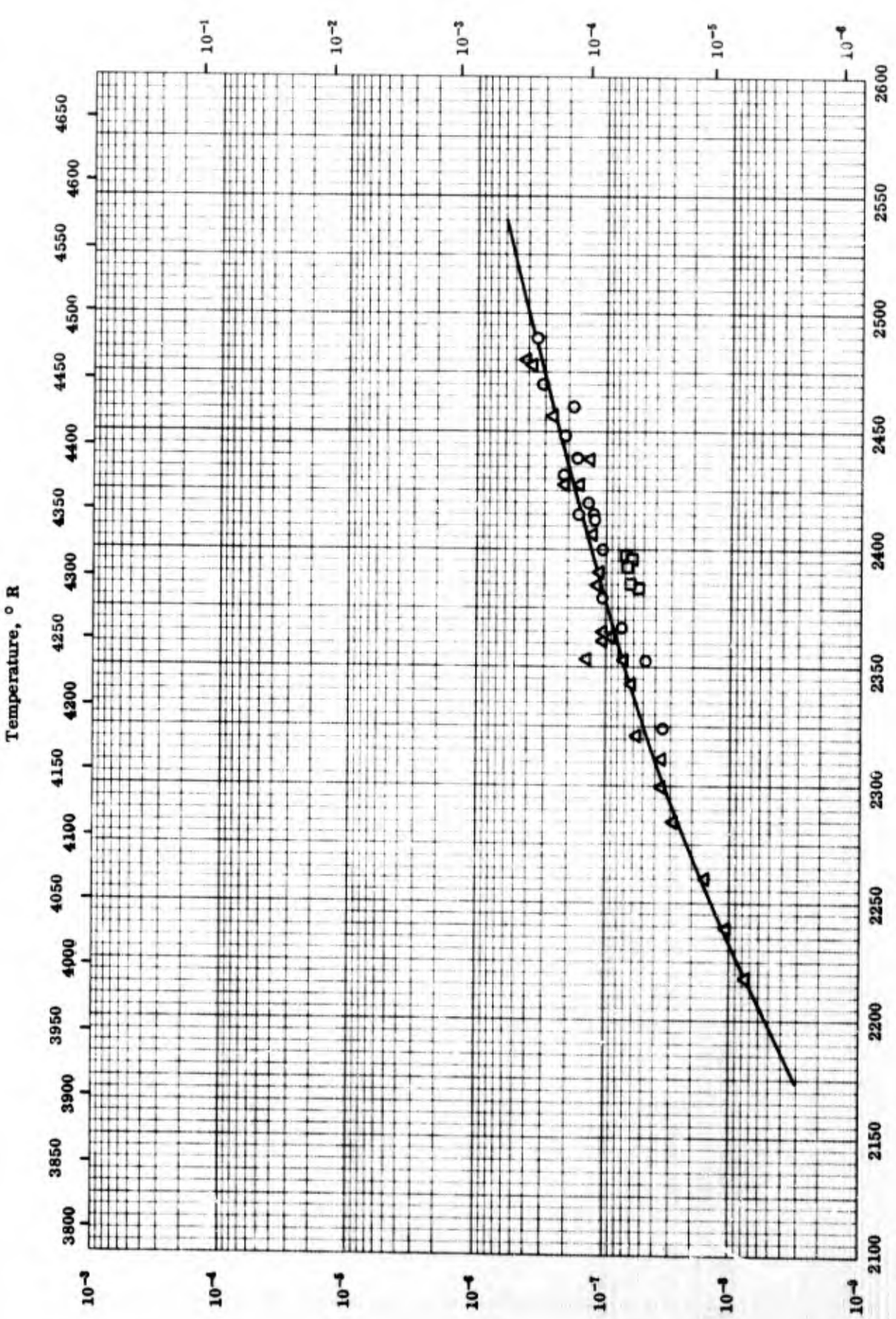
NORMAL SPECTRAL REFLECTANCE -- ZIRCONIUM DIBORIDE

Normal Spectral Reflectance

NORMAL SPECTRAL REFLECTANCE -- ZIRCONIUM DIBORIDE

REFERENCE INFORMATION

Symbol	Ref.	Temp. °K	Wavelength Range, μ	Rept. Error%	Sample Specifications	Remarks
O	63-16	298	0.23-2.65	5	99 ZrB_2; 0.051 in. thickness; density 3.34 g cm^{-3}.	Sintered at 2073 K for 1 hr; data taken from a curve; normal incidence, hemispherical viewing; MgO as reference standard.



VAPOR PRESSURE -- ZIRCONIUM DIBORIDE

VAPOR PRESSURE -- ZIRCONIUM DIBORIDE

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
○	62-15	2324-2489		$ZrB_{1.906}$; prepared from purest available Zr and B.	
□	62-15	2218-2480		Same as above.	
△	62-15	2384-2397		Same as above.	

PROPERTIES OF OTHER MISCELLANEOUS METAL BORIDES

REPORTED VALUES

Density		g cm^{-3}	lb ft^{-3}
○	SrB_6	3.3	206
△	PrB_6	4.85	303
▽	LaB_6	4.72	295
◇	Be_2B	2.19 ± 0.04	137 ± 3
	BeB	2.35	147
	BeB_6	2.33	145
▲	GdB_6	5.27	329
▼	PrB_6	4.85	303
●	YbB_6	5.56*	347*
■	YbB_6	5.45	340
◆	SmB_6	5.14*	321*
◁	SmB_6	5.07	317
▷	CeB_6	5.74	358
▶	YB_2	2.91	181.6
	YB_4	3.97	247.7
	YB_6	3.67	229.0
	LuB_4	7.52	469.2
	LuB_6	5.74	358.2
	YbB_4	7.31	456.1
	YbB_6	5.57	347.6
	LaB_4	5.44	339.5
	LaB_6	4.72	294.5
	GdB_4	6.47	403.7
	GdB_6	5.30	330.7
	ErB_4	6.99	436.2
	ErB_6	4.61	287.7
	HoB_4	6.79	423.7
	HoB_6	5.52	344.4
	DyB_4	6.74	420.6
	DyB_6	5.49	342.6
	TbB_4	6.5	405.6
	TbB_6	5.36	334.5
	TmB_6	7.09	442.4
	SmB_4	6.14	383.1
	SmB_6	5.08	317.0

*Most probable value for this compound.

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PROPERTIES OF OTHER MISCELLANEOUS METAL BORIDES (Continued)

REPORTED VALUES

Density (continued)		g cm^{-3}	lb ft^{-3}
	EuB_6	4.95	308.9
	CeB_4	5.74	358.2
	CeB_6	4.80	299.5
	NdB_4	6.14	383.1
	NdB_6	4.94	308.3
	PrB_4	5.74	358.2
	PrB_6	4.84	302.0

Melting Point		K	R
◀	SmB_6	2670 ± 100	4810 ± 180
○	BaB_6; hexagonal	2503	4505
◐	Be_3B	1433	2579
	Be_2B	≈1800	≈3240
	BeB_2	≈2000	≈3600
	BeB_4	>2273	>4091
	BeB_6	>2273	>4091
◒	BeB_2	>2243*	>4037*
	BeB_6	2343 ± 50*	4217 ± 90*
◒	BeB_6	2573	4631
◨	CaB_6	2503	4505
◧	CeB_6	2463	4433
◒	CoB	≈1673	≈3011
◒	GdB_6	>2373	>4271
◪	GdB_6	>2423*	>4361*
◪	FeB	1813	3263
	Fe_2B	1662	2992
◙	LaB_6	>2373	>4271
◙	LaB_6	>2773*	>4991*
	LaB_4	2073 ± 15	3731 ± 27
◪	NdB_6	2813	5063
◙	Ni_3B_2	1433	2579
⊟	Ni_2B	1373	2471
	Ni_3B	1428	2570
◨	SrB_6	2508	4514

*Most probable value for this compound.

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PROPERTIES OF OTHER MISCELLANEOUS METAL BORIDES (Continued)

REPORTED VALUES

Melting Point (continued)	K	R
⊖ YB_6	2573	4631
⊙ YB_4	3073	5531
YB_2	2373	4271

PROPERTIES OF OTHER MISCELLANEOUS METAL BORIDES

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
○	59-21	298		SrB_6.	
◇	55-23	298		Beryllium boride series.	
△	55-21	298		PrB_6.	Computed from x-ray measurements of lattice.
▽	55-21	298		LaB_6.	Same as above.
▲	55-21	298		GdB_6.	Same as above.
▼	55-21	298		PrB_6.	Same as above.
●	55-21	298		YbB_6.	Same as above.
■	55-21	298		YbB_6.	Measured by pycnometer.
⬙	55-21	298		SmB_6.	Same as above.
◁	55-21	298		SmB_6.	Computed from x-ray measurements of lattice.
▷	49-11	298		CeB_4.	Same as above.
◀	55-21	2570-2770		SmB_6.	By visual observation of powder in graphite crucibles; optical pyrometer.
▶	62-21	298		Rare earth metal borides.	
◑	51-8	2503		BaB_6; hexagonal.	
◐	61-29	1433-2273		Series of beryllium borides.	
⊖	61-33	2243-2393		Same as above.	

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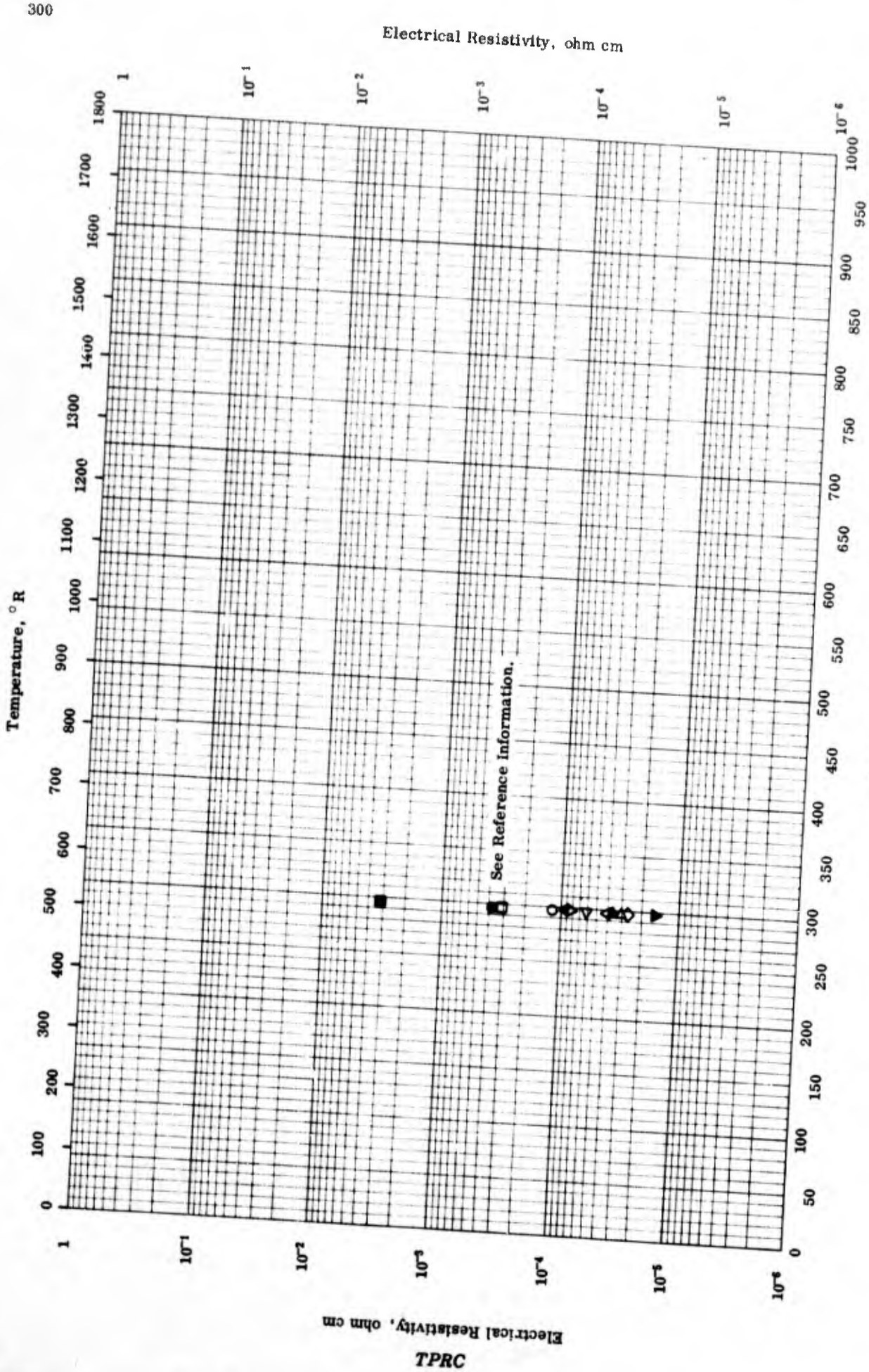
PROPERTIES OF OTHER MISCELLANEOUS METAL BORIDES (Continued)

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
●	61-30	2573		BeB_6.	
■	57-32	2503		CaB_6.	
◆	51-8	2463		CeB_6.	
▲	59-27	1673		CoB.	
▼	59-23	2373		GdB_6.	
◀	60-38	2423		GdB_6.	
▶	57-34	1662-1813		FeB and Fe_2B.	Decomp. temperature for Fe_2B.
★	60-38	2373		LaB_6.	
⬟	61-32	2073-2773		Pure LaB_4 and LaB_6.	Measured in argon.
⬢	60-35	2813		NdB_6.	
✕	32-1	1433		Ni_3B_2.	
⊞	60-37	1373-1428		Ni_2B and Ni_3B.	
⊠	51-8	2508		SrB_6.	
⊖	58-18	2573		YB_6.	
⊙	59-22	2373-3073		YB_2 and YB_4.	

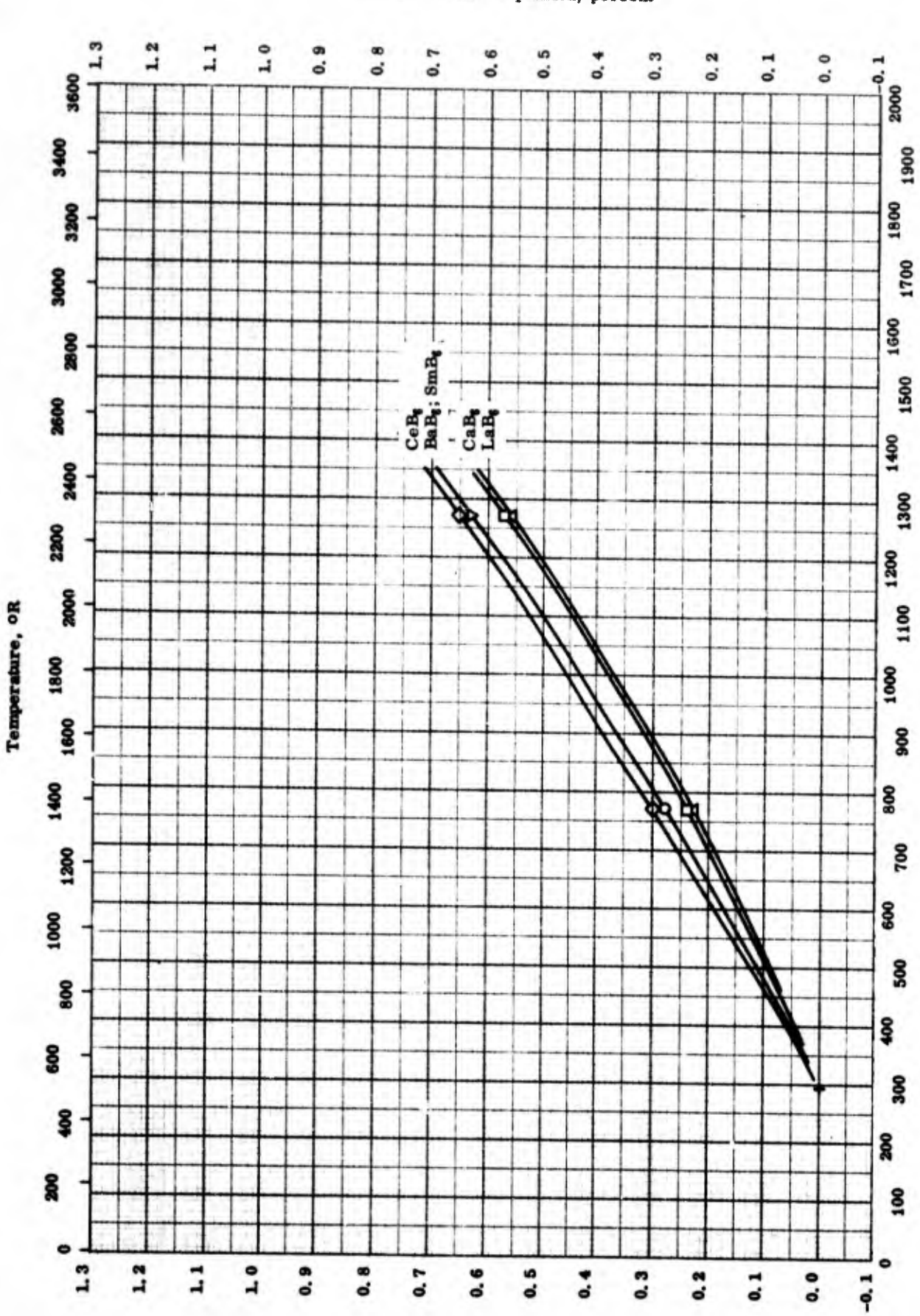


ELECTRICAL RESISTIVITY -- MISCELLANEOUS BORIDES

ELECTRICAL RESISTIVITY -- MISCELLANEOUS BORIDES

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
○	62-21	298		CaB_6.	
□	62-21	298		BaB_6.	
△	62-21	298		YB_6.	
▼	62-21	298		LaB_6.	
◁	62-21	298		CeB_6.	
▷	62-21	298		PrB_6.	
◇	62-21	298		NdB_6.	
●	62-21	298		SmB_6.	
■	62-21	298		EuB_6.	
▲	62-21	298		GdB_6.	
▽	62-21	298		TbB_6.	
▶	62-21	298		YbB_6.	

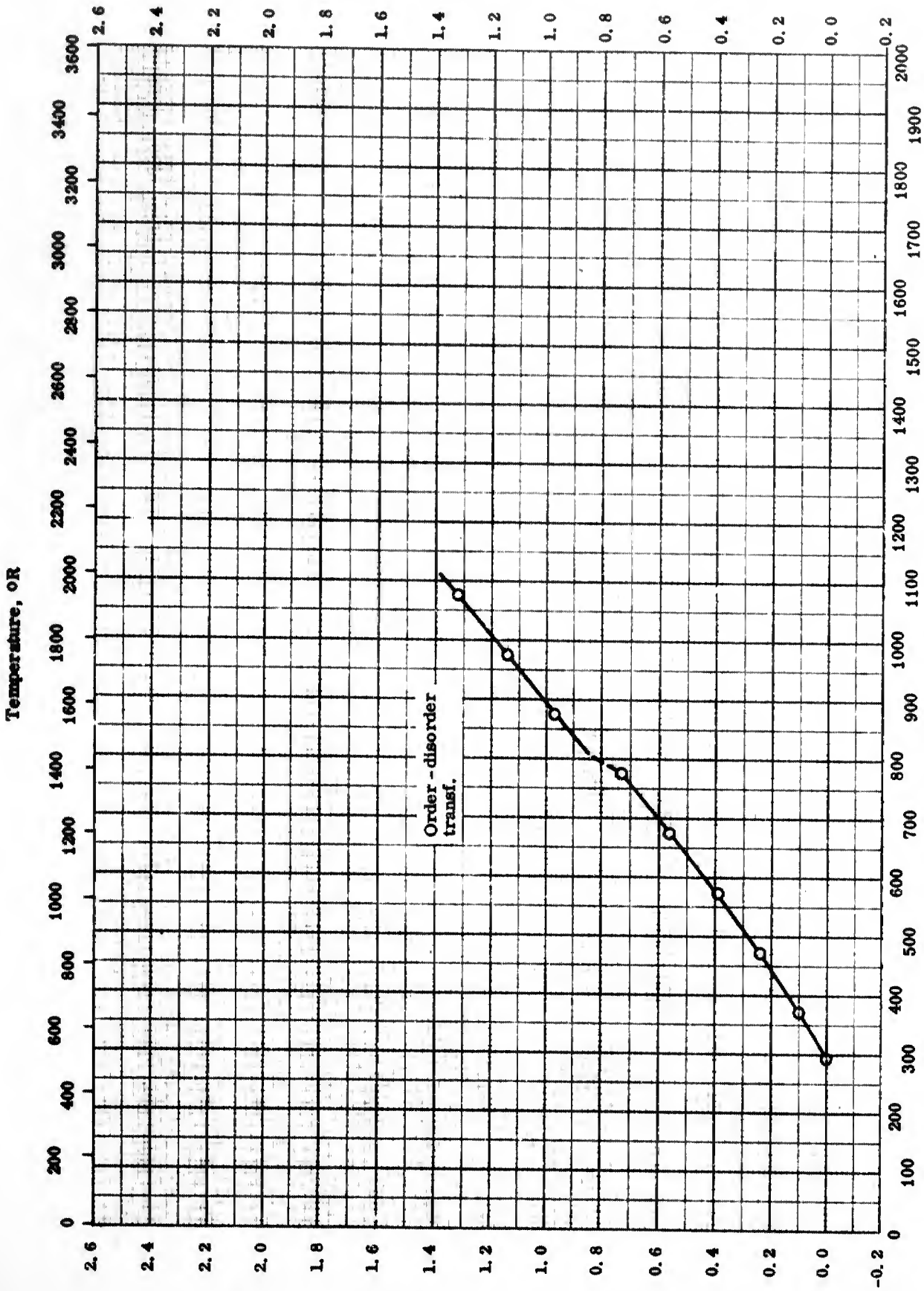


THERMAL LINEAR EXPANSION -- MISCELLANEOUS BORIDES

THERMAL LINEAR EXPANSION -- MISCELLANEOUS BORIDES

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
○	60-27	298-1273		BaB_6.	
□	60-27	298-1273		CaB_6.	
◇	60-27	298-1273		CeB_6.	
△	60-27	298-1273		LaB_6.	
▽	60-27	298-1273		SmB_6.	



THERMAL LINEAR EXPANSION -- NICKEL FERRIDE

THERMAL LINEAR EXPANSION -- NICKEL FERRIDE

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
O	57-21	293-1073		Ni_3Fe (analysis not given).	

PROPERTIES OF OTHER MISCELLANEOUS METAL FERRIDES

REPORTED VALUES

Density		g cm^{-3}	lb ft^{-3}
▽	YFe_5	7.33	457.4
	$GdFe_5$	8.38	522.9
	Gd_2Fe_3	8.52	531.6
	$GdFe_3$	8.40	524.2
	Gd_2Fe_7	8.44	526.7
	$GdFe_4$	8.54	532.9
	$HoFe_2$	9.52	594.0
	$HoFe_5$	8.79	548.5
	$SmFe_2$	8 62	537.9
	$SmFe_5$	8.07	503.6
◀	U_6Fe	17.7	1105
▶	UFe_2	13.21	825
◧	Pu_6Fe	17.1	1068
◨	$PuFe_2$	12.59	785.0

Melting Point		K	R
○	$TaFe_2$	2048	3687
□	$HfFe_2$	1923	3462
△	$TiFe_2$	1773	3192
◇	$NbFe_2$	1898	3416
●	$ZrFe_2$	1918	3453
◑	U_6Fe	1088	1959
◐	UFe_2	1508	2715
◆	$PuFe_2$	1503	2706
◆	FeTi	1523	2740
◆	FeTi	1523	2740

PROPERTIES OF OTHER MISCELLANEOUS METAL FERRIDES

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
○	53-17	2048		$TaFe_2$.	Arc-melted from high purity metal sheet and Bureau of Mines high purity Fe.
□	53-17	1923		$HfFe_2$.	Same as above.
△	53-17	1773		$TiFe_2$.	Same as above.
◇	53-17	1898		$NbFe_2$.	Same as above.
●	53-17	1918		$ZrFe_2$.	Same as above except iodide crystal Zr bar.
▽	62-21	298		Rare earth metal ferrides.	
◀	48-2 also 50-7	298		U_6Fe.	Density computed from x-ray measurements of lattice.
▶	48-2 also 50-7	298		UFe_2.	Same as above.
◑	50-6	1088		U_6Fe.	M. P. from break in time-temperature curve.
◐	50-6	1508		UFe_2.	Same as above.
◧	55-26	298		Pu_6Fe.	Computed from x-ray measurements of lattice.
◨	55-26	298		$PuFe_2$.	Same as above.
◆	55-26	1503		$PuFe_2$.	M. P. from break in time-temperature curve.
◆	56-28	1523		FeTi	By break in time-temperature curve.

(Continued onto next page)

PROPERTIES OF OTHER MISCELLANEOUS METAL FERRIDES (Continued)

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
◆	56-28	1523		FeTi.	Metallographic inspection for signs of chilled liquid in sample; quenched for 0.5 Sec from various temperature levels.

PROPERTIES OF MAGNESIUM GERMANIDE

MOST PROBABLE VALUES

Property	C.G.S. Units	Brit. Eng. Units
Density	3.086	192.7
Melting Point	1388	2498

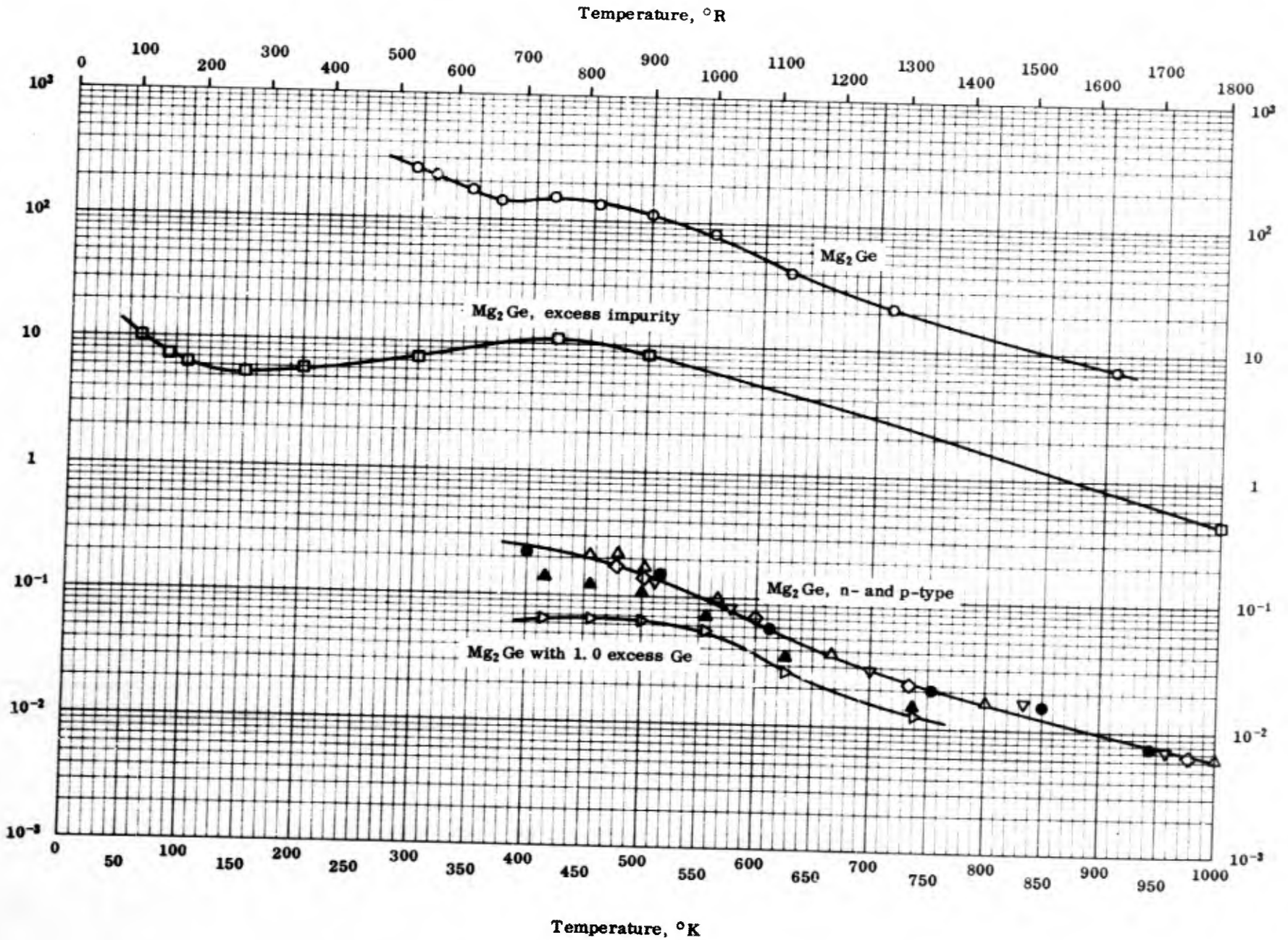
REPORTED VALUES

Density	$g\ cm^{-3}$	$lb\ ft^{-3}$
○ Mg_2Ge	3.086	192.7
Melting Point	K	R
□ Mg_2Ge	1388	2498

PROPERTIES OF MAGNESIUM GERMANIDE

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
○	50-3	298		Mg_2Ge; 59.74 Ge and 40.26 Mg.	Melted in Fe crucibles at 850 C or 1230 C; surface removed, milled in fine power in N_2, annealed 4 hrs at 300 C; measured by using pycnometer.
□	64-22	1388		Mg_2Ge.	



ELECTRICAL RESISTIVITY -- MAGNESIUM GERMANIDE

ELECTRICAL RESISTIVITY -- MAGNESIUM GERMANIDE

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
○	53-9	294-908		Mg_2Ge.	Melted spectroscopically pure components in graphite crucible under purified high pressure argon by high frequency current.
□	55-8	60-1000		Mg_2Ge; single crystal, excess impurity conductor; prepared from 99.99 Ge and 99.99 Mg.	Melted under He.
△	55-10	455-1000		Mg_2Ge, n-type; prepared from 99.98 Ge and Mg.	Melted from Mg and Ge with resistivity 10-50 ohm cm.
◇	55-10	476-1000		Same as above.	Same as above.
▽	55-10	476-1000		Same as above.	Same as above.
●	55-10	400-1000		Mg_2Ge, p-type; same as above.	Same as above.
▲	55-10	417-739		Mg_2Ge with 0.5 Mg; same as above.	Same as above.
▷	55-10	417-739		Mg_2Ge with 1.0 Ge; same as above.	Same as above.

PROPERTIES OF MOLYBDENUM GERMANIDES

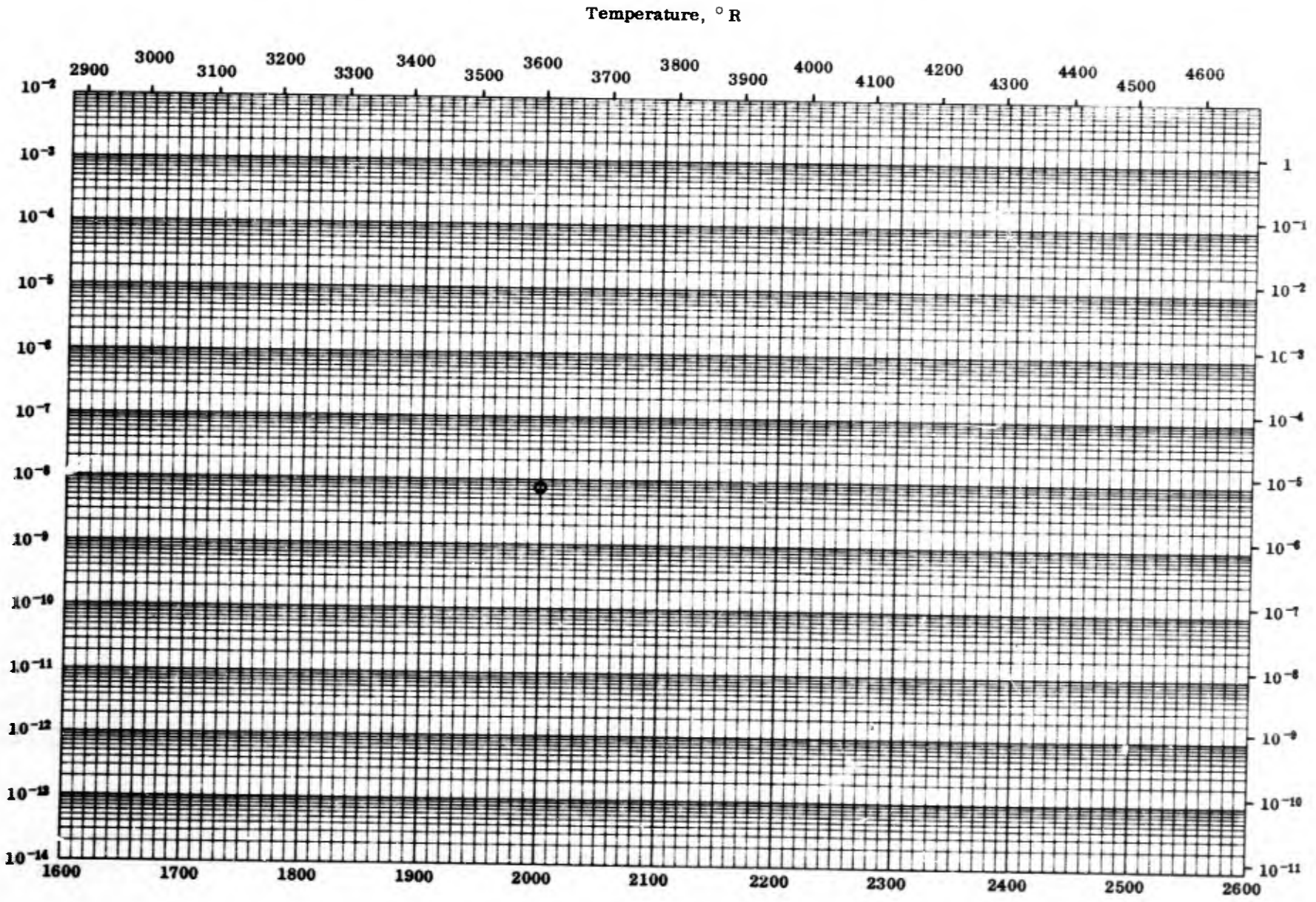
REPORTED VALUES

Melting Point	K	R
○ Mo_3Ge_2	>2022	>3640

PROPERTIES OF MOLYBDENUM GERMANIDES

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
O	52-28 also 53-29	2022		Mo_3Ge_2.	Probably Mo_5Ge_3.

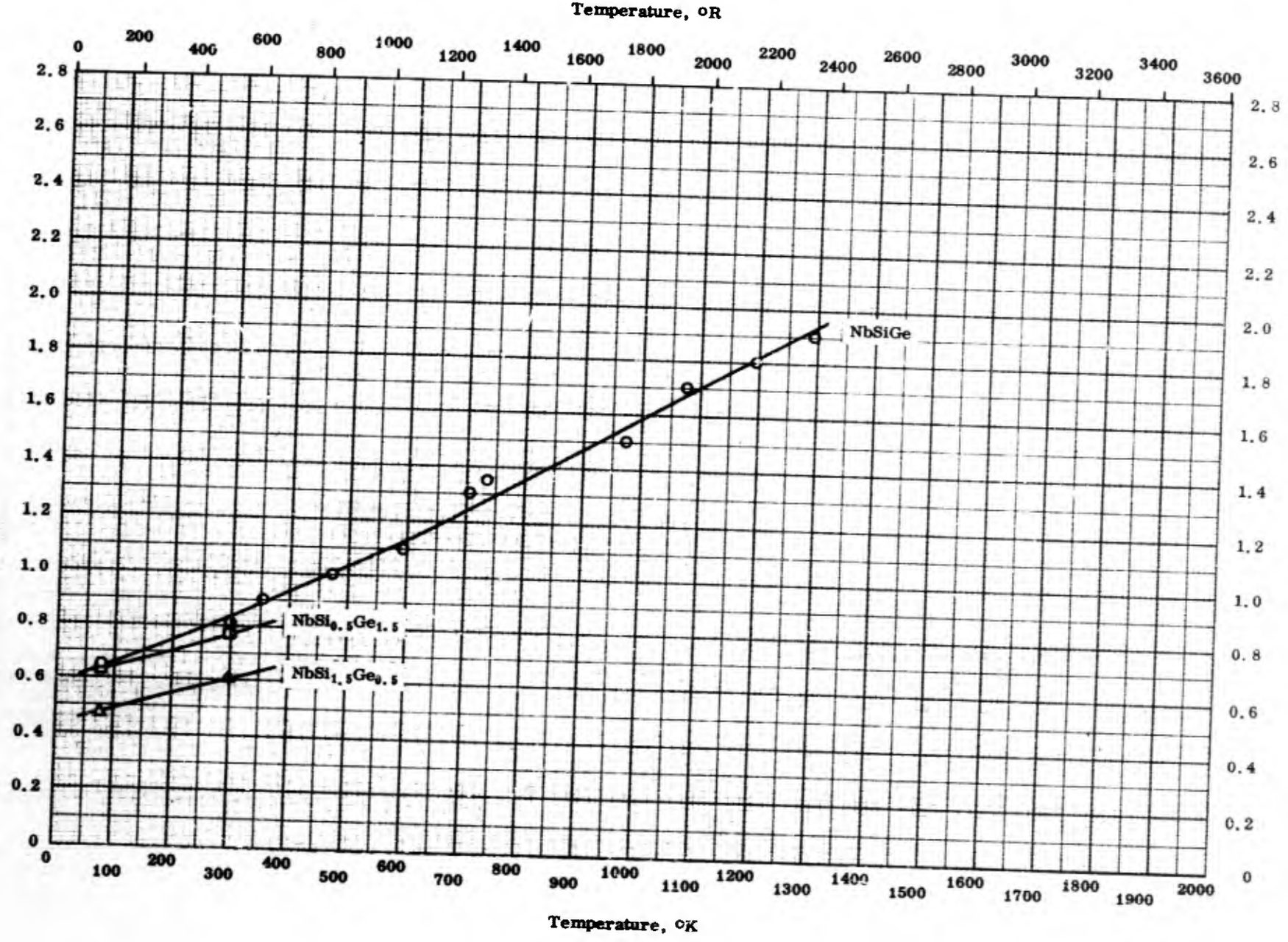


VAPOR PRESSURE -- MOLYBDENUM GERMANIDE

VAPOR PRESSURE -- MOLYBDENUM GERMANIDE

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
○	52-3	2000		Mo_3Ge.	Heated in vacuum of 10^{-5} mm Hg in graphite crucibles with graphite lids.

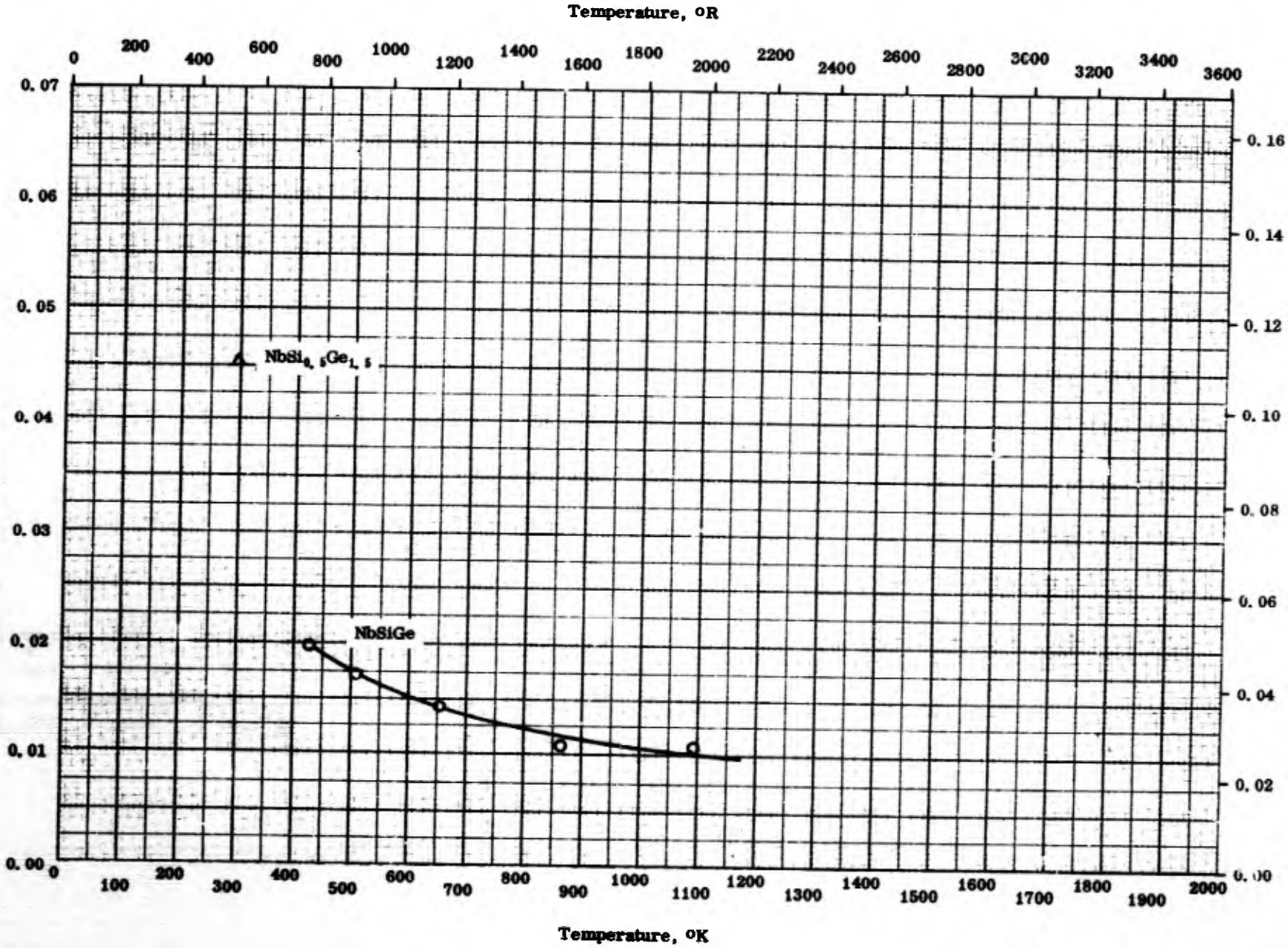


ELECTRICAL RESISTIVITY -- NIOBIUM SILICIDE GERMANIDE

ELECTRICAL RESISTIVITY -- NIOBIUM SILICIDE GERMANIDE

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
○	63-4	77-1293	±5	NbSiGe; density 6.982 g ml^{-1} by X-ray and 6.97 g ml^{-1} by Pycnom.	Hot or cold-pressed and subsequently sintered between 1500 and 1900 C.
□	63-4	77-298	±5	$NbSi_{0.5}Ge_{1.5}$; density 7.651 g ml^{-1} by X-ray and 7.59 g ml^{-1} by Pycnom.	Same as above.
△	63-4	77-298	±5	$NbSi_{1.5}Ge_{0.5}$; density 6.354 g ml^{-1} by X-ray and 6.34 g ml^{-1} by Pycnom.	Same as above.



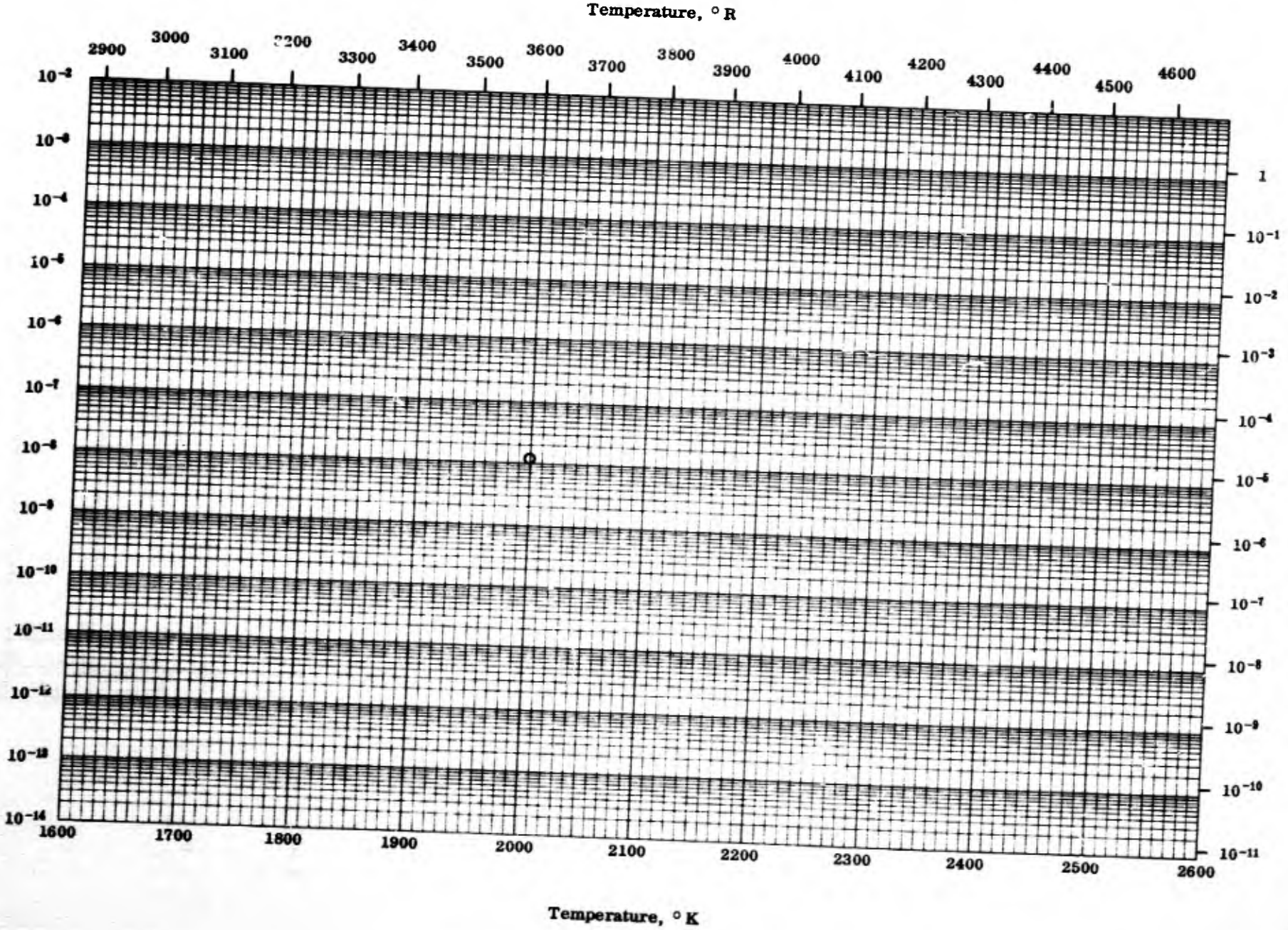
TPRC

THERMAL CONDUCTIVITY -- NIOBIUM SILICIDE GERMANIDE

THERMAL CONDUCTIVITY -- NIOBIUM SILICIDE GERMANIDE

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
O	63-4	438-1093	±10	NbSiGe.	Prepared by powder metallurgy.
Δ	63-4	298	±10	$NbSi_{0.5}Ge_{1.5}$.	Same as above.



VAPOR PRESSURE -- TANTALUM GERMANIDE

VAPOR PRESSURE -- TANTALUM GERMANIDE

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
O	52-3	2000		Ta_4Ge.	Heated in vacuum of 10^{-5} mm Hg in graphite cell.

PROPERTIES OF OTHER MISCELLANEOUS METAL GERMANIDES

REPORTED VALUES

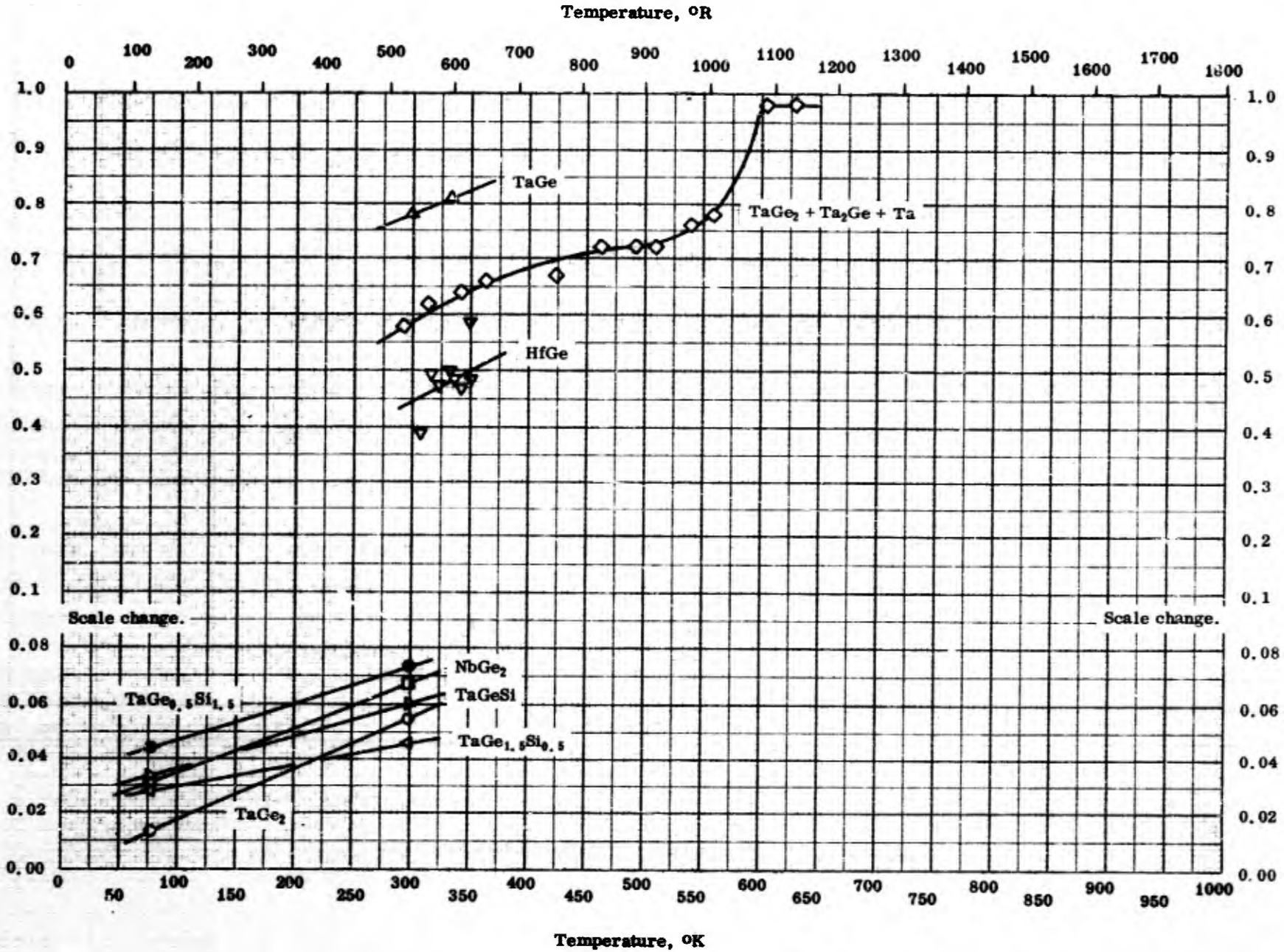
Density		g cm^{-3}	lb ft^{-3}
○	Rh_3Ge_4	8.5	531
□	RhGe	9.8	612
△	Rh_5Ge_3	10.7	668
◇	Rh_2Ge	11.0	687
▽	Y_5Ge_3	5.61	350.0
	$LaGe_2$	7.059	440.6
	$SmGe_2$	8.122	506.8
	$NdGe_2$	7.749	483.5
	PrGe	6.78	423.1
	$PrGe_2$	7.24	451.8
●	Nb_3Ge	8.17	510
■	Nb_3Ge	8.47*	529*
▲	$NbGe_2$	7.81 ± 0.24	488 ±15
▼	$NbGe_2$	8.20*	512*

Melting Point		K	R
◆	Nb_3Ge	1922	3460
	Nb_2Ge	2183	3929
	$NbGe_2$	1772	3190
◑	$ZrGe_2$; orthorhombic	1795	3231
	ZrGe	2511	4520
	Zr_5Ge_3	2878	5180
	Zr_3Ge	1861	3349
◐	$ZrGe_2$; orthorhombic	2572	4630
	ZrGe	2514	4525
	Zr_5Ge_3	2572	4630
	Zr_3Ge	1858	3344

PROPERTIES OF OTHER MISCELLANEOUS METAL GERMANIDES

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
○	56-19	298		Rh_3Ge_4; 48.47 Ge.	Alloyed in high frequency furnace with A atm; density from weight in air and in CCl_4.
□	56-19	298		RhGe; 41.36 Ge.	Same as above.
△	56-19	298		Rh_5Ge_3; 29.74 Ge.	Same as above.
◇	56-19	298		Rh_2Ge; 26.07 Ge.	Same as above.
▽	62-21	298		Rare earth metal germanides.	
●	56-31	298		Nb_3Ge; prepared from 99.4 Nb and 99.9 Ge.	By displacement in water and CCl_4.
■	56-31	298		Same as above.	Computed from x-ray measurements of lattice.
▲	56-31	298		$NbGe_2$; same as above.	By displacement in water and CCl_4.
▼	56-31	298		Same as above.	Computed from x-ray measurements of lattice based on 3 molecules per cell.
◆	55-36	1772-2183		Series of niobium germanides.	
◑	55-35	1795-2878		Series of zirconium germanides.	
◐	54-29	1858-2572		Same as above.	



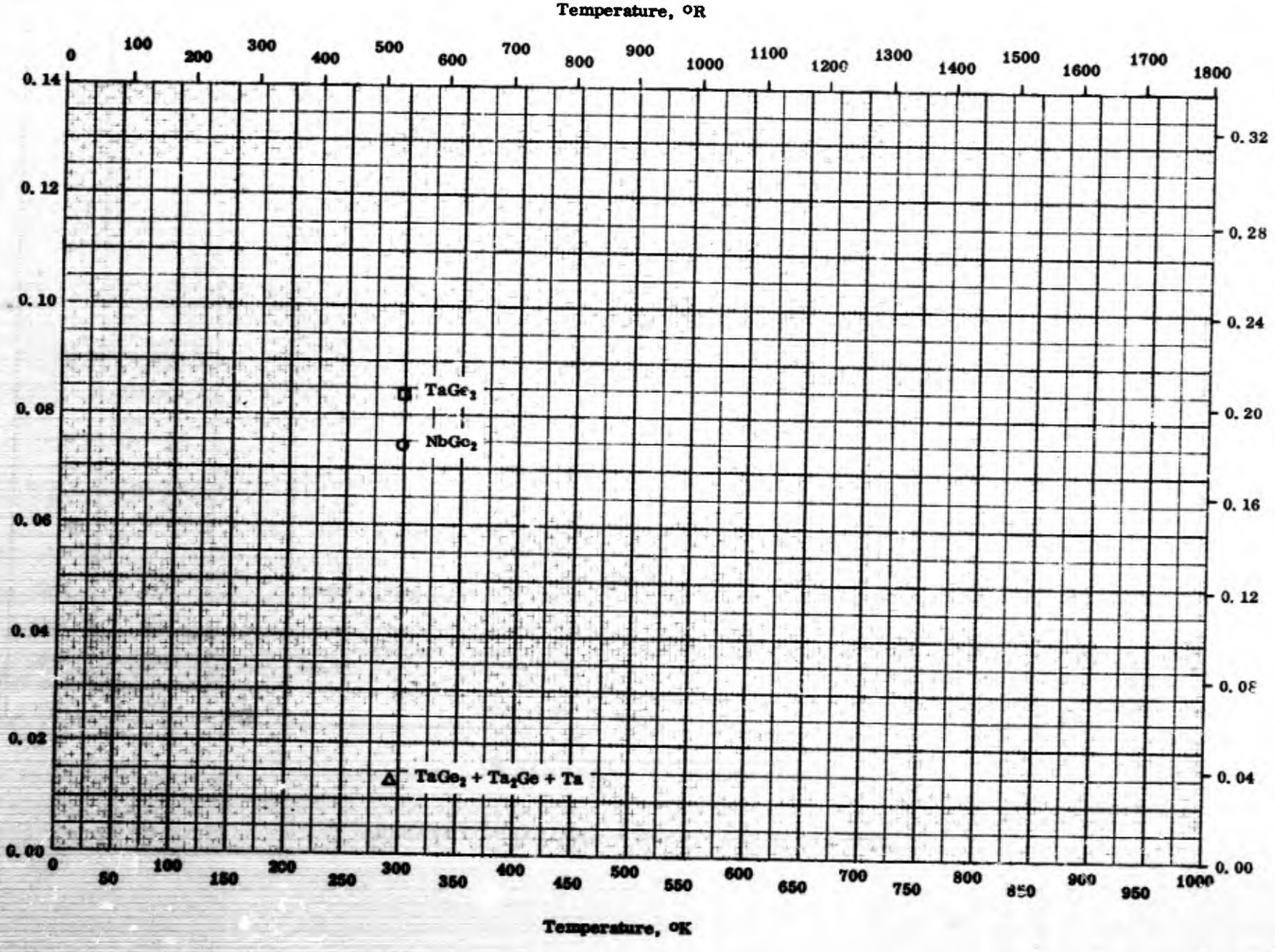
TPRC

ELECTRICAL RESISTIVITY -- MISCELLANEOUS GERMANIDES

ELECTRICAL RESISTIVITY -- MISCELLANEOUS GERMANIDES

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
○	63-4	77-298		$TaGe_2$; density 11.392 g ml^{-1} by X-ray and 11.28 g ml^{-1} by Pycnom.	Hot or cold pressed and then sintered subsequently between 1500 and 1900 C.
□	63-4	77-298		$NbGe_2$; density 8.295 g ml^{-1} by X-ray and 8.17 g ml^{-1} by Pycnom.	Same as above.
△	61-11	298-333		TaGe; excess of metallic tantalum.	Prepared by reacting powdered materials in evacuated ampoule with powders more intimately mixed; mixing atomic ratio of Ta and Ge 1 to 5.
◇	61-11	293-628		$TaGe_2 + Ta_2Ge + Ta$.	
▽	61-17	307-350		HfGe.	
◁	63-4	77-298		$TaGe_{1.5}Si_{0.5}$; density 10.808 g ml^{-1} by X-ray and 10.51 g ml^{-1} by Pycnom.	Hot or cold pressed and then sintered subsequently between 1500and 1900 C.
▷	63-4	77-298		TaGeSi; density 10.300 g ml^{-1} by X-ray and 10.24 g ml^{-1} by Pycnom.	Same as above.
●	63-4	77-298		$TaGe_{0.5}Si_{1.5}$; density 9.594 g ml^{-1} by X-ray and 9.61 g ml^{-1} by Pycnom.	Same as above.



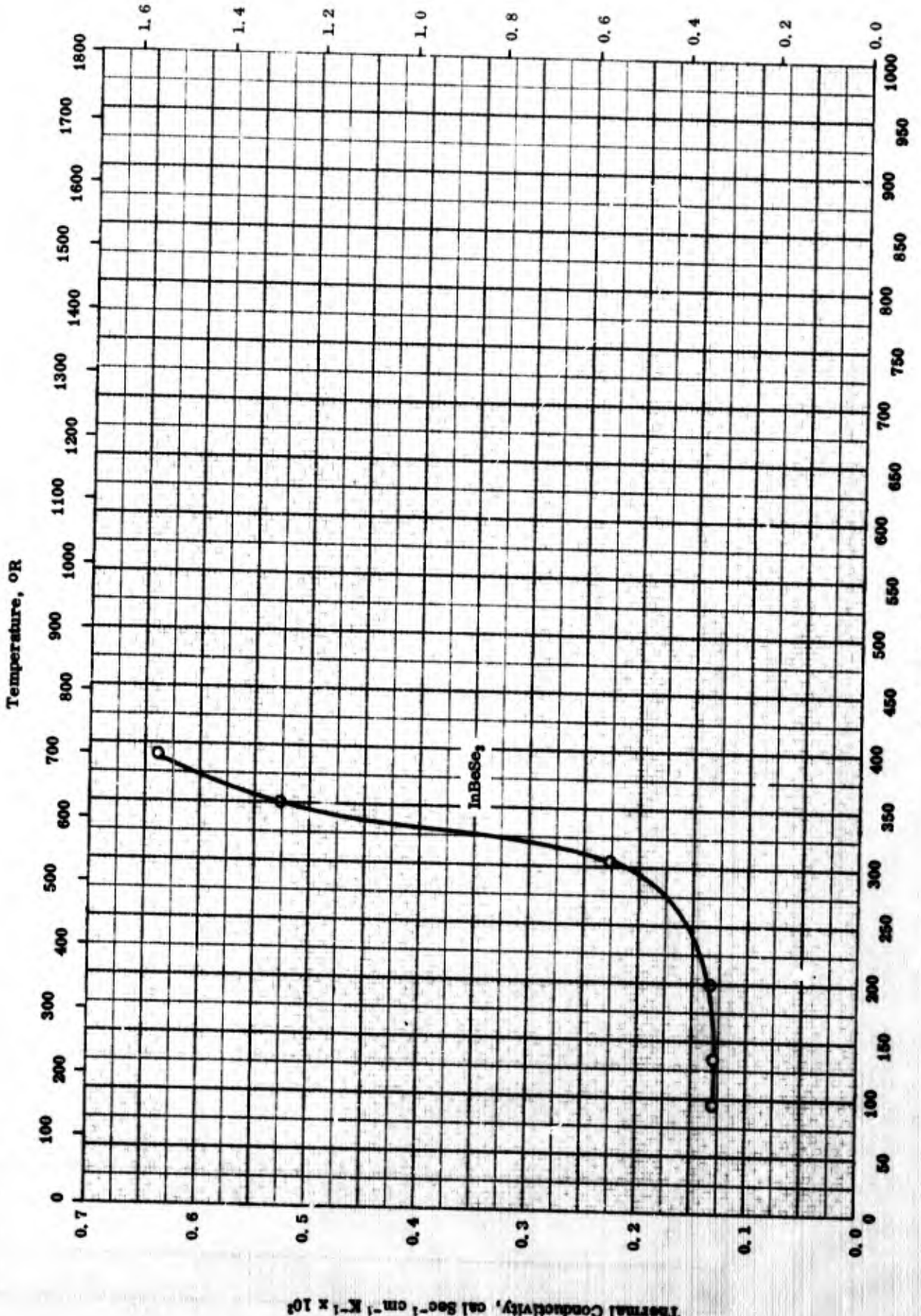
TPRC

THERMAL CONDUCTIVITY -- MISCELLANEOUS GERMANIDE

THERMAL CONDUCTIVITY -- MISCELLANEOUS GERMANIDE

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
○	63-4	298	± 10	$NbGe_2$.	Prepared by powder metallurgy.
□	63-4	298	± 10	$TaGe_2$.	Same as above.
△	63-4	293		$TaGe_2 + Ta_2Ge + Ta$.	

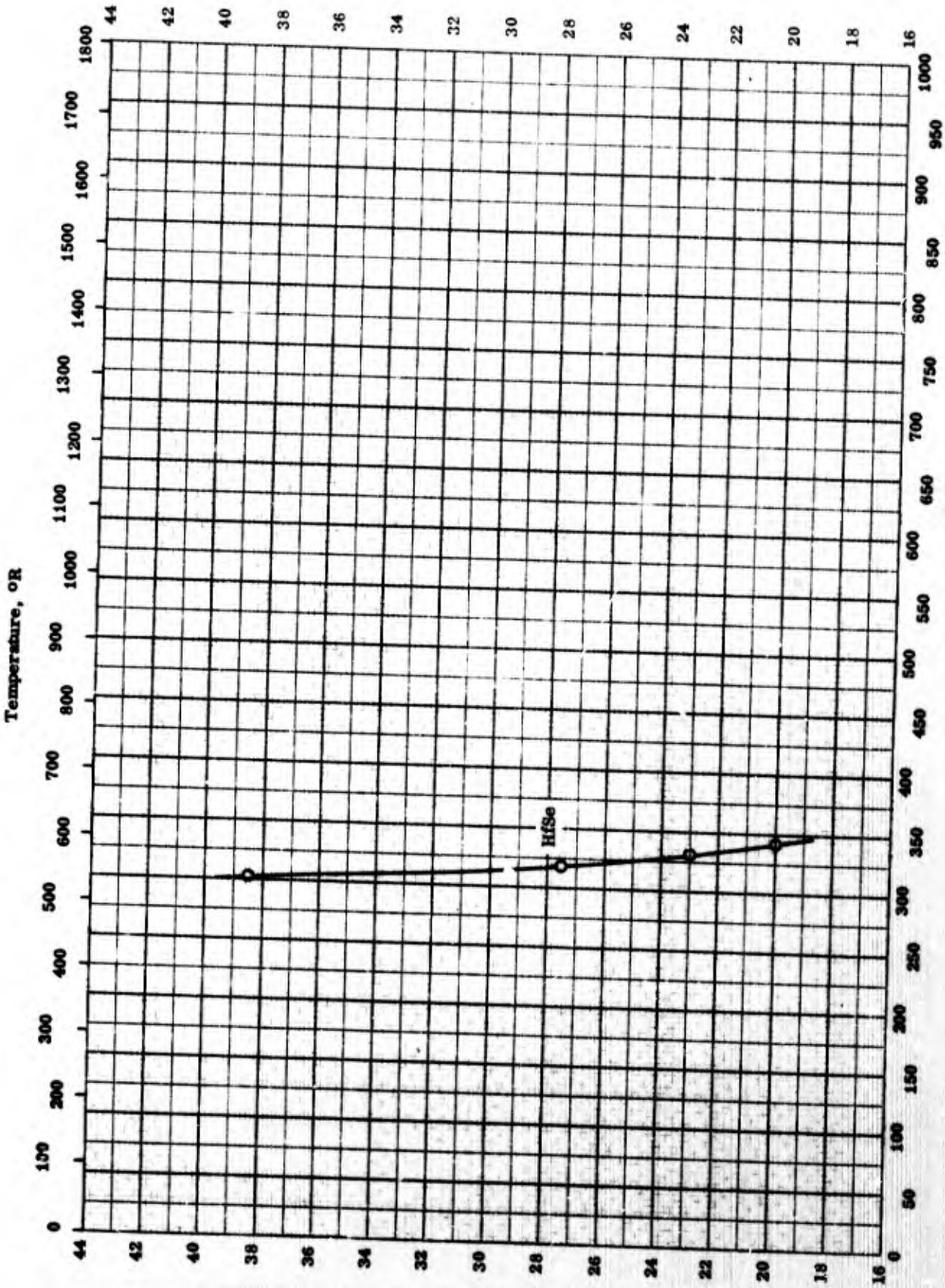


THERMAL CONDUCTIVITY -- BERYLLIUM INDIUM SELENIDE

THERMAL CONDUCTIVITY -- BERYLLIUM INDIUM SELENIDE

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
O	60-11	95-390		$InBeSe_3$.	

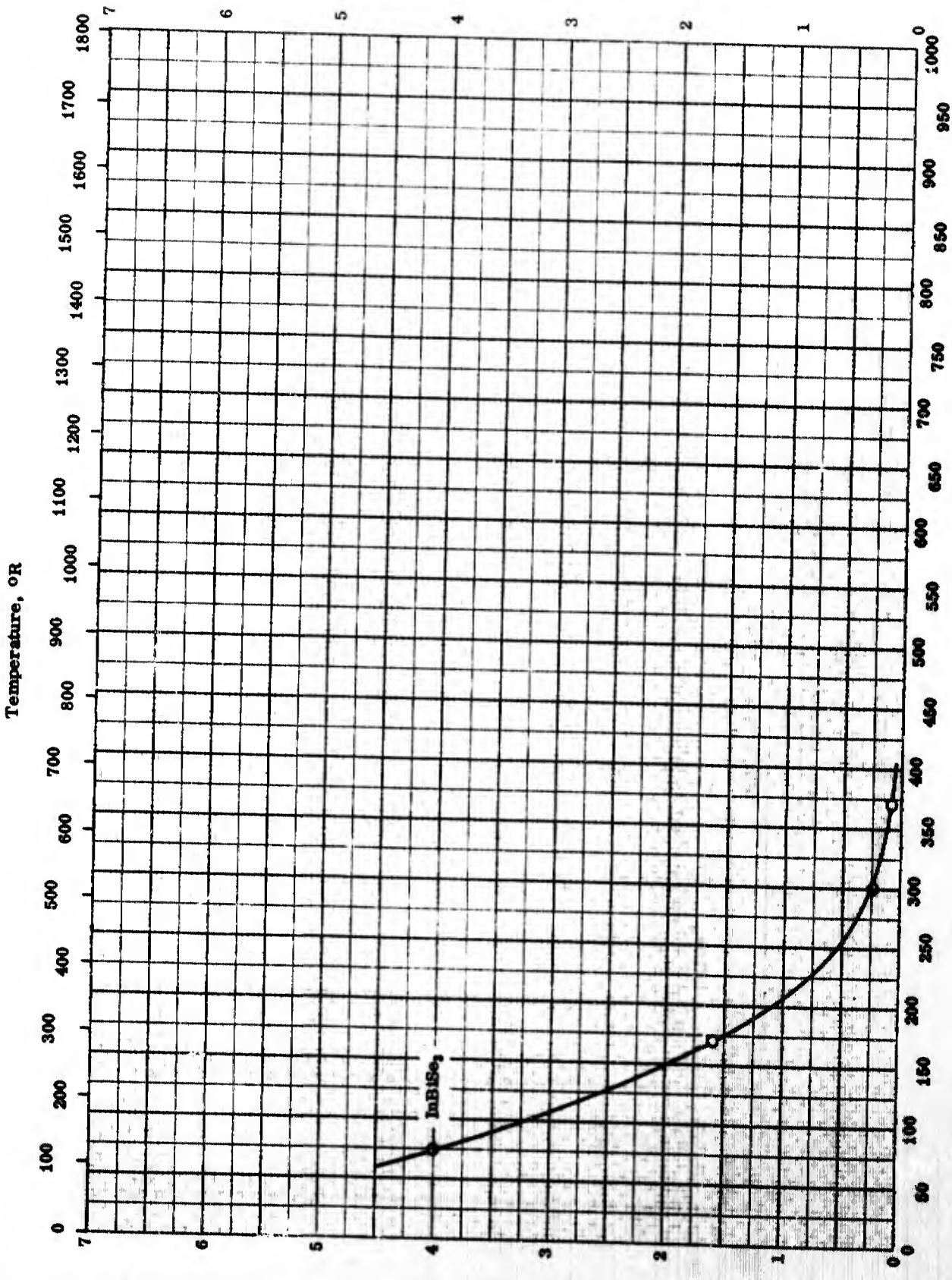


ELECTRICAL RESISTIVITY -- HAFNIUM SELENIDE

ELECTRICAL RESISTIVITY -- HAFNIUM SELENIDE

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
O	61-17	303-343		HfSe; metallographic examination showed an unknown crystalline phase embedded in a selenium matrix and x-ray diffraction showed pattern of this material to be complex and no elemental Hf.	A mixture of Hf and Se in an atomic ratio of 1 to 4; reacted at 1200 F for 64 hrs in a helium pressure of 5 microns of Hg.

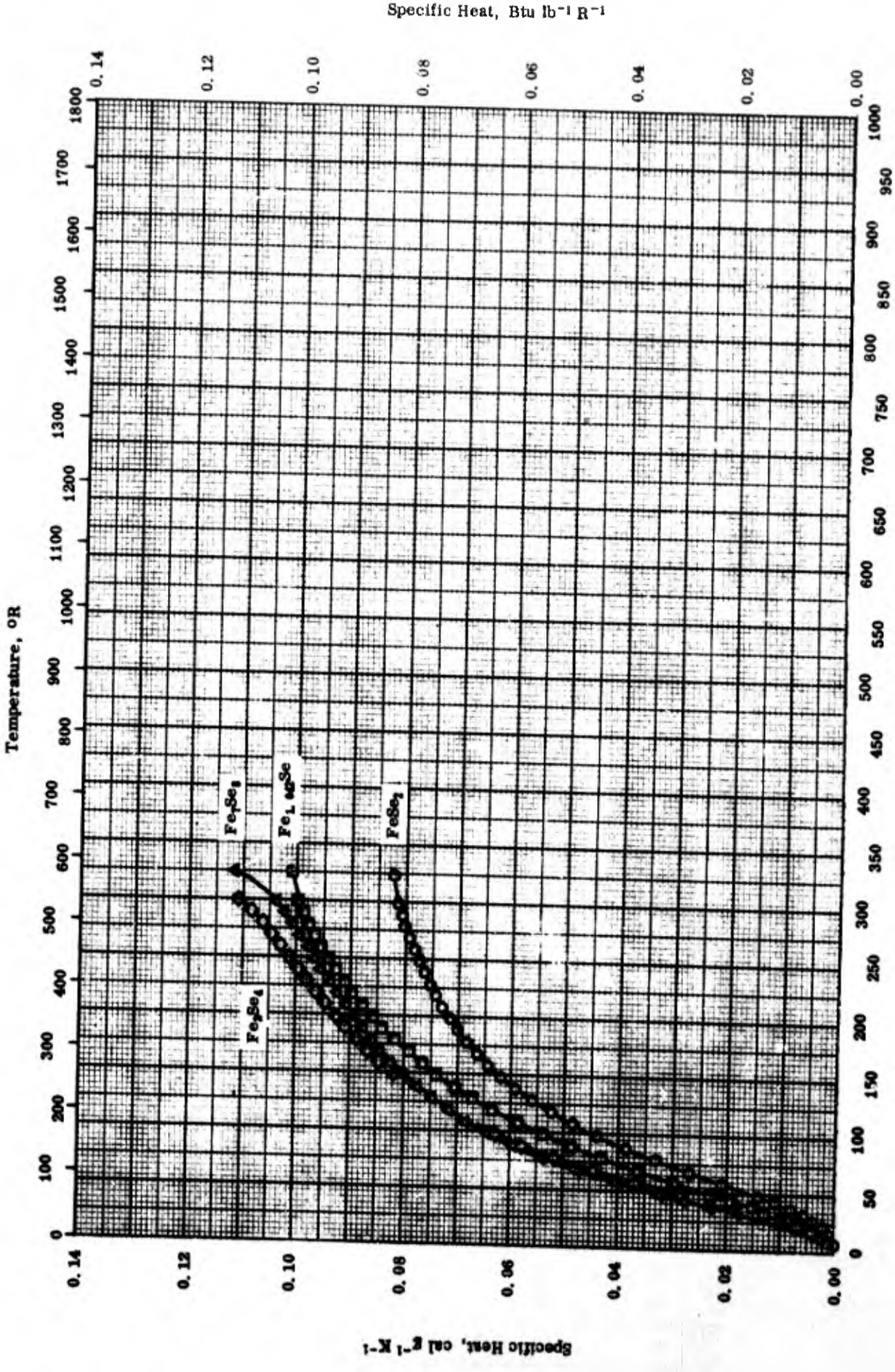


ELECTRICAL RESISTIVITY -- INDIUM BISMUTH SELENIDE

ELECTRICAL RESISTIVITY -- INDIUM BISMUTH SELENIDE

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
O	60-11	75-370		$InBiSe_3$.	

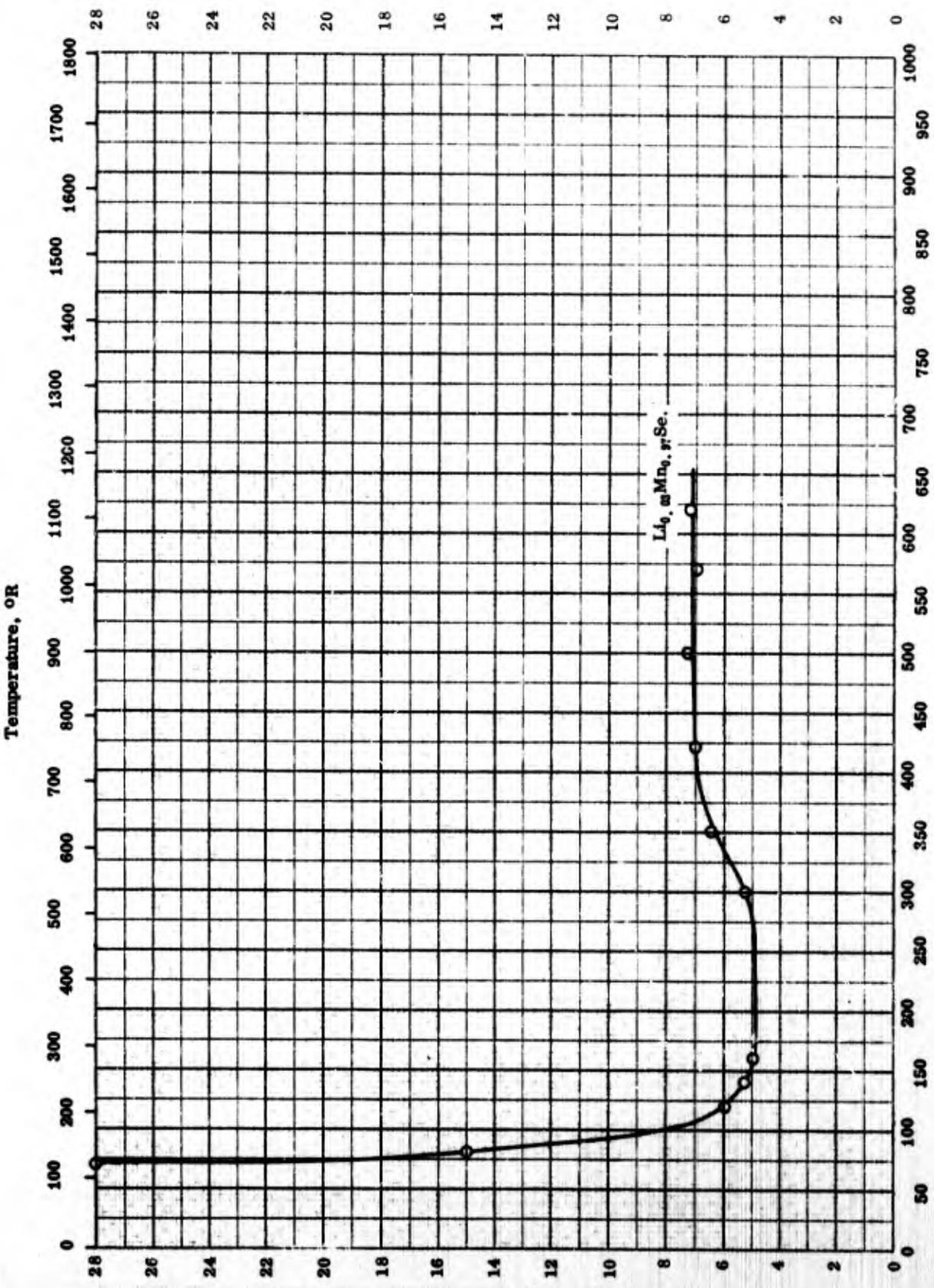


SPECIFIC HEAT -- IRON SELENIDES

SPECIFIC HEAT -- IRON SELENIDES

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
○	62-25	5-350	0.1-5	$FeSe_2$; 0.01 Ni, 0.01 Si, 0.001 Mn; prepared by high purity iron and selenium.	Heated slowly to 1000 C 2 hrs under vacuum and cooled to room temperature; heated one month at 340 C and cooled slowly to room temperature for a period of one month.
□	59-15	5-350	0.1-1	99.979 $Fe_{1.012}Se$, 0.01 Ni, 0.01 Si, and 0.001 Mn.	Fused 2 hrs at 1050 C, cooled to room temperature; fragmented under dry nitrogen; homogenized 30 days at 350 C and cooled to room temperature over 30 days.
△	59-15	5-350	0.1-1	99.979 Fe_7Se_8, 0.01 Ni, 0.01 Si, and 0.001 Mn.	Fused 4 hrs at 1050 C, cooled to room temperature under dry nitrogen; homogenized 30 days at 350 C and cooled to room temperature over 30 days.
◇	59-15	5-350	0.1-1	99.979 Fe_3Se_4, 0.01 Ni, 0.01 Si, and 0.001 Mn.	Same as above.

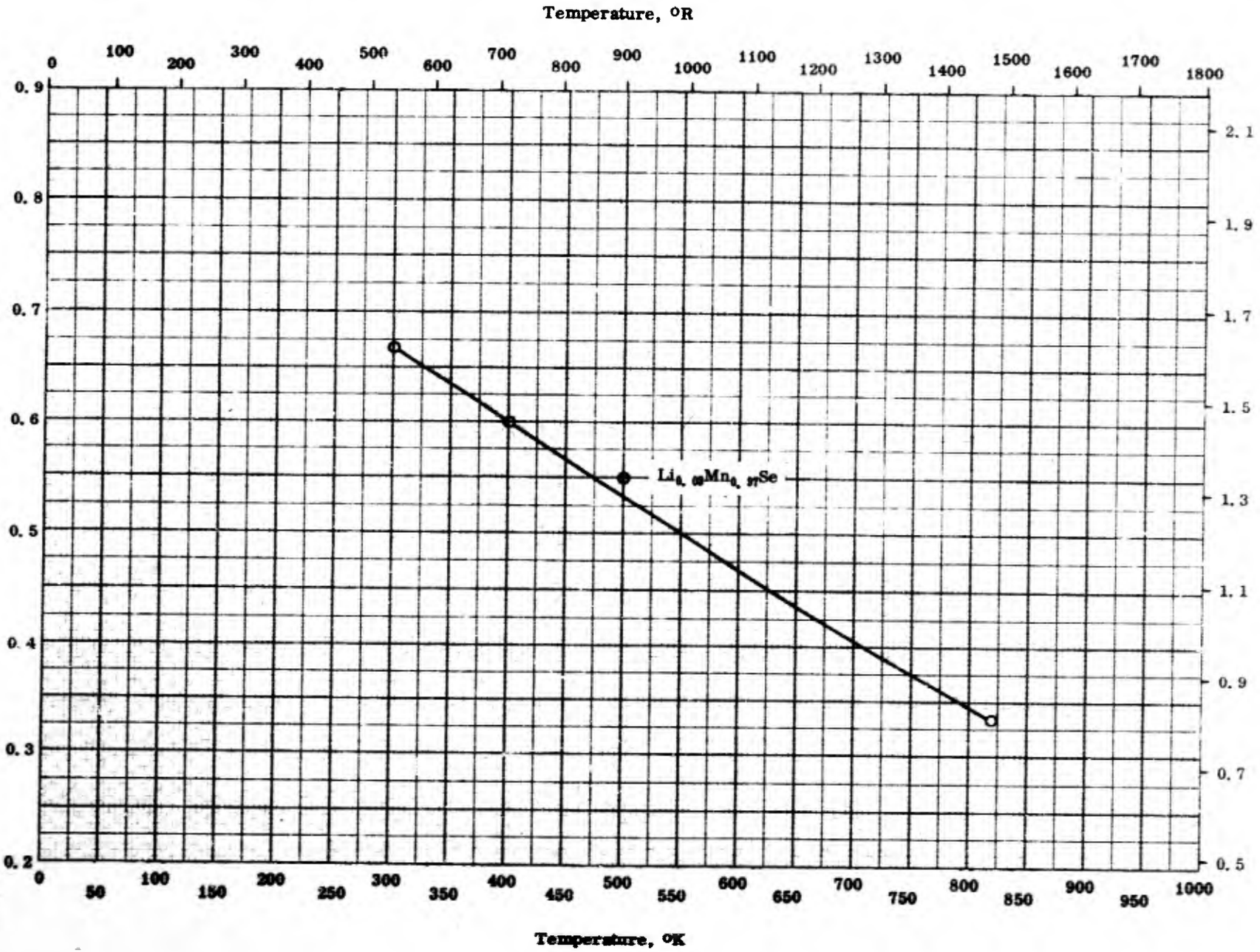


ELECTRICAL RESISTIVITY -- LITHIUM MANGANESE SELENIDE

ELECTRICAL RESISTIVITY -- LITHIUM MANGANESE SELENIDE

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
O	60-11	70-620		$Li_{0.03}$ $Mn_{0.97}$ Se.	

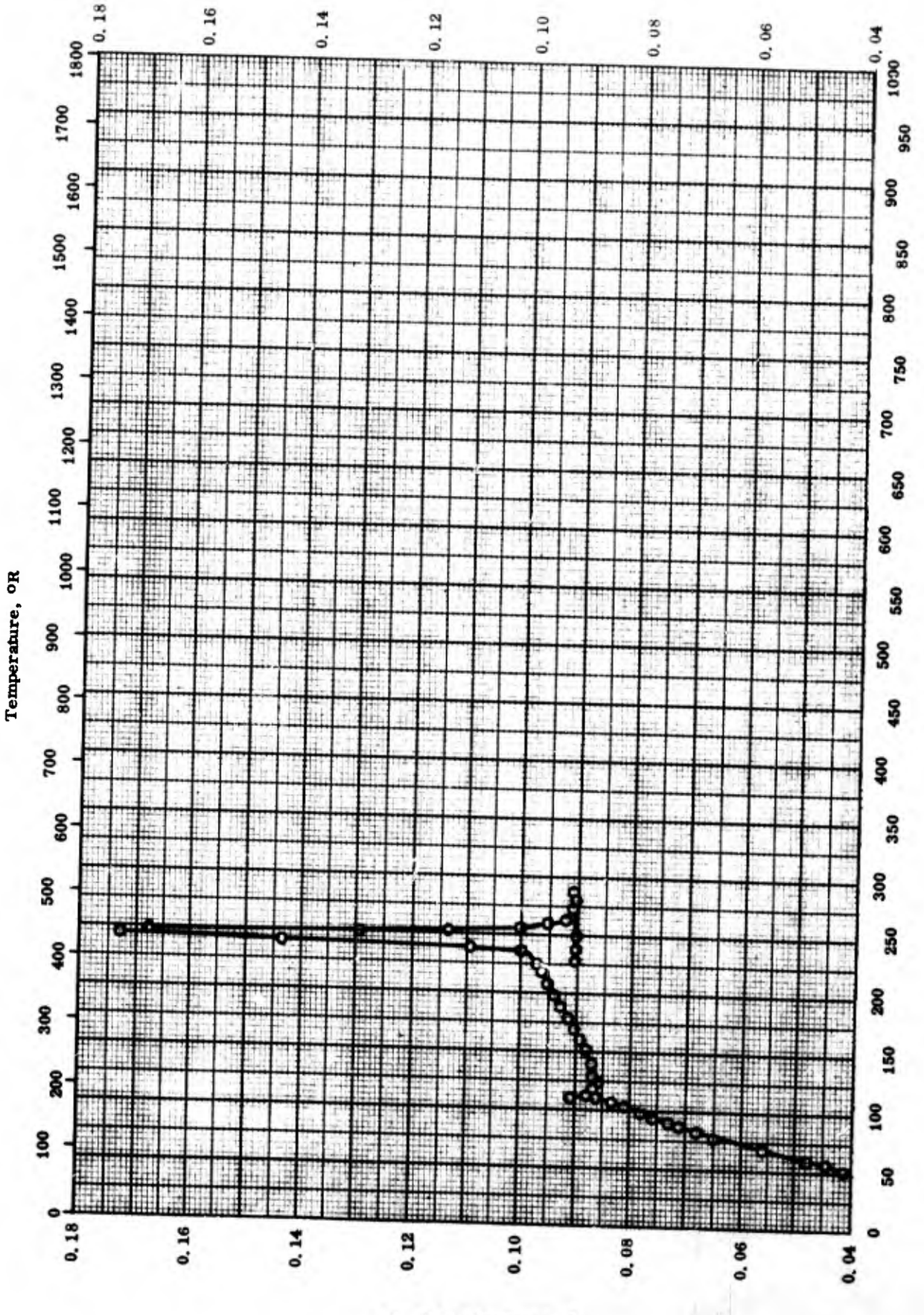


THERMAL CONDUCTIVITY -- LITHIUM MANGANESE SELENIDE

THERMAL CONDUCTIVITY -- LITHIUM MANGANESE SELENIDE

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
O	60-11	300-820		$Li_{0.03}Mn_{0.97}Se$.	

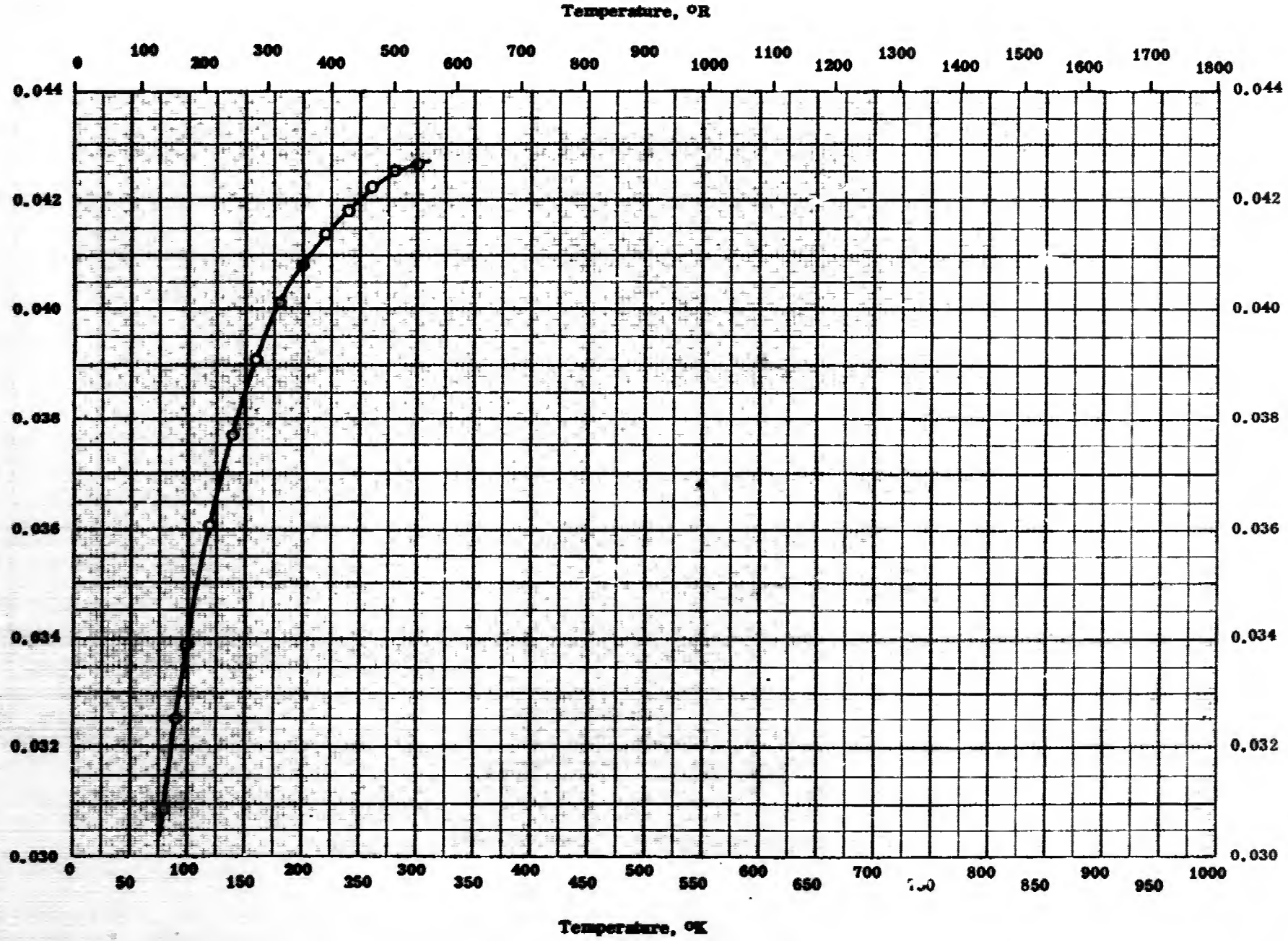


SPECIFIC HEAT -- MANGANESE SELENIDE

SPECIFIC HEAT -- MANGANESE SELENIDE

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
O	61-7	54-287		MnSe; 99.33 pure.	



TPRC

SPECIFIC HEAT -- MERCURIC SELENIDE

SPECIFIC HEAT -- MERCURIC SELENIDE

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
O	59-16	80-300	3-7	HgSe; polycrystalline.	

PROPERTIES OF NICKEL SELENIDES

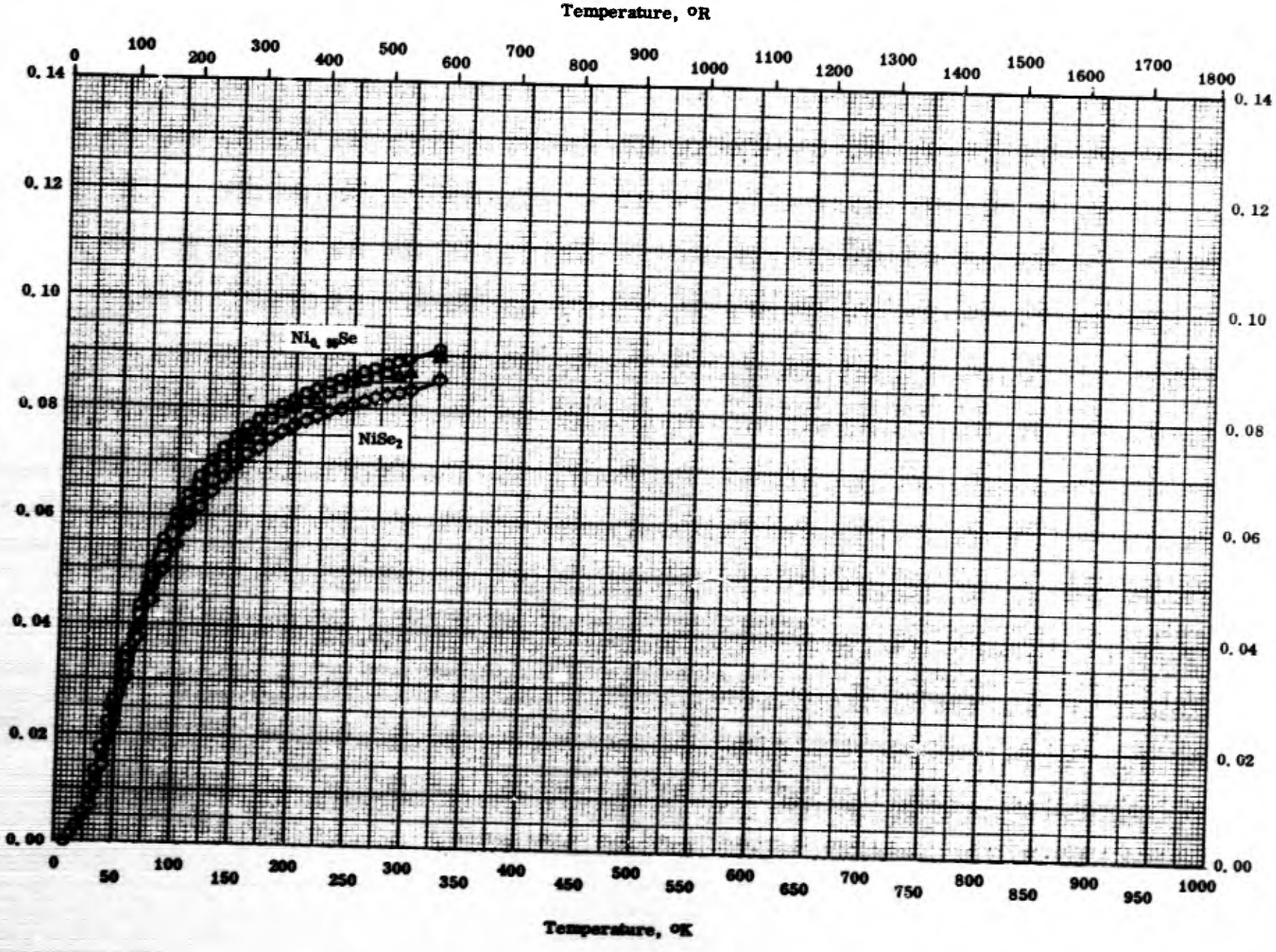
REPORTED VALUES

Density		g cm^{-3}	lb ft^{-3}
○	$NiSe_{1.00}$	7.269	453.8
	$NiSe_{1.07}$	7.169	447.5
	$NiSe_{1.10}$	7.132	445.2
	$NiSe_{1.175}$	6.993	436.6
	$NiSe_{1.20}$	6.974	435.4
	$NiSe_{1.225}$	6.915	431.7
	$NiSe_{1.25}$	6.890	430.4
	$NiSe_{1.275}$	6.894	430.4
□	$NiSe_{1.00}$	7.217	450.5
	$NiSe_{1.04}$	7.219	450.7
	$NiSe_{1.10}$	7.127	444.9
	$NiSe_{1.15}$	7.052	440.2
	$NiSe_{1.20}$	6.980	435.7
	$NiSe_{1.25}$	6.927	432.4
	$NiSe_{1.30}$	6.918	431.9
	$NiSe_{1.33}$	6.914	431.6
△	$NiSe_{1.85}$	6.730	420.1
	$NiSe_{1.975}$	6.724	419.8
	$NiSe_{2.00}$	6.720	419.5
	$NiSe_{2.025}$	6.703	418.5
	$NiSe_{2.05}$	6.693	417.8

PROPERTIES OF NICKEL SELENIDES

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
○	56-20	298		$NiSe_{1-1.275}$ series.	Heat-treated at 550 C; density computed from x-ray measurement of lattice.
□	56-20	298		$NiSe_{1-1.333}$ series.	Heat-treated at 300 C; density obtained same as above.
△	56-20	298		$NiSe_{1.95-2.05}$ series.	Density obtained same as above.



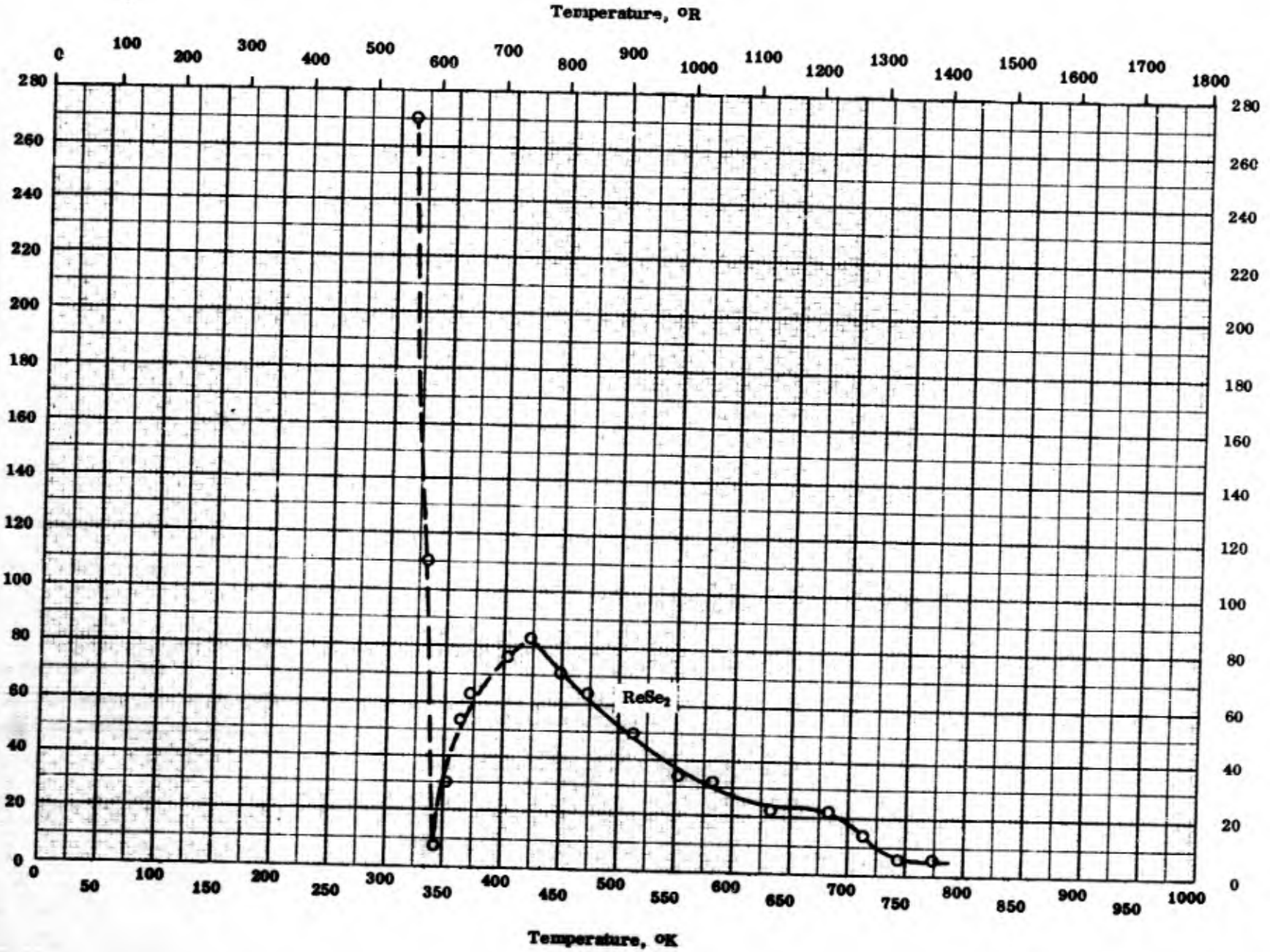
SPECIFIC HEAT -- NICKEL SELENIDES

TPRC

SPECIFIC HEAT -- NICKEL SELENIDES

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
○	60-20	5-350	0.1-1	$Ni_{0.88}Se$; nickel impurities: 0.01 Al, 0.005 Mg, 0.005 Si, 0.001 Ca, 0.001 Co, 0.001 Fe, 0.0001 Ba, 0.0001 Cr, 0.0001 Cu, and 0.0001 Mn; selenium impurities: 0.0002 Cl_2, 0.00008 Fe, 0.00004 Na, and 0.00003 K.	Prepared by fusion of high purity nickel and selenium for 2 hrs at 1050, 1000 and 950 C; cooled and fragmented; annealed 7 days at 550 C and then cooled over a period of 2 days.
□	60-20	5-360	0.1-1	$Ni_{0.875}Se$; same as above.	Same as above.
△	60-20	5-360	0.1-1	$Ni_{0.89}Se$; same as above.	Same as above.
◇	62-25	5-380	0.1-1	$NiSe_2$; same as above.	Prepared from nickel oxide by reduction with H_2 at 500 C for 5 hrs; cooled and fragmented, and heated with H_2 at 1000 C for 4 hrs; mixture of Ni and Se was heated under vacuum for 1 day at 800 C then lowered to 400 C for 3 days; product crushed and heated one week at 400 C, one week at 500 C, and annealed one week at 300 C.

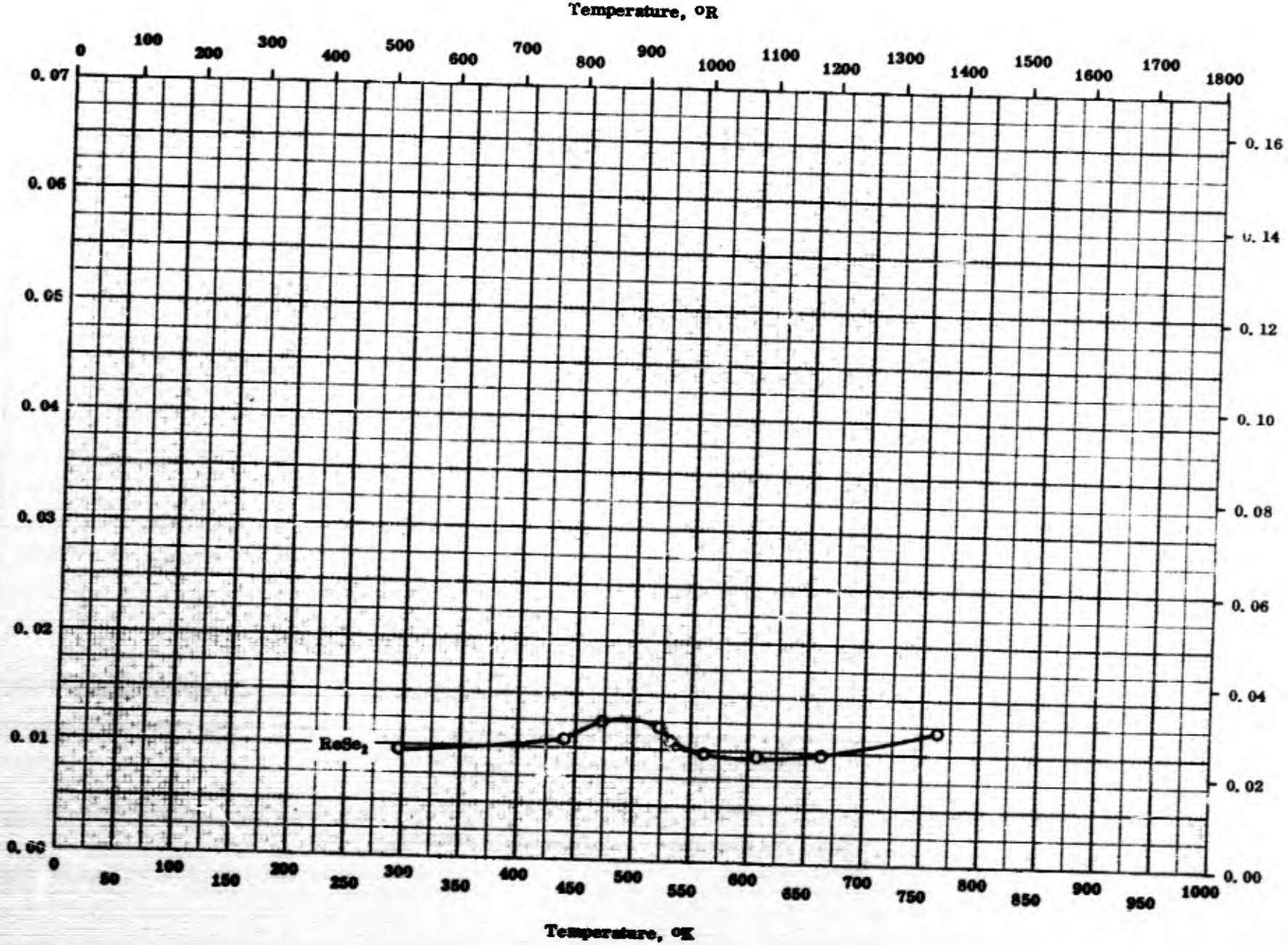


ELECTRICAL RESISTIVITY -- RHENIUM SELENIDE

ELECTRICAL RESISTIVITY -- RHENIUM SELENIDE

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
O	61-11	313-773		$ReSe_2$	Erratic results probably due to strong rectification properties when clamped between copper beryllium contacts; measurement at temperatures over 200C confirmed by a repeat experiment.

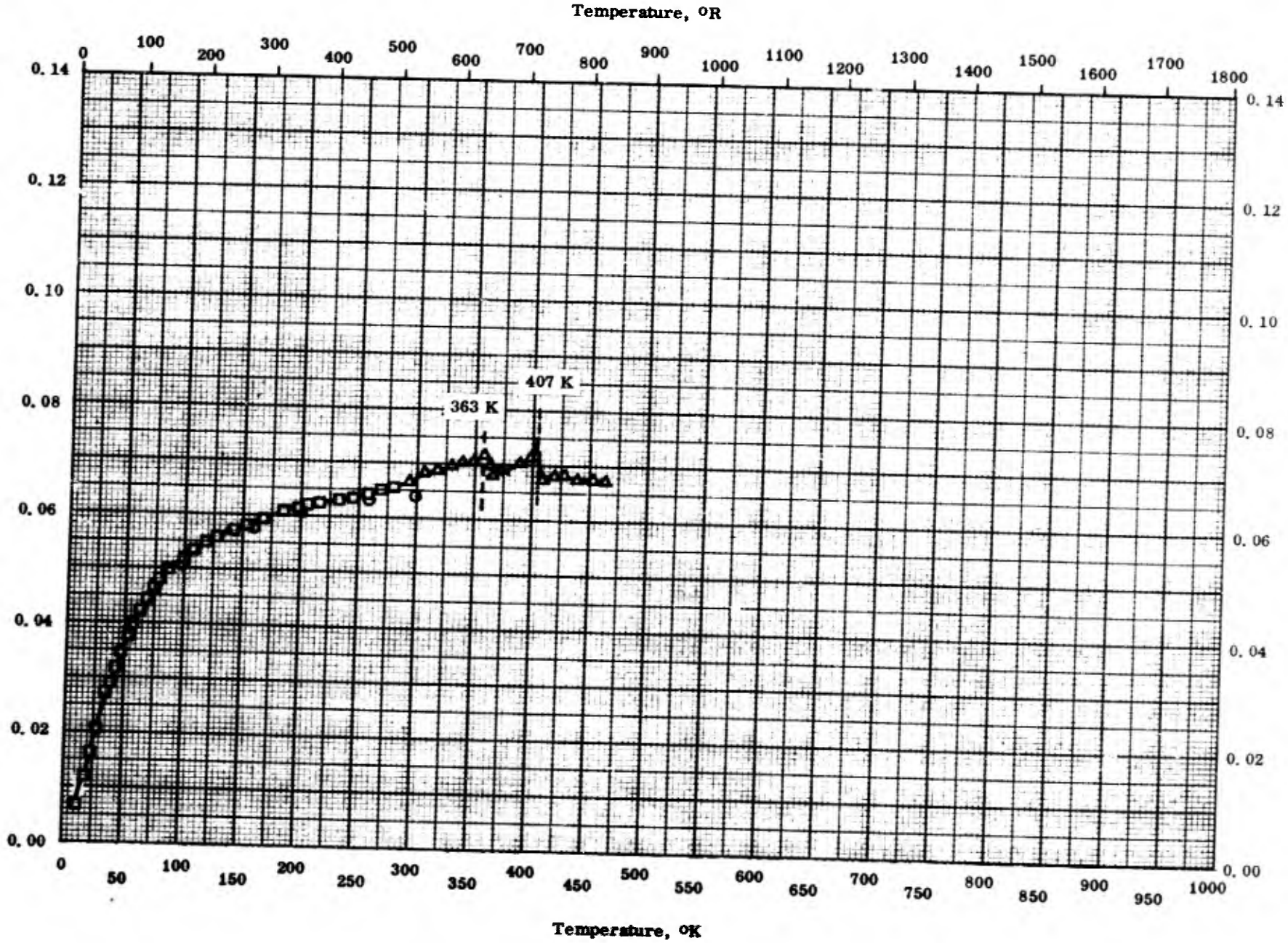


THERMAL CONDUCTIVITY -- RHENIUM SELENIDE

THERMAL CONDUCTIVITY -- RHENIUM SELENIDE

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
O	61-11	296-764		$ReSe_2$.	



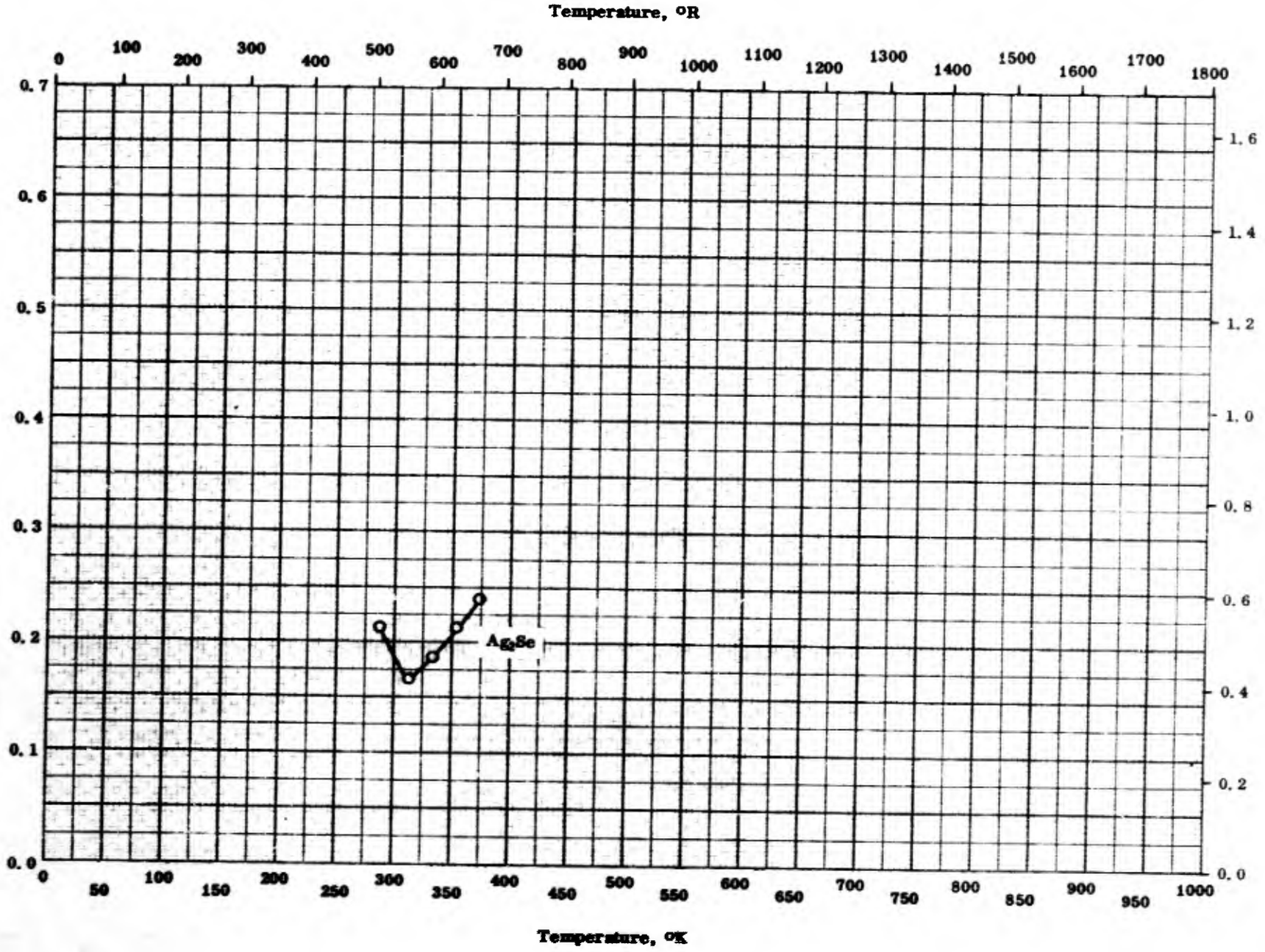
TPRC

SPECIFIC HEAT -- SILVER SELENIDES

SPECIFIC HEAT -- SILVER SELENIDES

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
○	59-16	80-300	3-7	Ag_2Se; polycrystalline.	
□	62-24	16-283		$Ag_{1.99}Se$.	Crushed under argon atmosphere.
△	62-26	307-444	5	Ag_2Se; spectroscopically pure; single crystal.	Zone-melted under controlled vapor pressure; cooled to 150 at 5-10 C per hr; annealed several hrs below transition.



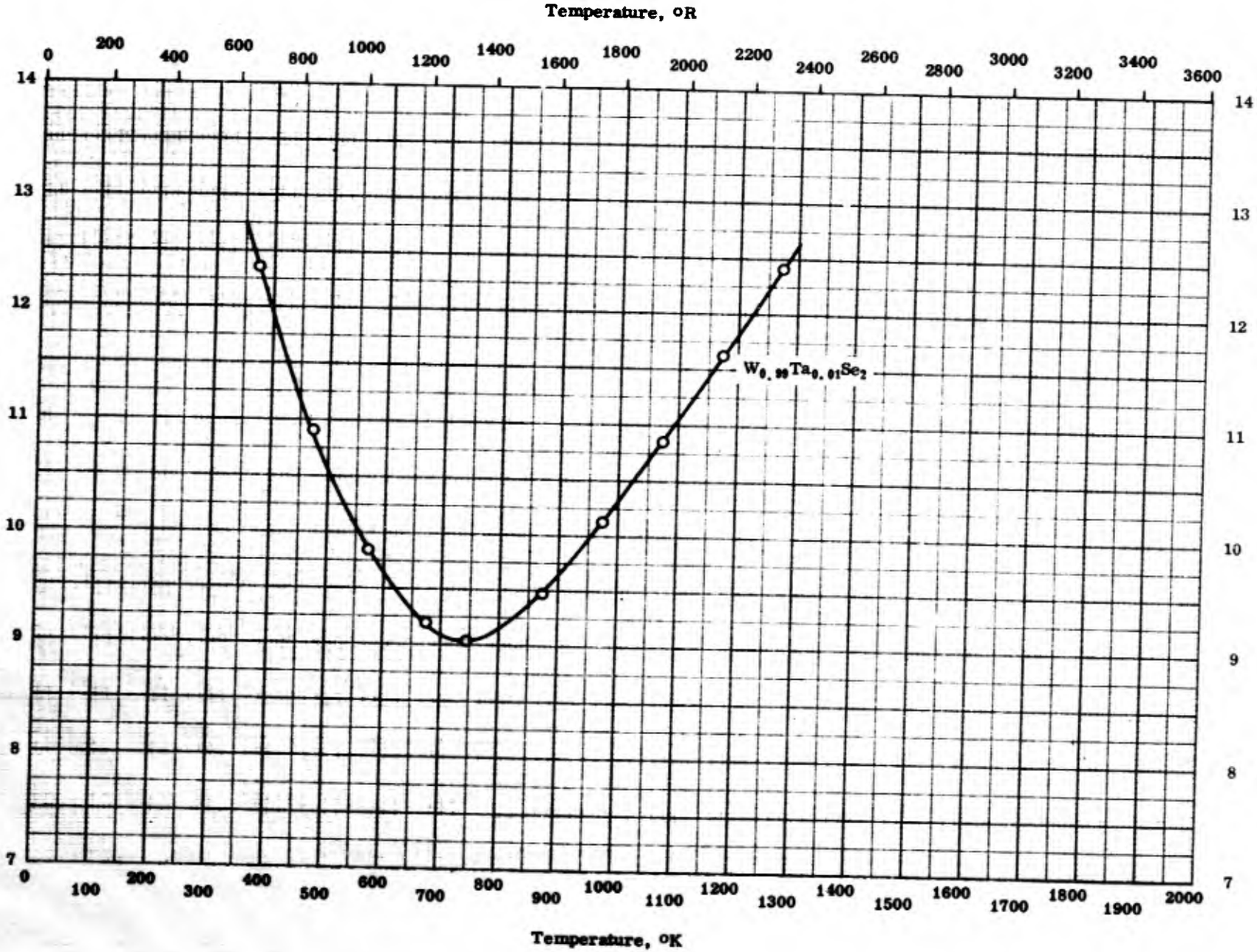
TPRC

THERMAL CONDUCTIVITY -- SILVER SELENIDE

THERMAL CONDUCTIVITY -- SILVER SELENIDE

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
O	60-10	288-373		Ag_2Se; stoichiometric; 99.999+ Se, 99.99+ and 99.9999 Ag, and same high purity of doping materials; homogeneous sample with clean, but slightly pitted, free-oxidation surface.	Raw materials mixing in a quartz tube at 900 C heated to 1050 - 1100 C for 16 hrs followed by 3 hrs cooling in furnace; machined and annealed at 125 C for 48 hrs.

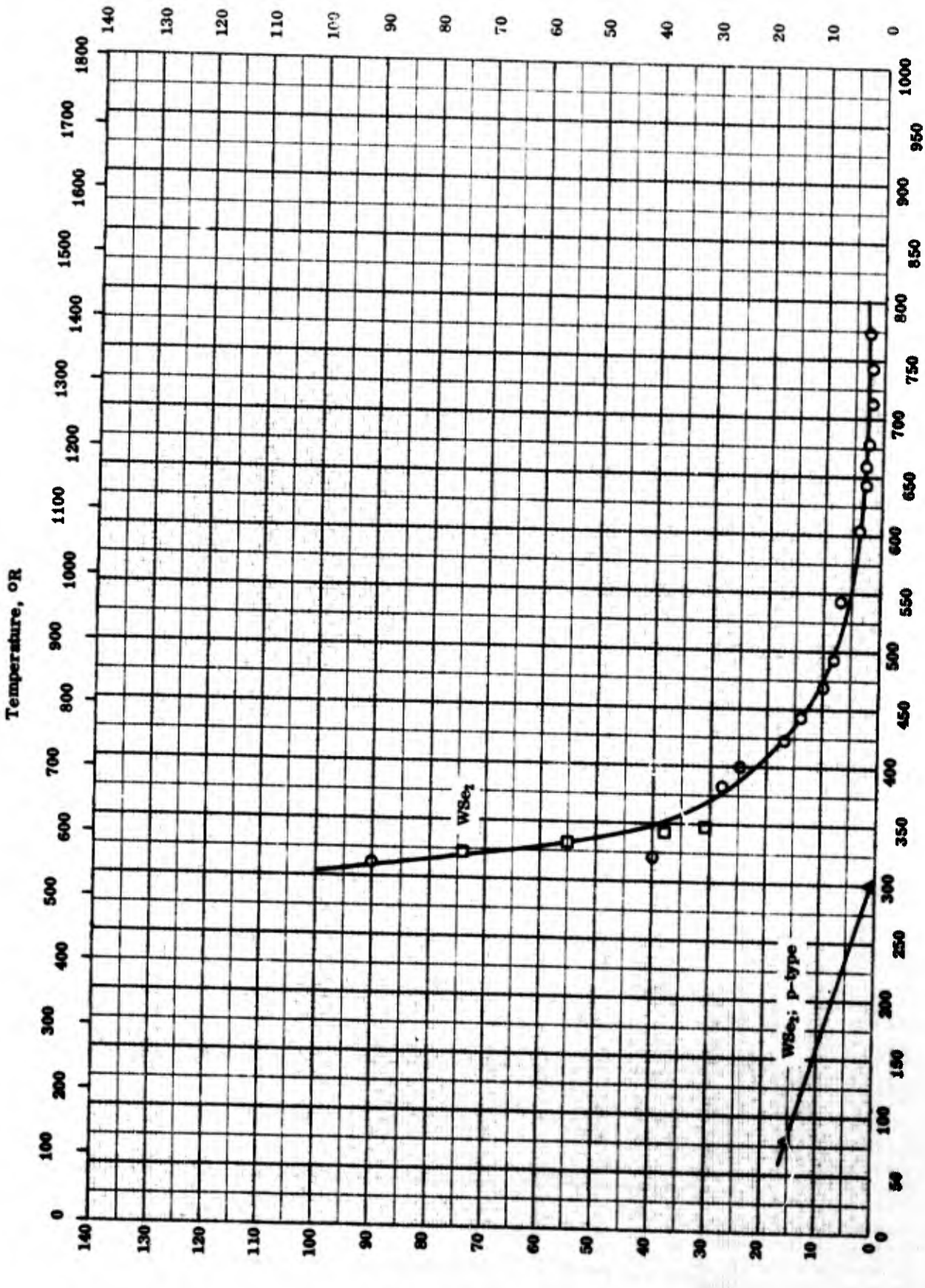


ELECTRICAL RESISTIVITY -- TANTALUM TUNGSTEN SELENIDE

ELECTRICAL RESISTIVITY -- TANTALUM TUNGSTEN SELENIDE

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
O	63-10	373-1273		$W_{0.38}$ $Ta_{0.61}$ Se_2.	Average of two samples including their cooling curves.

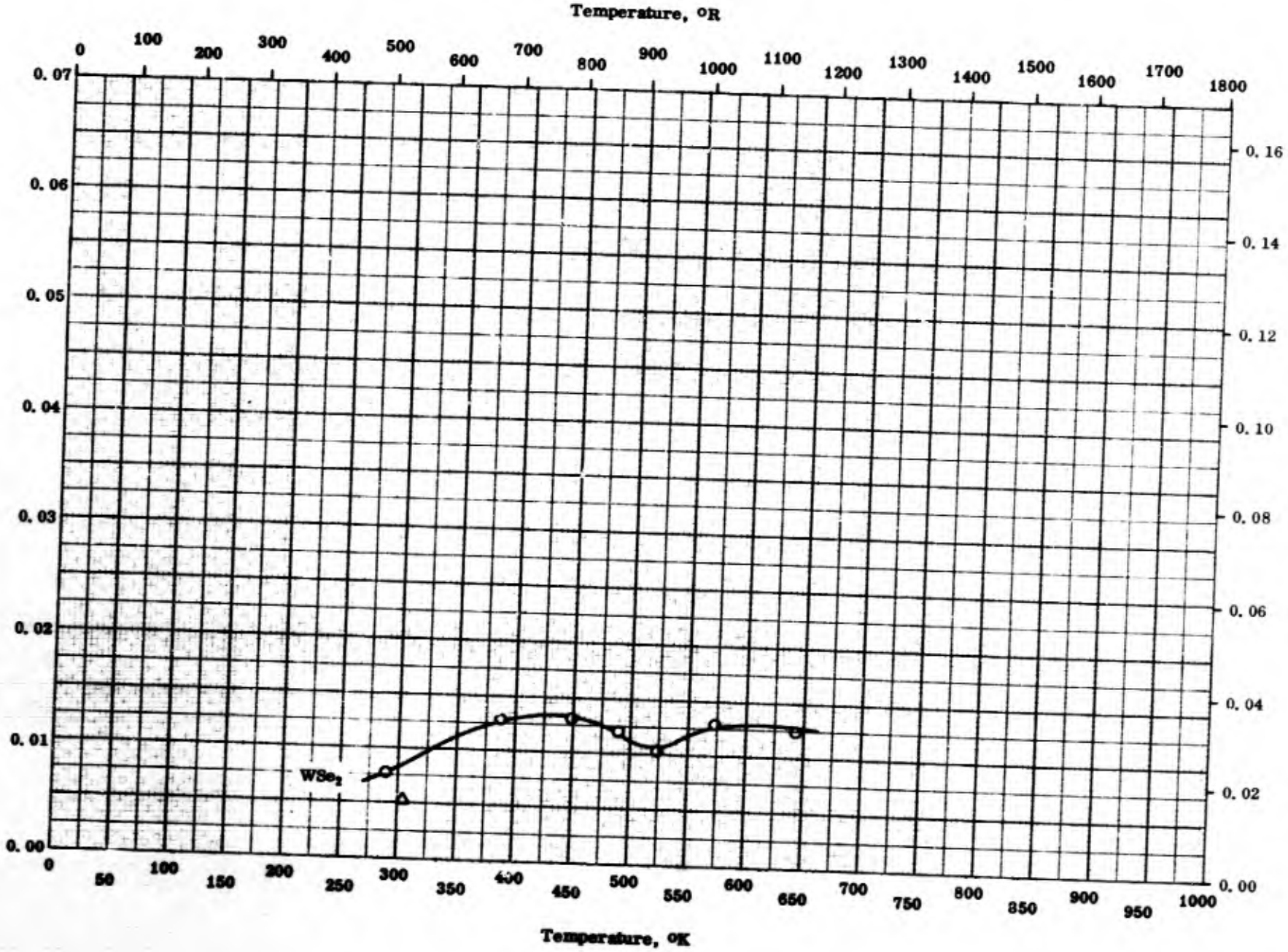


ELECTRICAL RESISTIVITY -- TUNGSTEN SELENIDE

ELECTRICAL RESISTIVITY -- TUNGSTEN SELENIDE

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
○	61-11	312-773		WSe_2.	Hot-pressed.
□	61-17	308-348		WSe_2.	Hot pressed.
△	62-9	77-298		WSe_2; p-type; prepared from 99.9% purity raw materials; a homogeneous polycrystal of grey metallic lustre.	Mixture of powders by firing charges at 600-700 C for 10-15 hrs; again fired at 1000-1200 C for another 10-15 hrs to assure complete reaction.

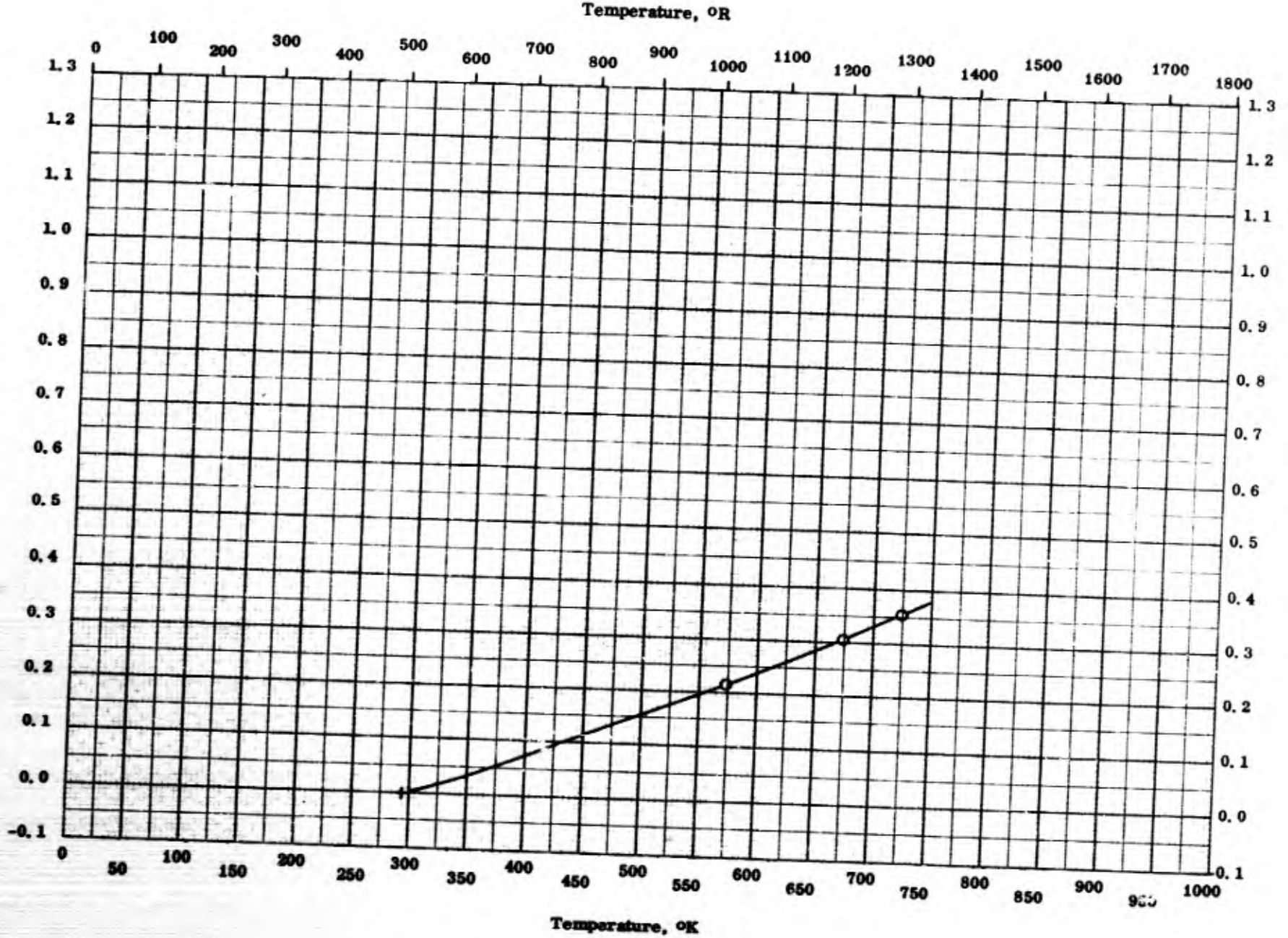


THERMAL CONDUCTIVITY -- TUNGSTEN SELENIDE

THERMAL CONDUCTIVITY -- TUNGSTEN SELENIDE

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
O	61-11	289-643		WSe_2.	
Δ	62-9	306	<±20	99.9* c.p. WSe_2.	Cold-pressed at 80,000 - 100,000 psi and sintered at 600 - 800 C for 10 - 15 hrs.



THERMAL LINEAR EXPANSION -- ZINC SELENIDE

THERMAL LINEAR EXPANSION -- ZINC SELENIDE

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
O	64-15	293-1673		ZnSe; density 5.267 g cm^{-3}.	Hot-pressed.

PROPERTIES OF OTHER MISCELLANEOUS METAL SELENIDES

REPORTED VALUES

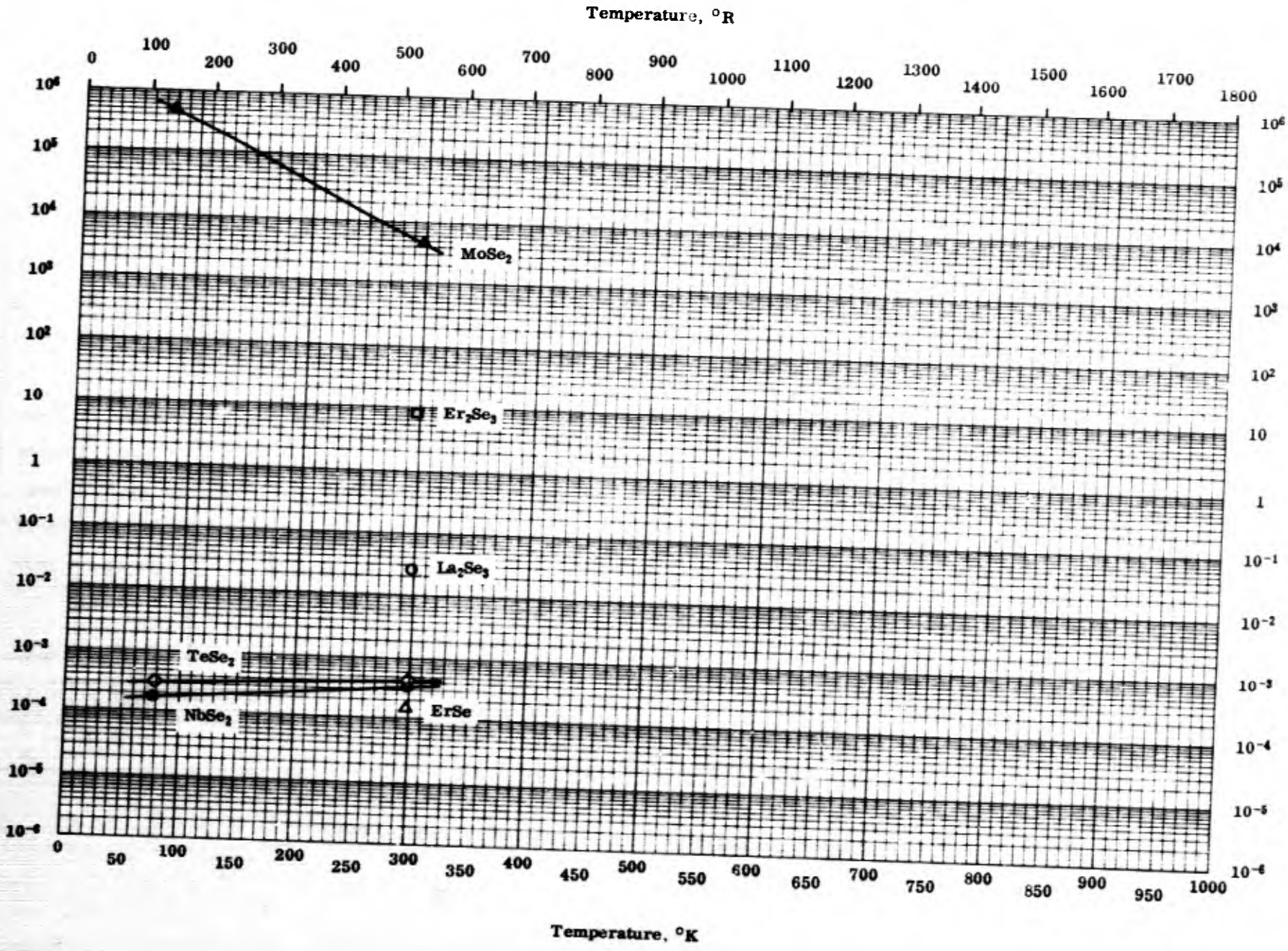
Density		g cm^{-3}	lb ft^{-3}
□	Sc_2Se_3	4.51	281.4
△	YbSe	8.235	513.9
	LaSe	6.34	395.6
	La_3Se_4	9.47	590.9
	La_2Se_3	6.32	394.3
	GdSe	7.53	469.9
	Gd_3Se_4	7.89	492.3
	Gd_2Se_3	7.25	452.4
	SmSe	6.42	400.6
	CeSe	6.55	408.7
	Ce_3Se_4	6.72	419.3
	PrSe	6.80	424.3
	Pr_3Se_4	6.92	431.8
	Pr_2Se_3	6.66	415.6
	NdSe	6.98	435.6
	Nd_3Se_4	6.98	435.6
	Nd_2Se_3	6.83	426.2

Melting Point		K	R
○	BaSe	2143 ± 20	3858 ± 36
▽	CaSe; cubic	1811	3260

PROPERTIES OF OTHER MISCELLANEOUS METAL SELENIDES

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
○	58-16	2123-2163		BaSe.	By visual observation.
□	62-21	298		Sc_2Se_3.	
△	62-21	298		Rare earth metal selenides.	
▽	52-26	1811		Cubic CaSe.	

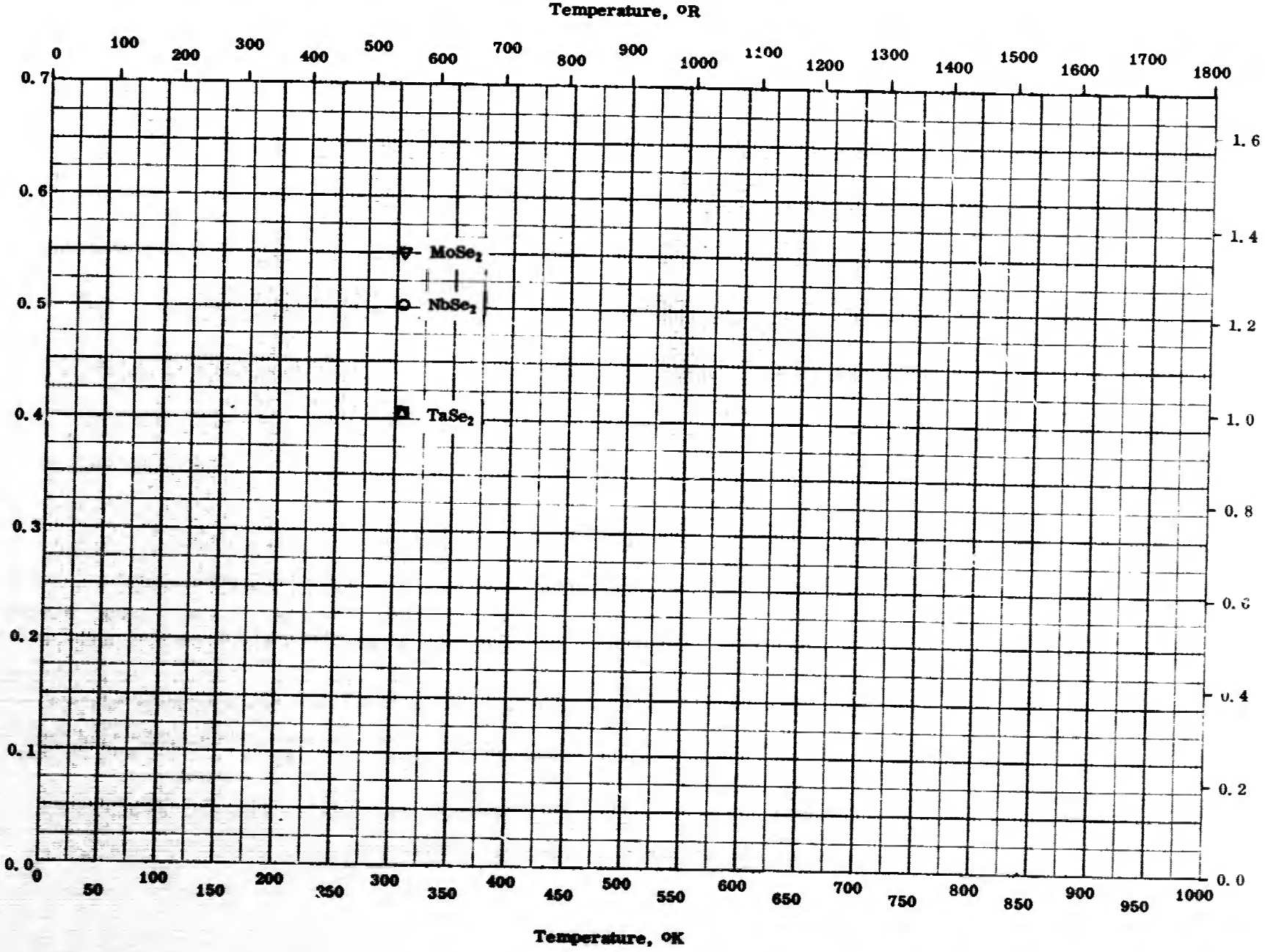


ELECTRICAL RESISTIVITY -- MISCELLANEOUS SELENIDES

ELECTRICAL RESISTIVITY -- MISCELLANEOUS SELENIDES

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
●	62-9	77-298		$NbSe_2$; type n; prepared from 99.9+ purity raw materials; a homogeneous polycrystal product of grey metallic lustre.	Mixture of powders by firing charges at 600-700 C for 10-15 hrs; again fired at 1000-1200 C for another 10-15 hrs to assure complete reaction.
◇	62-9	77-298		$TaSe_2$; same as above.	Same as above.
▲	62-9	77-298		$MoSe_2$; same as above.	Same as above.
○	62-21	298		La_2Se_3.	
□	62-21	298		Er_2Se_3.	
△	62-21	298		ErSe.	



TPRC

THERMAL CONDUCTIVITY -- MISCELLANEOUS SELENIDES

THERMAL CONDUCTIVITY -- MISCELLANEOUS SELENIDES

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
○	62-9	306	< ±20	99.9+ c.p. $NbSe_2$.	Cold-pressed at 80,000 - 100,000 psi and sintered at 600 - 800 C for 10 - 15 hrs.
□	62-9	306	< ±20	99.9+ c.p. $TaSe_2$.	Same as above.
▽	62-9	306	< ±20	99.9+ c.p. $MoSe_2$.	Same as above.

PROPERTIES OF BARIUM SILICIDES

MOST PROBABLE VALUES

Property	C.G.S. Units	Brit. Eng. Units
Melting Point	2213	3983

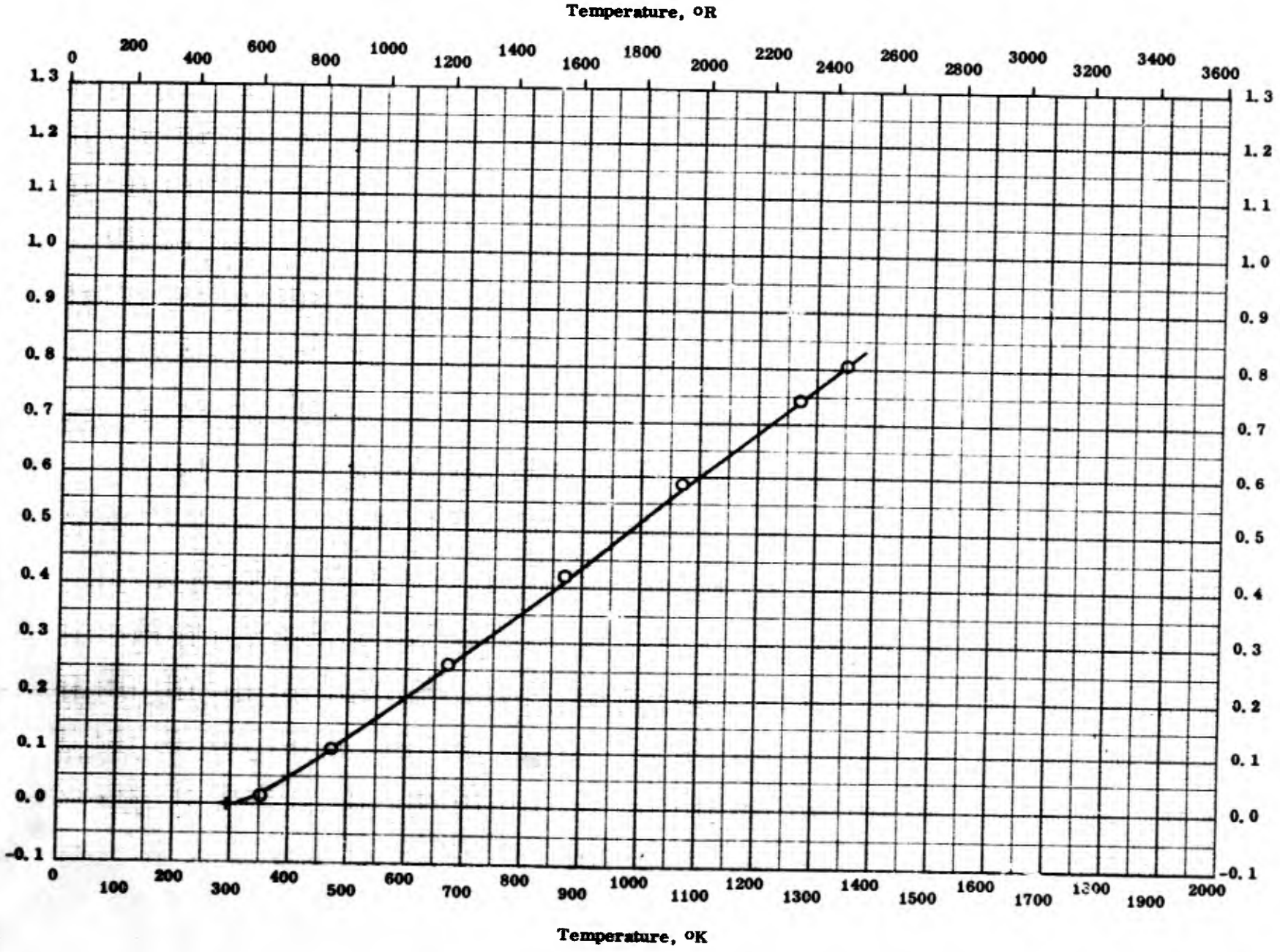
REPORTED VALUES

Melting Point	K	R
O $BaSi_2$	2213 ± 50	3983 ± 90

PROPERTIES OF BARIUM SILICIDES

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
O	63-33	2163-2263		$BaSi_2$.	

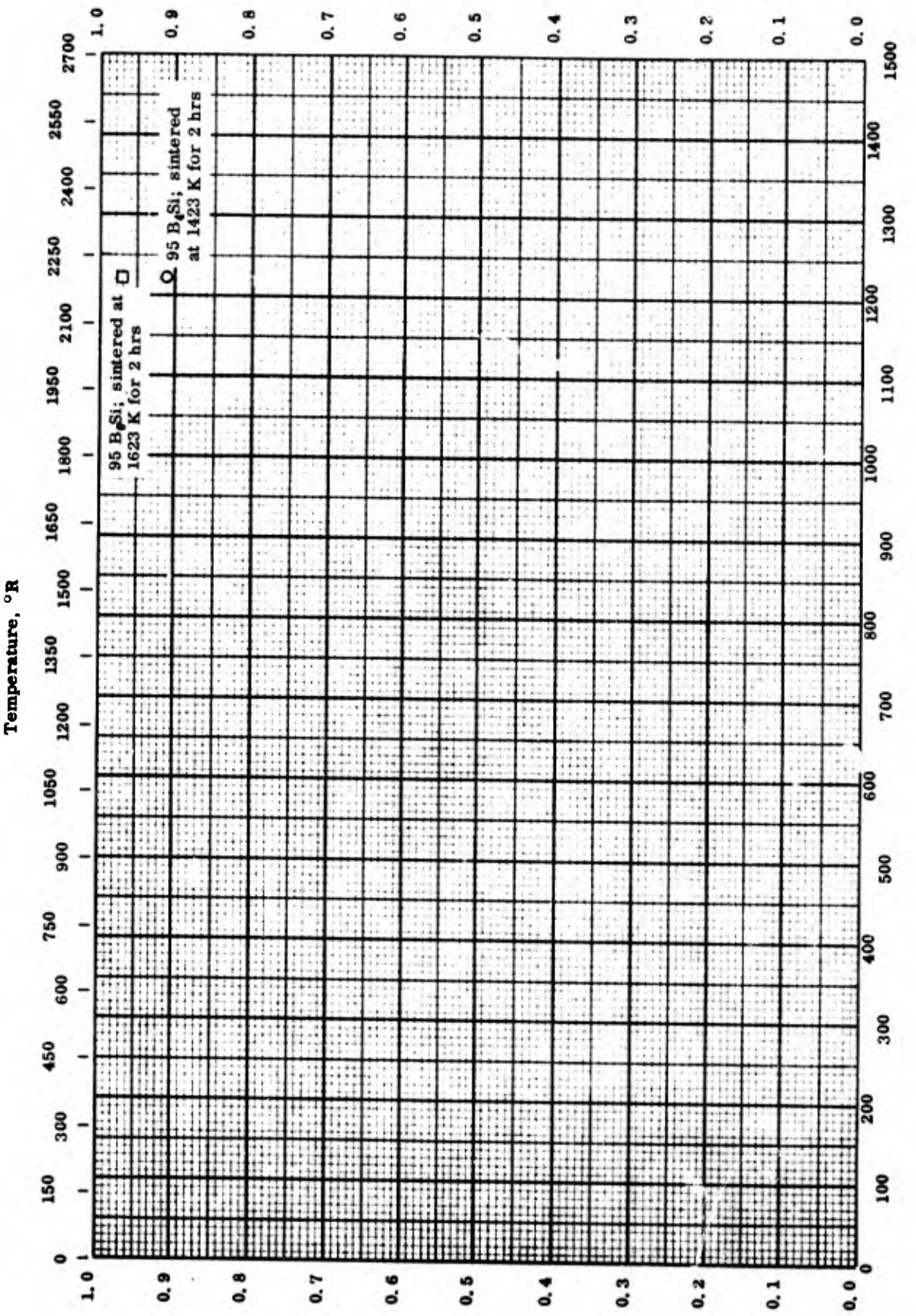


THERMAL LINEAR EXPANSION -- BARIUM SILICIDE

THERMAL LINEAR EXPANSION -- BARIUM SILICIDE

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
O	63-28	293-1353		$BaSi_2$; 68.8 Ba and 27.2 total Si.	Sintered, hot pressed, and annealed; fusion temperature 2123 K.

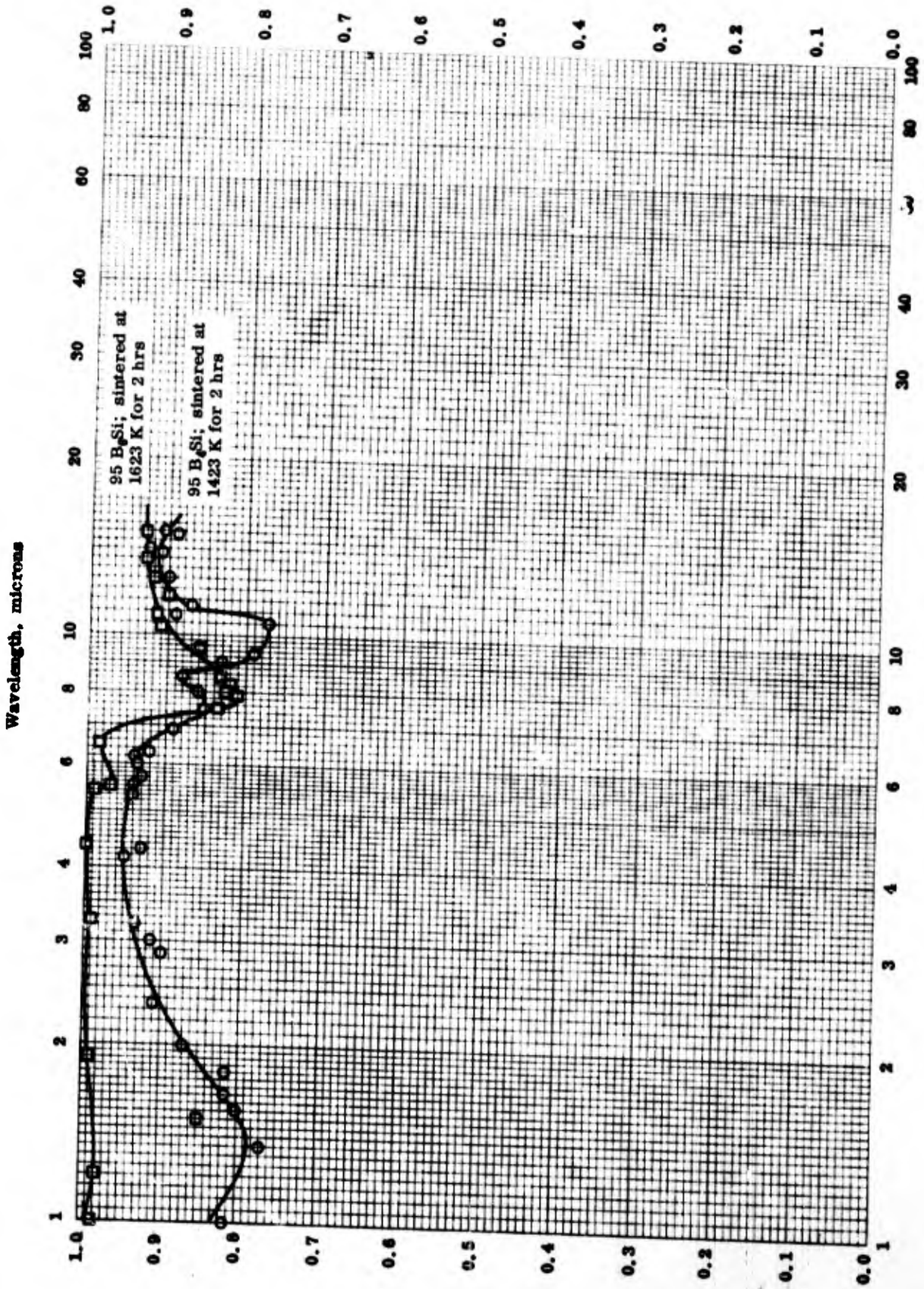


NORMAL TOTAL EMITTANCE -- BORON SILICIDES

NORMAL TOTAL EMITTANCE -- BORON SILICIDES

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
○	63-16	1223	± 8	95 pure B_4Si; 0.066 in. thickness plate; density 1.32 g cm^{-3}.	Sintered at 1423 K for 2 hrs.; measured in argon atmosphere; calculated from spectral data.
□	63-16	1223	± 8	95 pure B_6 Si; 0.082 in. thickness plate; density 1.32 g cm^{-3}.	Sintered at 1623 K for 2 hrs.; measured in argon atmosphere; calculated from spectral data.

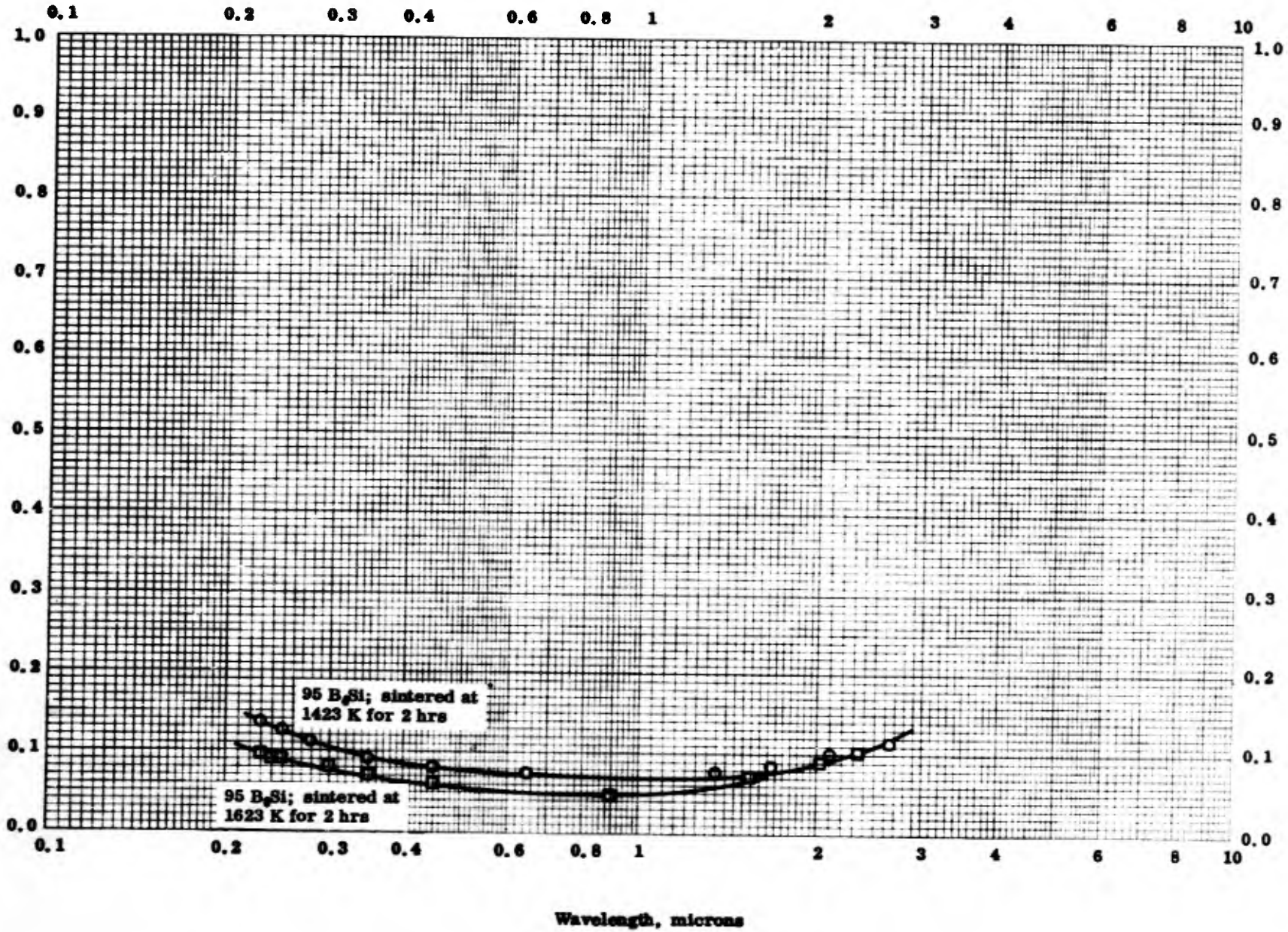


NORMAL SPECTRAL EMITTANCE -- BORON SILICIDES

NORMAL SPECTRAL EMITTANCE -- BORON SILICIDES

REFERENCE INFORMATION

Symbol	Ref.	Temp. °K	Wavelength Range, μ	Rept. Error %	Sample Specifications	Remarks
○	63-16	1223	1-15		95 pure B_4Si; 0.066 in. thickness plate; density 1.32 g cm^{-3}.	Sintered at 1423 K for 2 hrs; measured in argon atmosphere; data taken from a curve.
□	63-16	1223	1-15		95 pure B_6Si; 0.082 in. thickness plate; density 1.32 g cm^{-3}.	Sintered at 1623 K for 2 hrs; measured in argon atmosphere; data taken from a curve.



NORMAL SPECTRAL REFLECTANCE -- BORON SILICIDES

NORMAL SPECTRAL REFLECTANCE -- BORON SILICIDES

REFERENCE INFORMATION

Symbol	Ref.	Temp. °K	Wavelength Range, μ	Rept. Error %	Sample Specifications	Remarks
○	63-16	298	0.23-2.65	5	95 pure B_4Si; 0.066 in. thickness plate; density 1.32 g cm^{-3}.	Sintered at 1423 K for 2 hrs; data taken from a curve; normal incidence, hemispherical viewing; MgO as reference standard.
□	63-16	298	0.23-2.65	5	95 pure B_6Si; 0.082 in. thickness plate; density 1.32 g cm^{-3}.	Sintered at 1623 K for 2 hrs; data taken from a curve; normal incidence, hemispherical viewing; MgO as reference standard.

PROPERTIES OF CHROMIUM SILICIDES

REPORTED VALUES

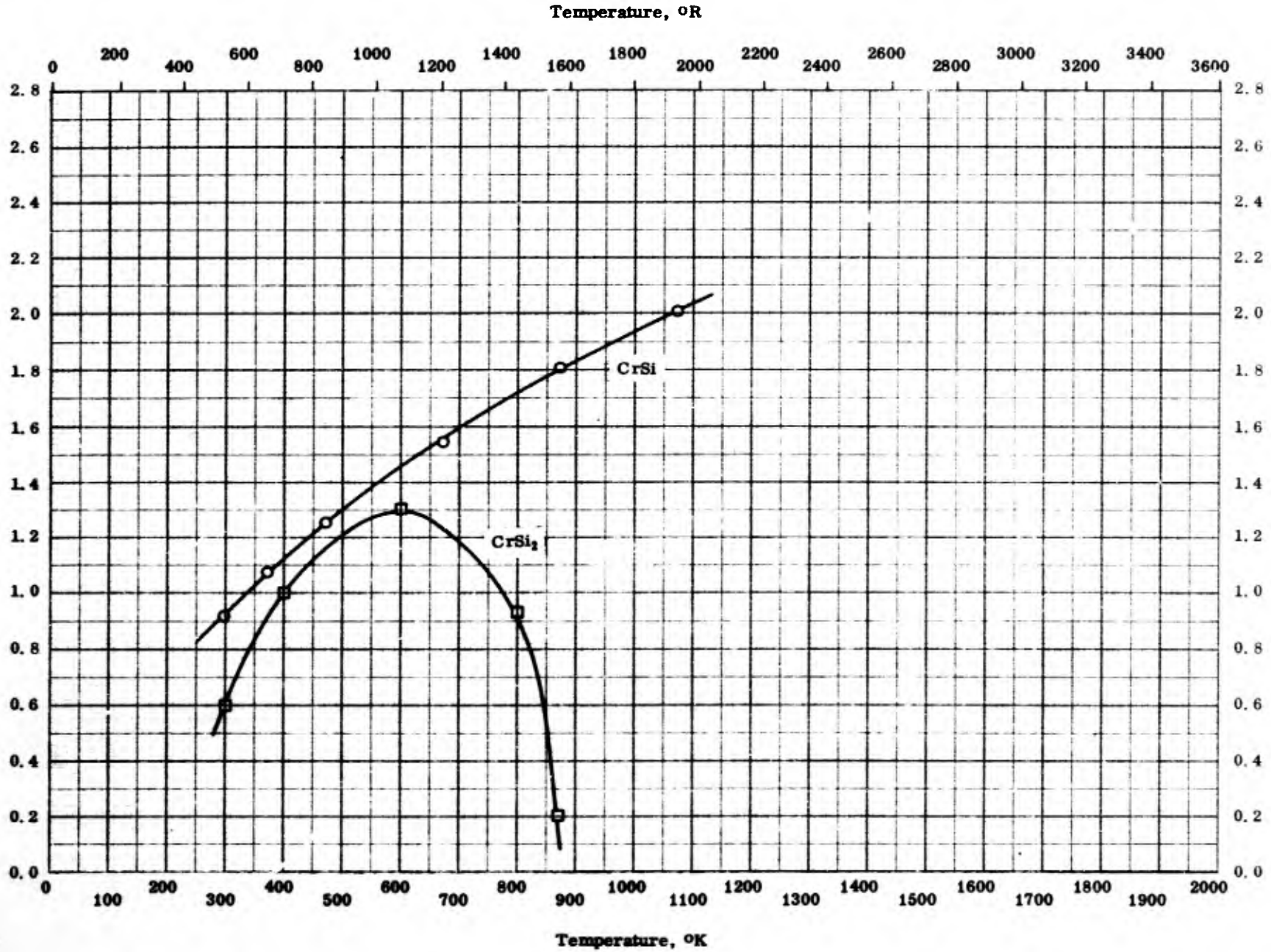
Melting Point		K	R
○	$CrSi_2$	1773 ± 20*	3191 ± 36*
	CrSi	1818 ± 50*	3272 ± 90*
	Cr_5Si	1873 ± 50*	3371*
□	$CrSi_2$	<1706	<3071
	CrSi; cubic	<1761	3089
△	$CrSi_2$	1822	3280
	CrSi; cubic	1817	3271
	Cr_5Si; tegragonal	1822	3280
▽	Cr_3Si; cubic	1983	3569
◇	$CrSi_2$	1845	3321

*Most probable value for this compound.

PROPERTIES OF CHROMIUM SILICIDES

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
○	59-28	1753-1923		Series of chromium silicides.	Decomp. temperature for Cr_5Si.
□	55-34	1706-1761		Same as above; CrSi in cubic structure.	
△	53-25	1817-1822		Same as above except Cr_5Si in tetragonal form.	
▽	56-34	1983		Cr_3Si; cubic.	
◇	53-27	1845		$CrSi_2$.	



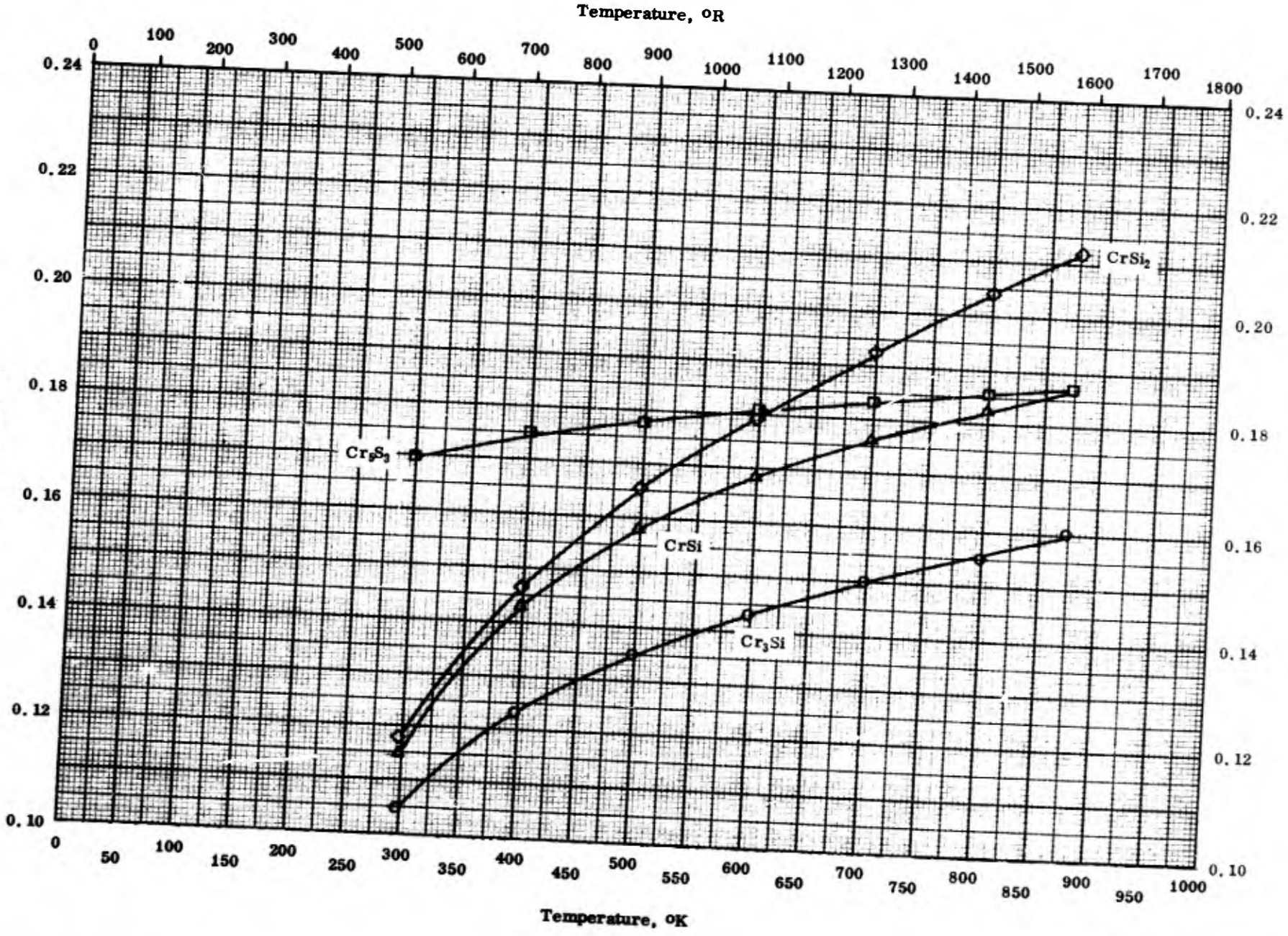
Electrical Resistivity, ohm cm x 10⁴

ELECTRICAL RESISTIVITY -- CHROMIUM SILICIDES

ELECTRICAL RESISTIVITY -- CHROMIUM SILICIDES

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
○	61-16	298-1073		CrSi.	
□	60-11	300-870		$CrSi_2$.	

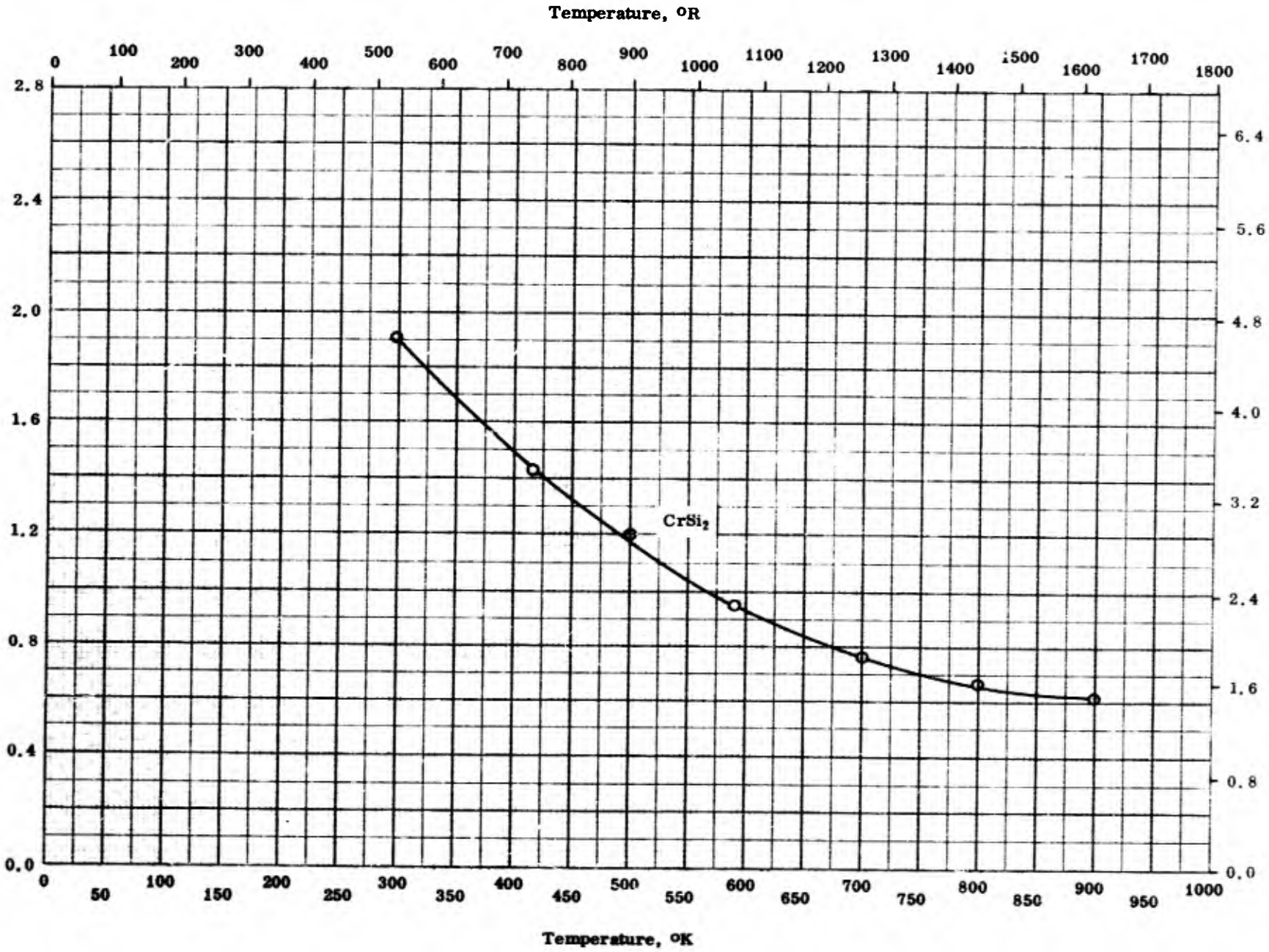


SPECIFIC HEAT -- CHROMIUM SILICIDES

SPECIFIC HEAT -- CHROMIUM SILICIDES

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
○	61-20	298-873	± 2	Cr_3Si; stoichiometric.	Under argon atm.
□	61-20	298-873	± 2	Cr_5Si_3; stoichiometric.	Same as above.
△	61-20	298-873	± 2	CrSi; stoichiometric.	Same as above.
◇	61-20	298-873	± 2	$CrSi_2$; stoichiometric.	Same as above.

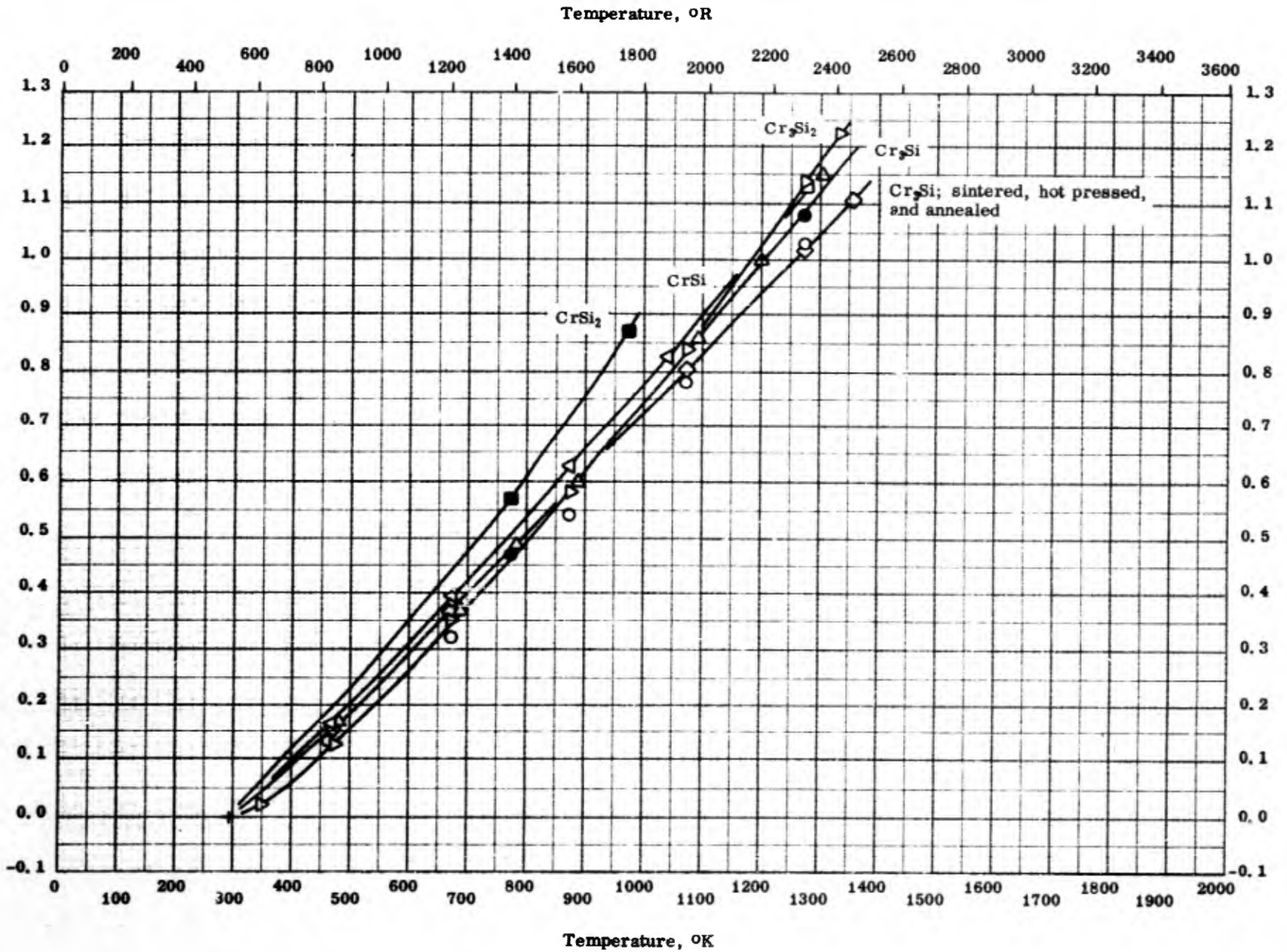


THERMAL CONDUCTIVITY -- CHROMIUM SILICIDE

THERMAL CONDUCTIVITY -- CHROMIUM SILICIDE

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
O	60-11	297-900		$CrSi_2$.	

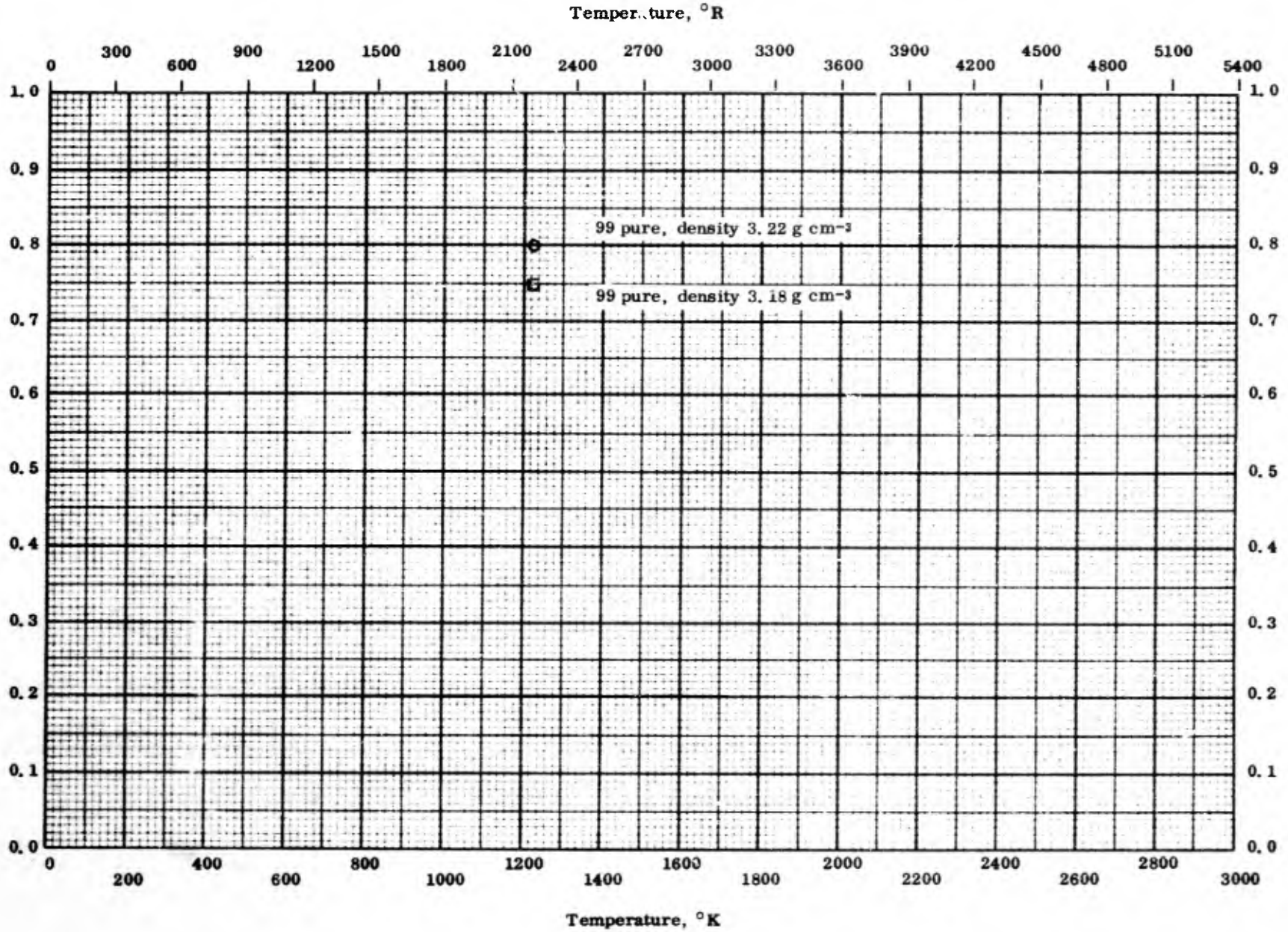


THERMAL LINEAR EXPANSION -- CHROMIUM SILICIDES

THERMAL LINEAR EXPANSION -- CHROMIUM SILICIDES

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
○	53-13	473-1273		Nominally Cr_3Si.	Hot pressed.
□	54-14	293-1273		CrSi; 95.8% of theor. density.	Tested in He atmosphere.
△	55-15	273-1303		Cr_3Si; 0.01 - 0.1 V, 0.001 - 0.01 ea. Al, Ca, Fe, Mn, Pb, Sn, Ti, and 0.0001 - 0.001 ea. Cu, Mg.	
▷	63-28	293-1333		$CrSi_2$; 73.8 Cr and 26.9 total Si (0.6 free).	Sintered, hot pressed, and annealed; fusion temperature 1883 K.
◁	63-28	293-1043		CrSi; 65.1 Cr and 36.2 Si (0.6 free).	Sintered, hot pressed, and annealed; fusion temperature 1818 K.
◇	63-28	293-1353		Cr_3Si; 85.0 Cr and 14.9 total Si.	Sintered, hot pressed, and annealed; fusion temperature 1383 K.
●	60-27	298-1273		Cr_3Si.	
■	60-27	298-973		$CrSi_2$.	

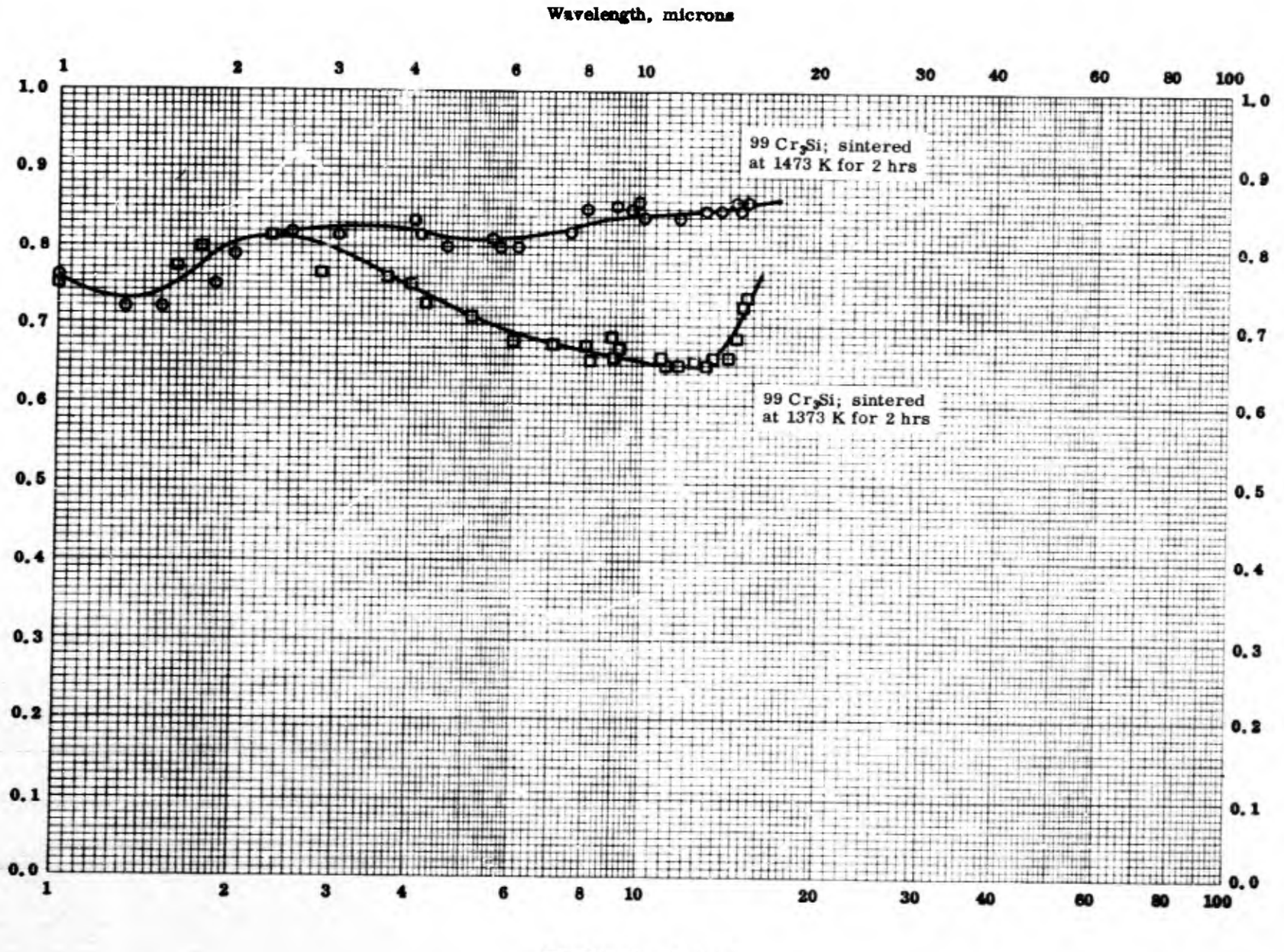


NORMAL TOTAL EMITTANCE -- TRICHROMIUM SILICIDE

NORMAL TOTAL EMITTANCE -- TRICHROMIUM SILICIDE

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
○	63-16	1223	±8	99 pure Cr_3Si; 0.05 in. thickness plate; density 3.22 g cm^{-3}.	Sintered at 1473 K for 2 hrs; measured in argon atm; calculated from spectral data.
□	63-16	1223	±8	99 pure Cr_3Si; 0.063 in. thickness plate; density 3.18 g cm^{-3}.	Same as above except sintered at 1373 K for 2 hrs.

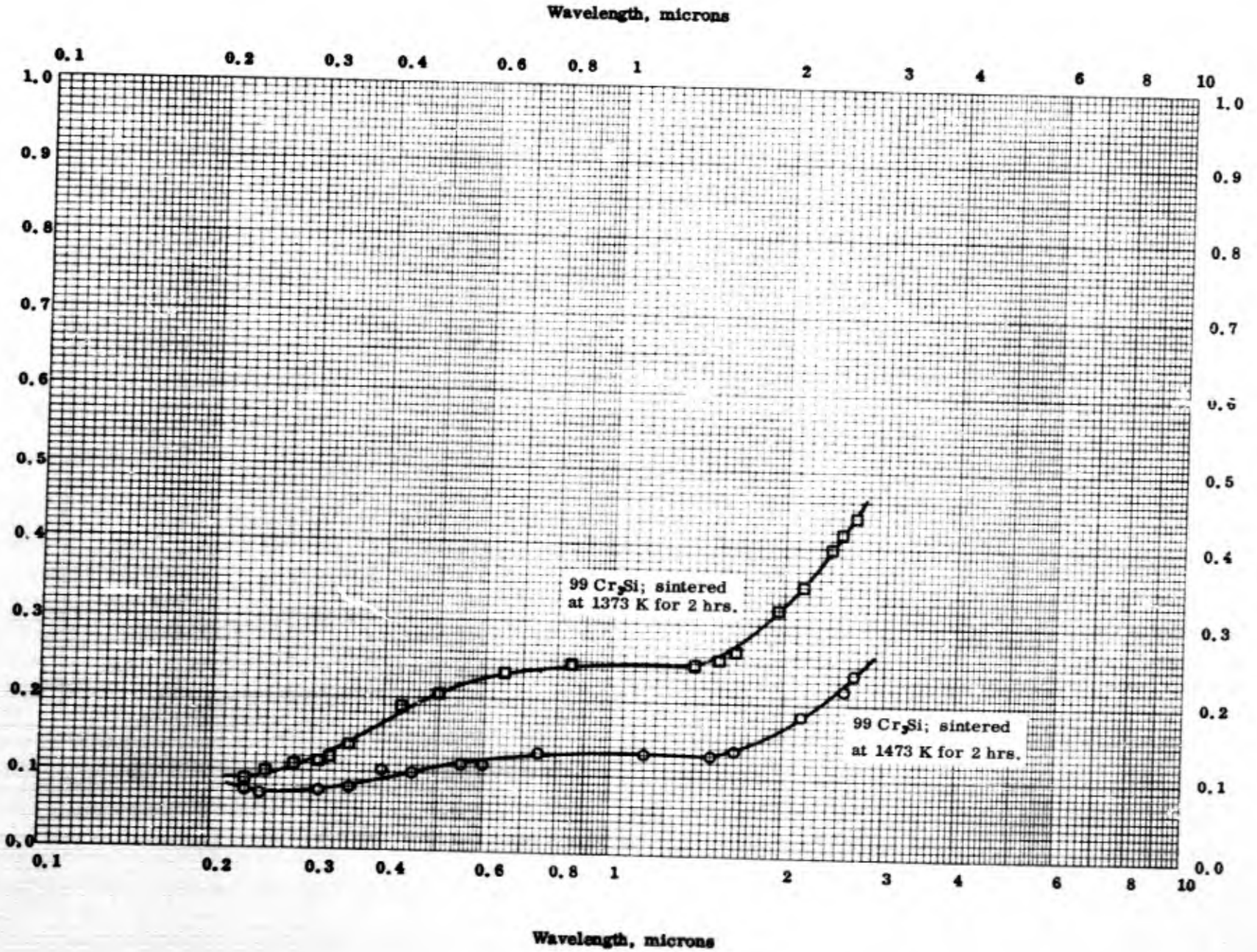


NORMAL SPECTRAL EMITTANCE -- TRICHROMIUM SILICIDE

NORMAL SPECTRAL EMITTANCE -- TRICHROMIUM SILICIDE

REFERENCE INFORMATION

Symbol	Ref.	Temp. °K	Wavelength Range μ	Rept. Error%	Sample Specifications	Remarks
○	63-16	1223	1-15		99 pure Cr_3Si; 0.05 in. thickness plate; density 3.22 g cm^{-3}.	Sintered at 1473 K for 2 hrs; measured in argon; data taken from a curve.
□	63-16	1223	1-15		99 pure Cr_3Si; 0.063 in. thickness plate; density 3.18 g cm^{-3}.	Same as above except sintered at 1373 K for 2 hrs.



NORMAL SPECTRAL REFLECTANCE -- TRICHROMIUM SILICIDE

NORMAL SPECTRAL REFLECTANCE -- TRICHROMIUM SILICIDE

REFERENCE INFORMATION

Symbol	Ref.	Temp. °K	Wavelength Range μ	Rept. Error%	Sample Specifications	Remarks
O	63-16	298	0.23-2.65	5	99 pure Cr_3Si; 0.05 in. thickness plate; density 3.22 g cm^{-3}.	Sintered at 1473 K for 2 hrs; data taken from a curve; normal incidence, hemispherical viewing; MgO as reference standard.
□	63-16	298	0.23-2.65	5	99 pure Cr_3Si; 0.063 in. thickness plate; density 3.18 g cm^{-3}.	Same as above except sintered at 1373 K for 2 hrs.

PROPERTIES OF COBALT SILICIDES

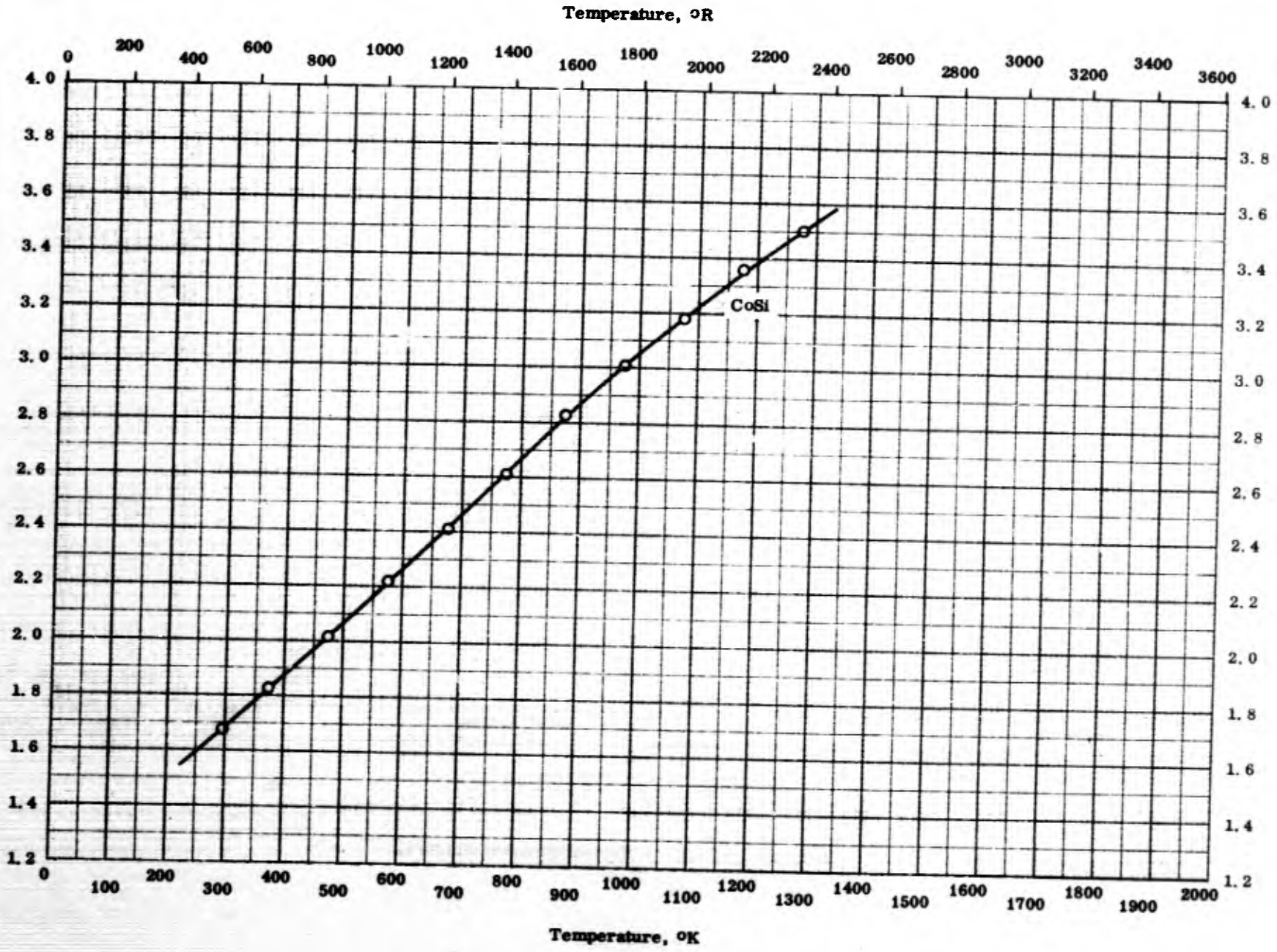
REPORTED VALUES

Melting Point		K	R
○	$CoSi_3$	1579	2842
	$CoSi_2$	1550	2790
	CoSi	1688	3038
	Co_2Si	1605	2889
	Co_3Si	1483	2669
□	Co_2Si; orthorhombic	1733	3119

PROPERTIES OF COBALT SILICIDES

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
○	59-28	1483-1688		Series of cobalt silicides.	Decomp. temperature for Co_2Si.
□	37-1	1733		Co_2Si; orthorhombic.	

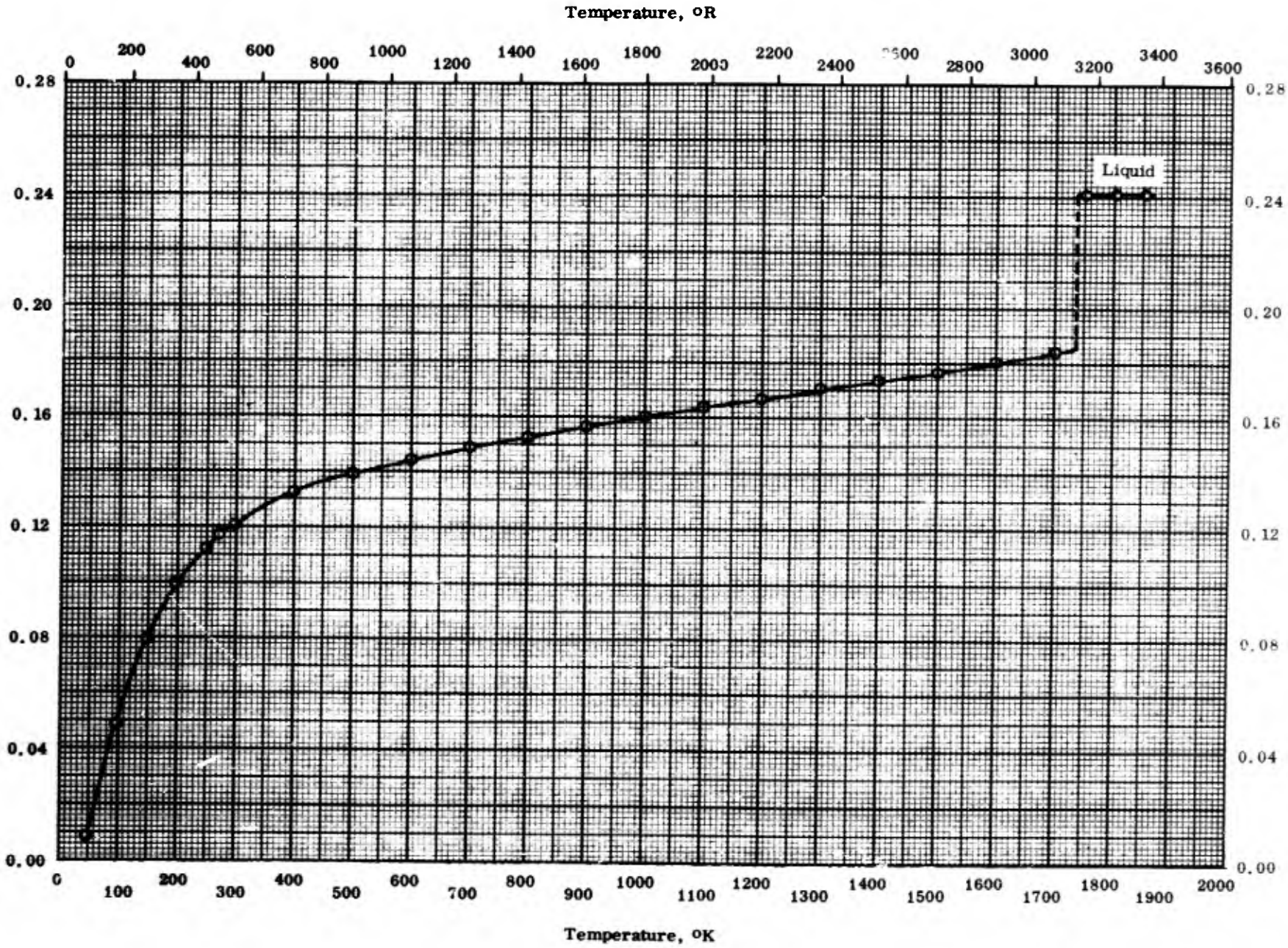


ELECTRICAL RESISTIVITY -- COBALT SILICIDE

ELECTRICAL RESISTIVITY -- COBALT SILICIDE

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
O	61-16	298-1273		CoSi.	



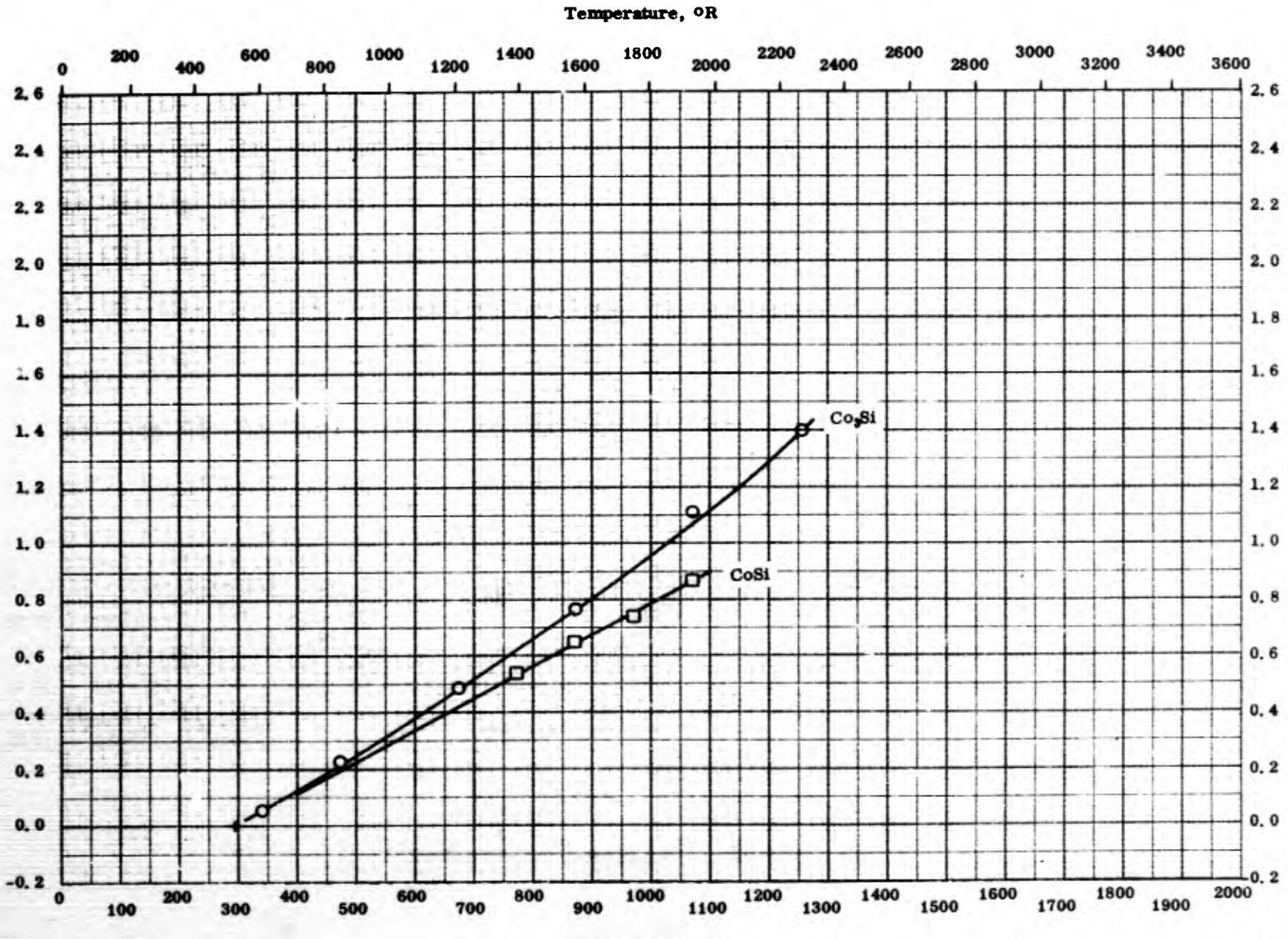
TPRC

SPECIFIC HEAT — COBALT SILICIDE

SPECIFIC HEAT -- COBALT SILICIDE

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
O	64-8	50-1850		CoSi; stoichiometric; prepared from 99.98 Co and 99.97 Si.	Made by melting elements in purified argon.

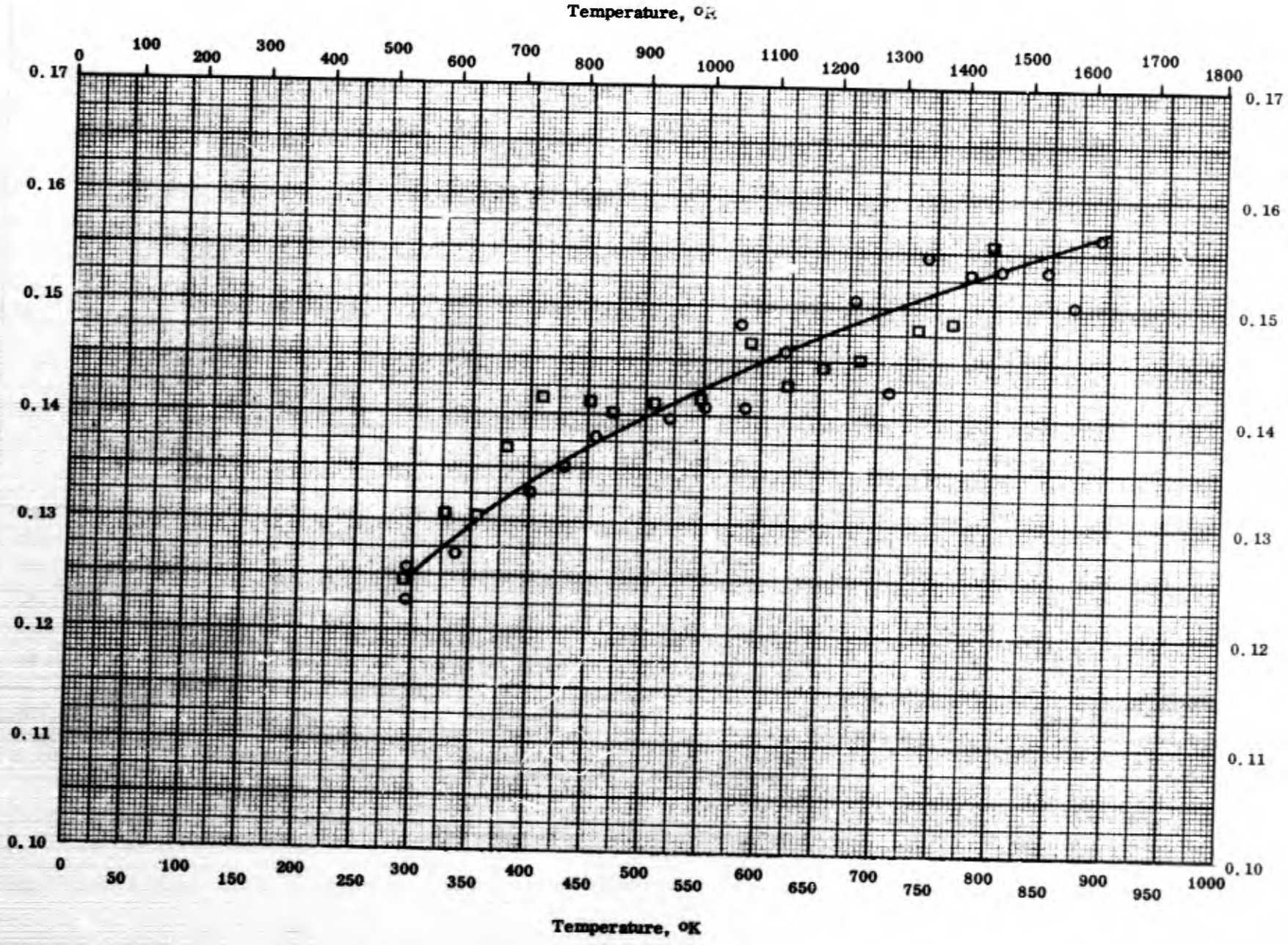


THERMAL LINEAR EXPANSION -- COBALT SILICIDES

THERMAL LINEAR EXPANSION -- COBALT SILICIDES

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
○	63-28	293-1258		Co_2Si; 86.4 Co and 13.1 total Si.	Sintered, hot pressed, and annealed; fusion temperature 1483 K.
□	62-36	293-1073		CoSi.	X-ray method; iron radiation; calculated from lattice parameter.

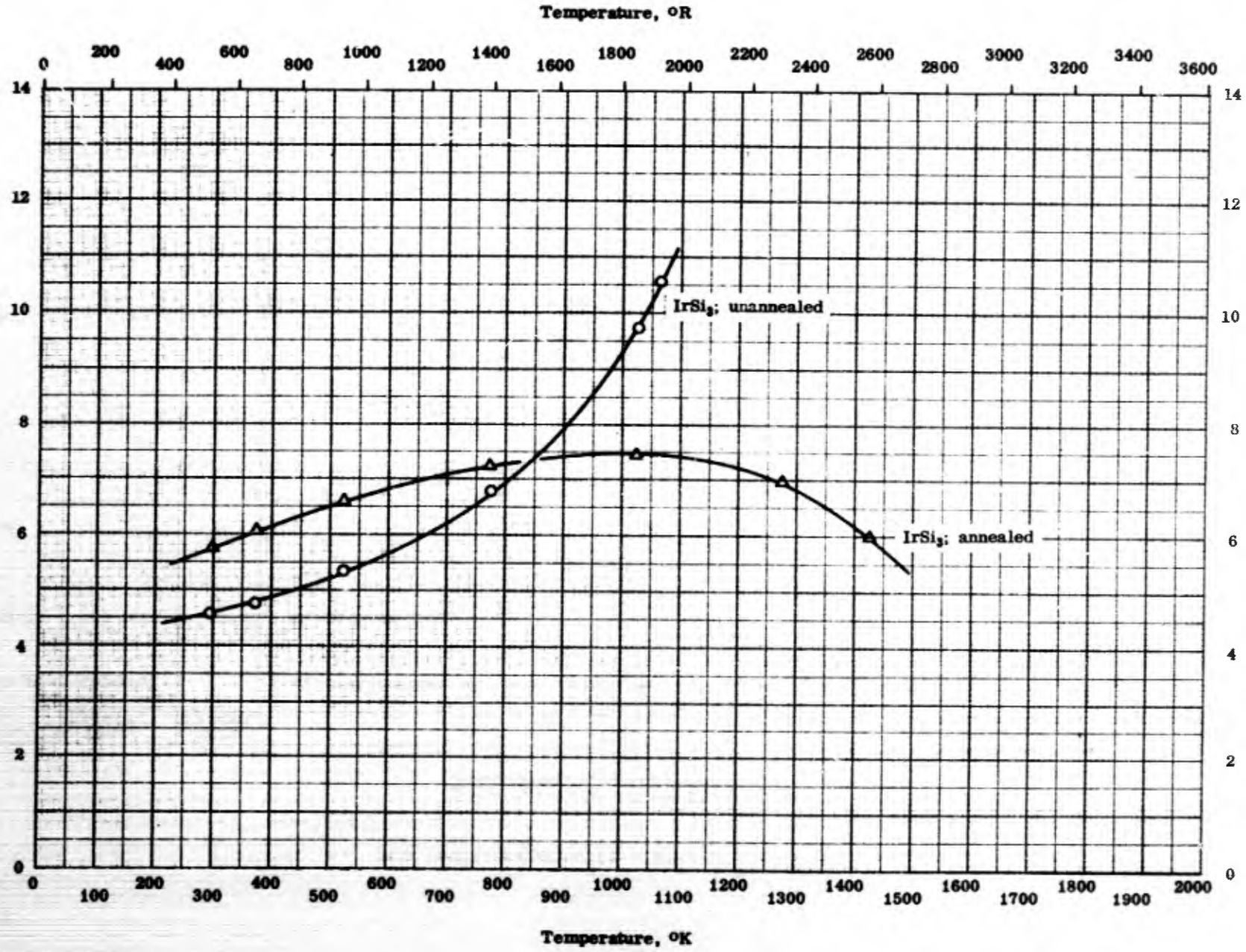


SPECIFIC HEAT -- GERMANIUM SILICIDE

SPECIFIC HEAT -- GERMANIUM SILICIDE

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
○	64-7 also 65-1	297-891		SiGe No. 46; 52.5 Ge and 47.4 Si; n-type; resistivity 1.7×10^{-3} ohm cm^{-1}.	
□	64-7 also 65-1	295-799		SiGe No. 75; 52.6 Ge and 47.4 Si; p-type; resistivity 2.0×10^{-3} ohm cm^{-1}.	



ELECTRICAL RESISTIVITY -- IRIDIUM TRISILICIDE

Electrical Resistivity, ohm cm x 10⁴

ELECTRICAL RESISTIVITY -- IRIDIUM TRISILICIDE

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
O	61-16	298-1061		$IrSi_3$; prepared from 99.5 pure iridium and 99.99 pure silicon.	Made by fusing iridium and silicon under argon atm. by induction heating.
Δ	61-16	298-1423		$IrSi_3$; same as above.	Same as above; annealed at 800 C for 15 hrs.

PROPERTIES OF IRON SILICIDES

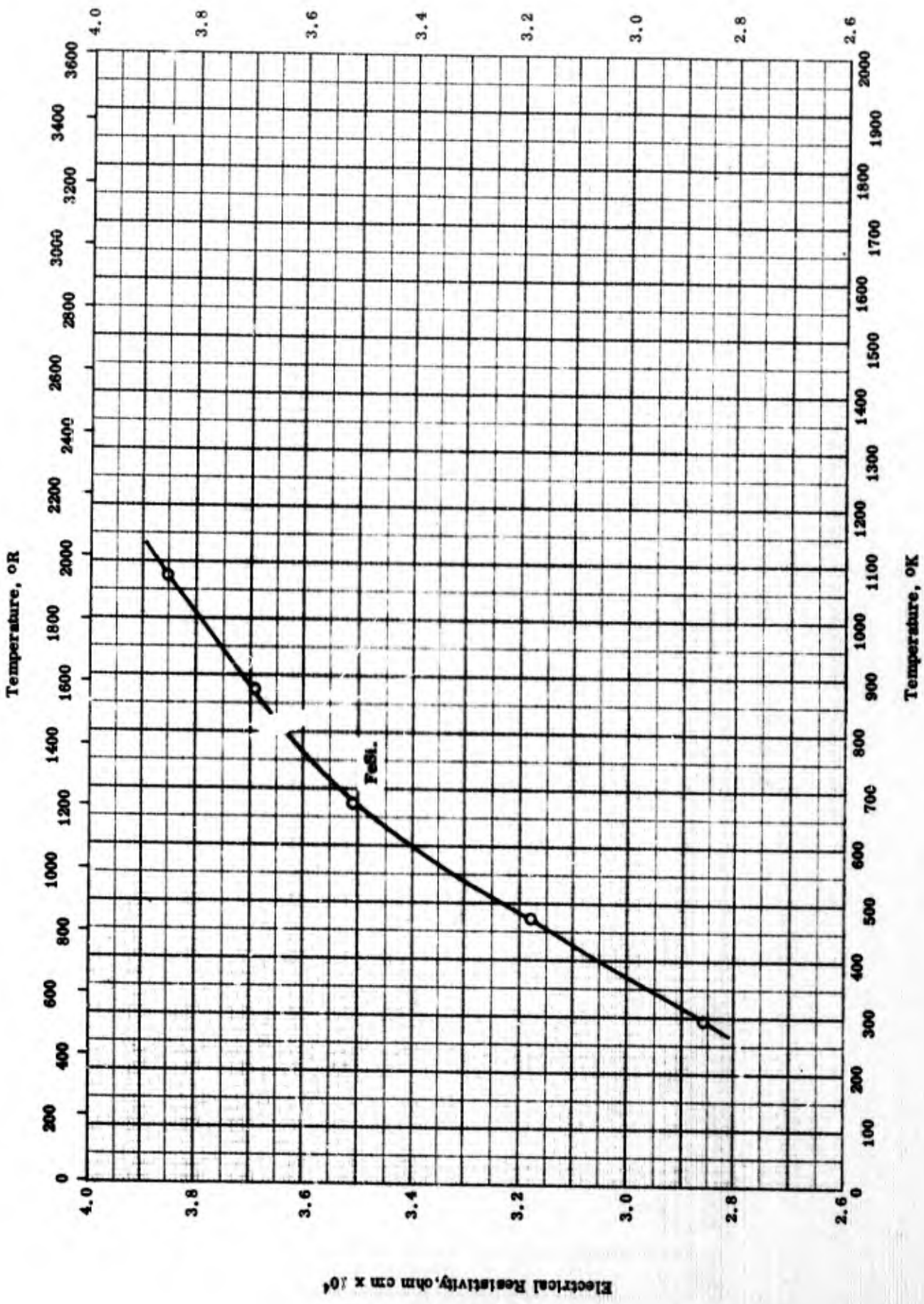
REPORTED VALUES

Melting Point	K	R
○ $FeSi_2$	1483	2669
FeSi	1683	3030
Fe_5Si_3	1468	2642
Fe_3Si	≈1573	≈2831

PROPERTIES OF IRON SILICIDES

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
O	59-28	1468-1683		Series of iron silicides.	

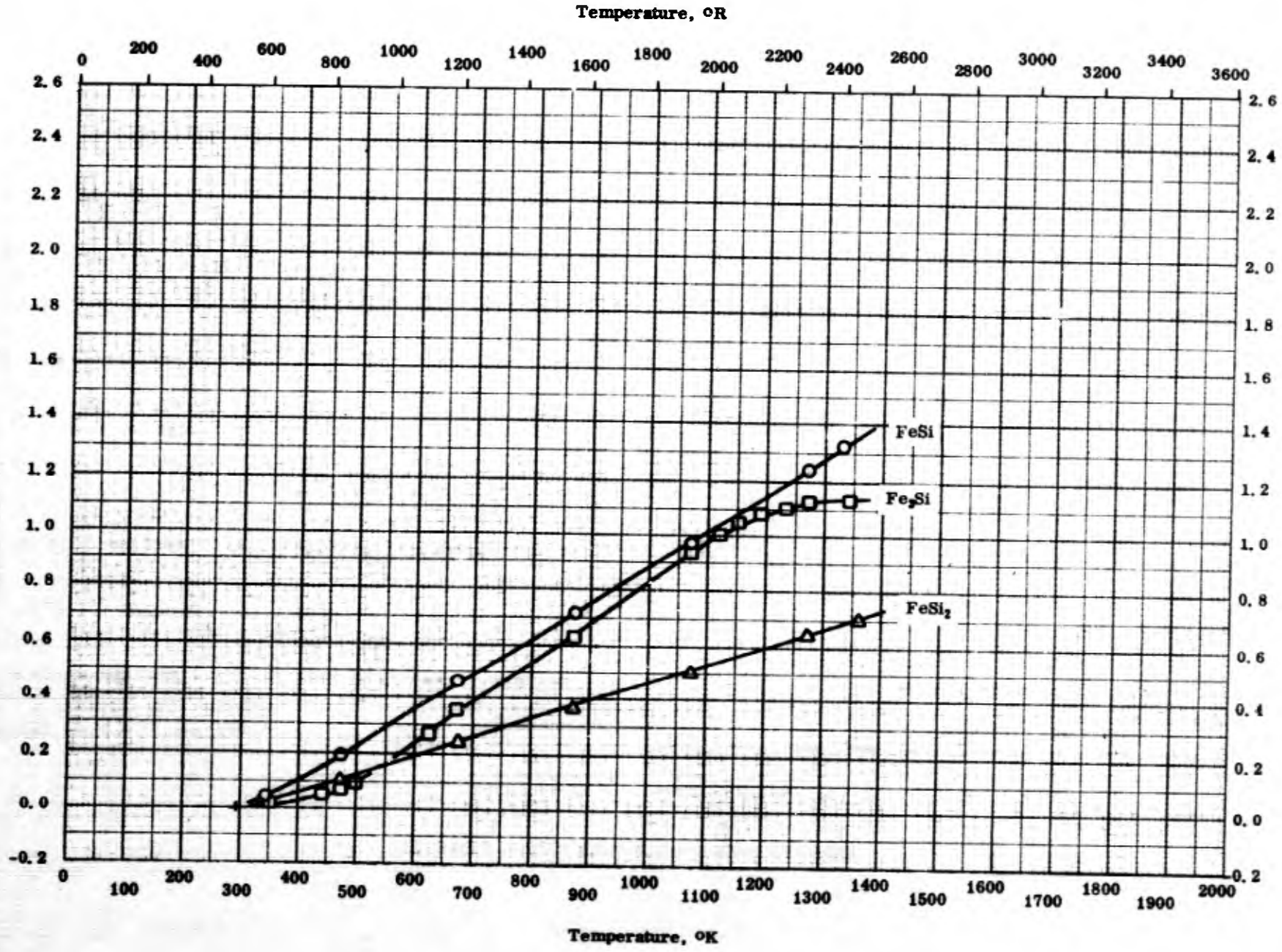


ELECTRICAL RESISTIVITY -- IRON SILICIDE

ELECTRICAL RESISTIVITY -- IRON SILICIDE

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
O	61-16	298-1073		FeSi.	



THERMAL LINEAR EXPANSION -- IRON SILICIDES

THERMAL LINEAR EXPANSION -- IRON SILICIDES

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
○	63-28	293-1333		FeSi; 66.3 Fe and 33.1 total Si.	Sintered, hot pressed, and annealed; fusion temperature 1683 K.
□	63-28	293-1343		Fe_2Si; 84.6 Fe and 14.2 total Si (0.3 free).	Sintered, hot pressed, and annealed; fusion temperature 1573 K.
△	63-28	293-1363		$FeSi_2$; 50.9 Fe and 50.8 total Si.	Sintered, hot pressed, and annealed; fusion temperature 1483 K.

PROPERTIES OF LANTHANUM SILICIDES

REPORTED VALUES

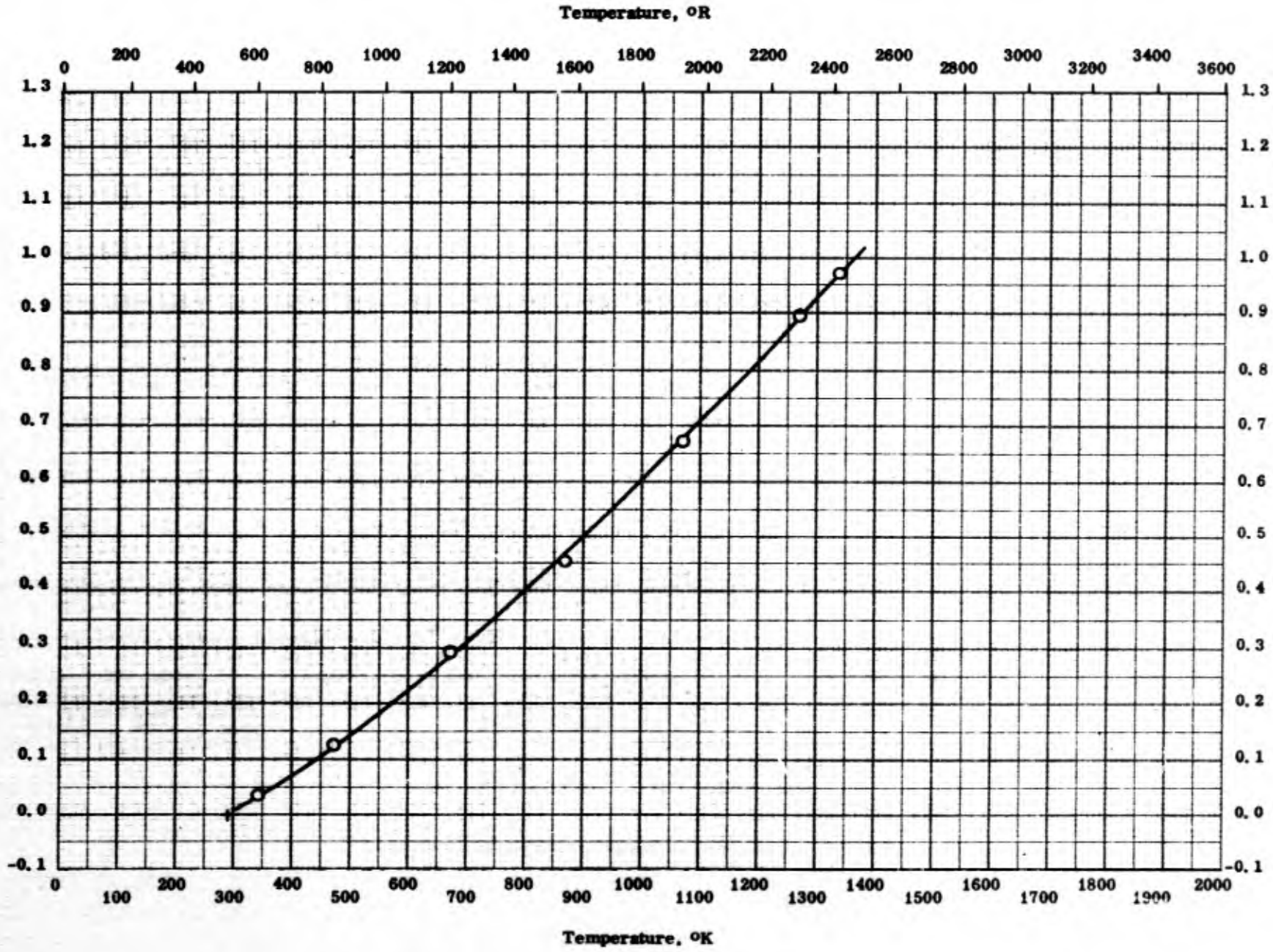
Density		g cm^{-3}	lb ft^{-3}
○	$LaSi_2$	5	312
□	β-$LaSi_2$	4.95	308.9

Melting Point		K	R
△	$LaSi_2$	1793	3227

PROPERTIES OF LANTHANUM SILICIDES

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
○	62-21	298		$LaSi_2$.	
□	62-21	298		β-$LaSi_2$.	
△	60-38	1793		$LaSi_2$.	



Thermal Linear Expansion, percent

Thermal Linear Expansion, percent

TPRC

THERMAL LINEAR EXPANSION -- LANTHANUM SILICIDE

THERMAL LINEAR EXPANSION -- LANTHANUM SILICIDE

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
O	63-28	293-1338		$LaSi_2$; 70.95 La and 27.0 total Si (0.06 free).	Sintered, hot pressed, and annealed; fusion temperature 1793 K.

PROPERTIES OF DIMAGNESIUM SILICIDE

MOST PROBABLE VALUES

Property	C.G.S. Units	Brit. Eng. Units
Melting Point	1359	2446

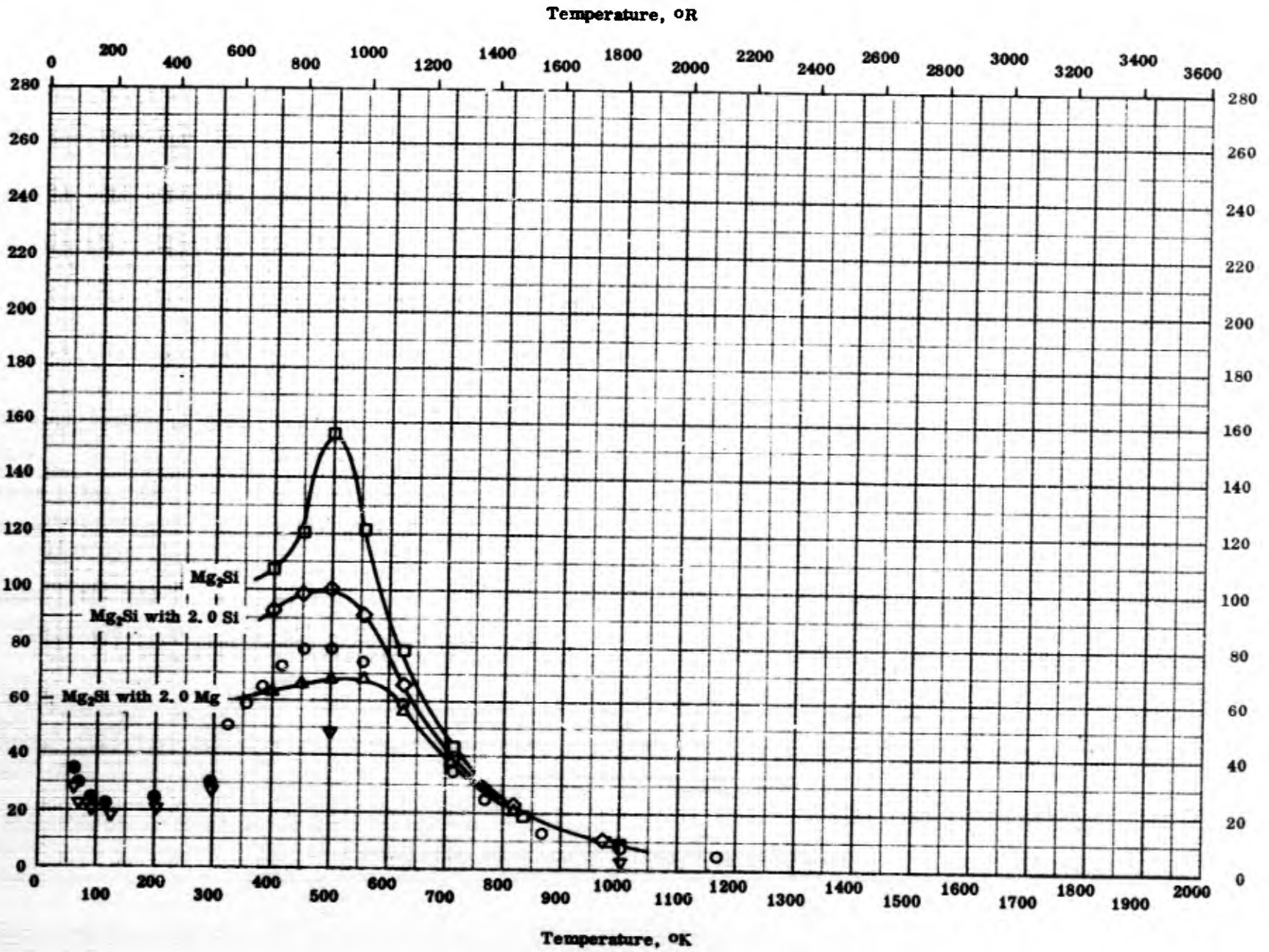
REPORTED VALUES

Melting Point	K	R
○ Mg_2Si	1343	2417
□ Mg_2Si	1359 ± 16	2446 ± 29

PROPERTIES OF DIMAGNESIUM SILICIDE

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
O	26–1	1343		Mg_2Si.	
□	64–22	1343–1375		Mg_2Si.	



ELECTRICAL RESISTIVITY -- DIMAGNESIUM SILICIDE

ELECTRICAL RESISTIVITY -- DIMAGNESIUM SILICIDE

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Expt. Error %	Sample Specifications	Remarks
○	53-9	322-1167		Mg_2Si.	Melted from spectroscopically pure components in graphite crucible under purified argon, under pressure, by high requency current.
□	55-10	400-1000		Mg_2Si.	Prepared from 99.98 Mg by melting and chilling; tested in A atm. furnace.
△	55-10	400-1000		Mg_2Si + 2 Mg.	Same as above.
◇	55-10	400-1000		Mg_2Si + 2 Si.	Same as above.
▽	55-8	60-1000	±4	Mg_2Si, single crystal; excess impurity type conductor.	For Region I, high purity end.
●	55-8	60-1000	±4	Same as above.	For Region II, closer to center of sample, slightly higher purity.

PROPERTIES OF MANGANESE SILICIDES

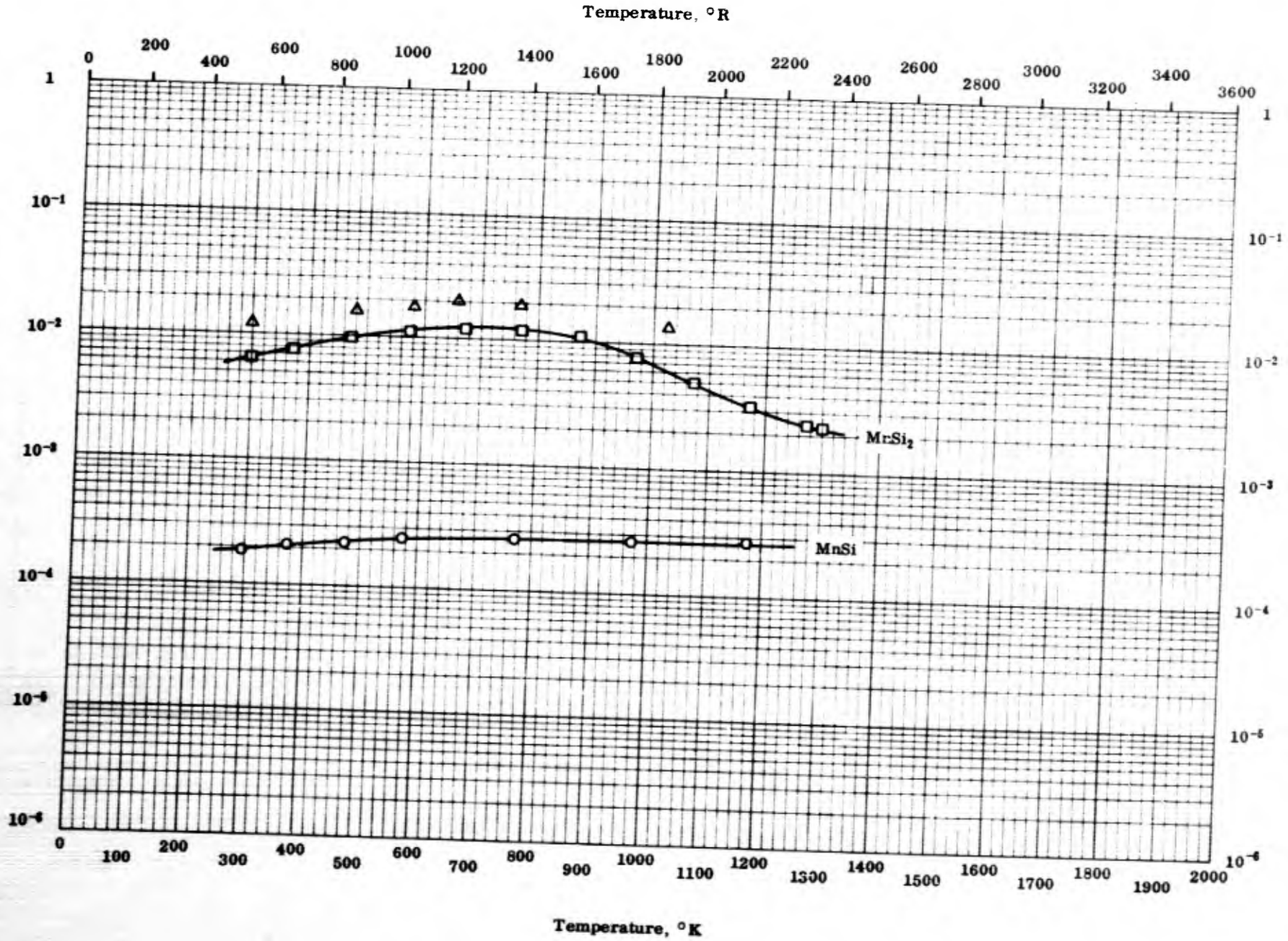
REPORTED VALUES

Melting Point		K	R
O	MnSi	1548	2786
	Mn_5Si_3	1558	2804
	Mn_3Si	1393	2507

PROPERTIES OF MANGANESE SILICIDES

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
O	59-28	1393-1558		Series of Manganese silicide.	Decomp. temperature for Mn_3Si.

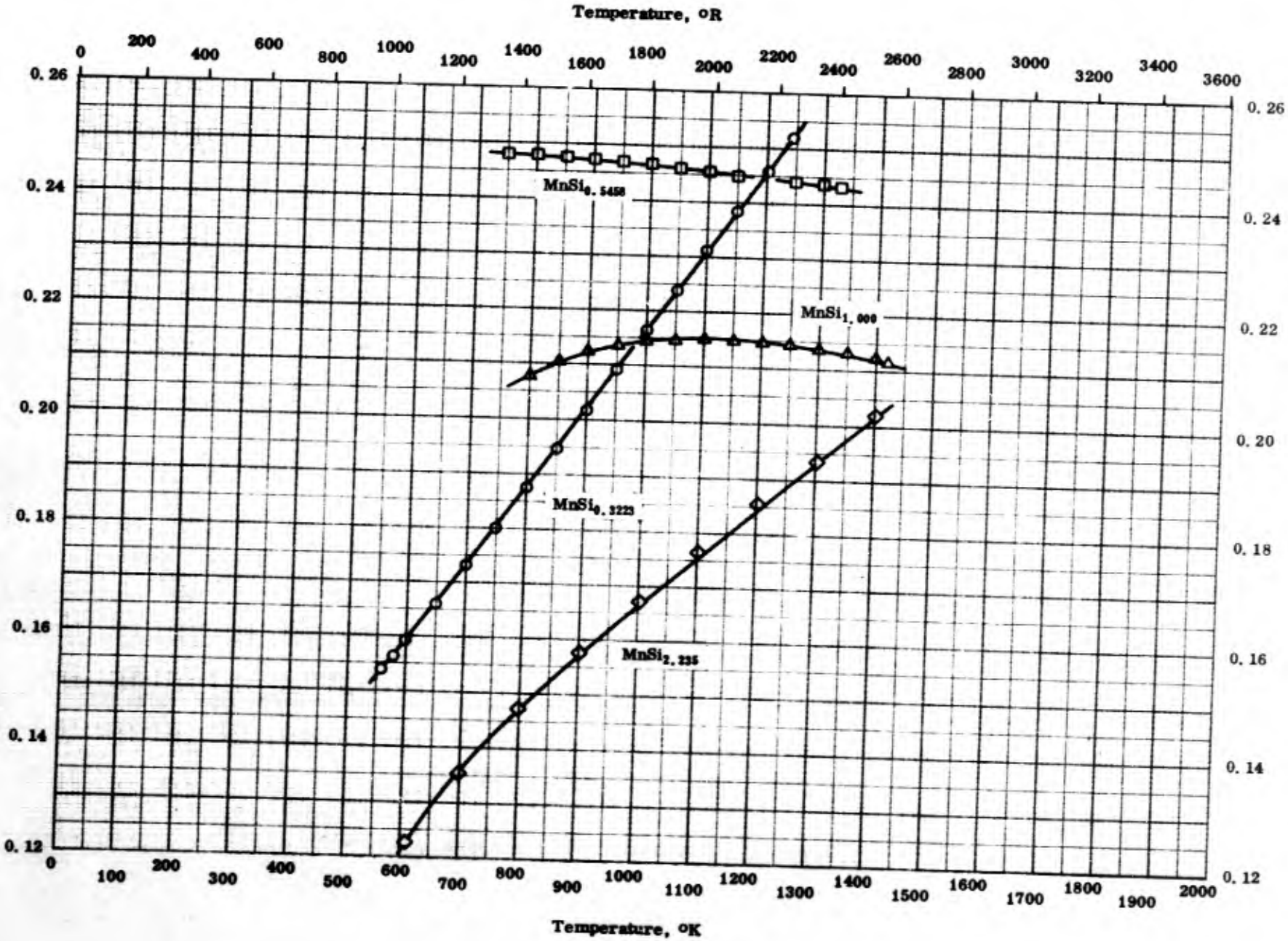


ELECTRICAL RESISTIVITY -- MANGANESE SILICIDES

ELECTRICAL RESISTIVITY -- MANGANESE SILICIDES

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
○	61-16	298-1173		MnSi.	
□	61-16	298-1298		$MnSi_2$.	
△	60-11	300-1025		$MnSi_2$.	

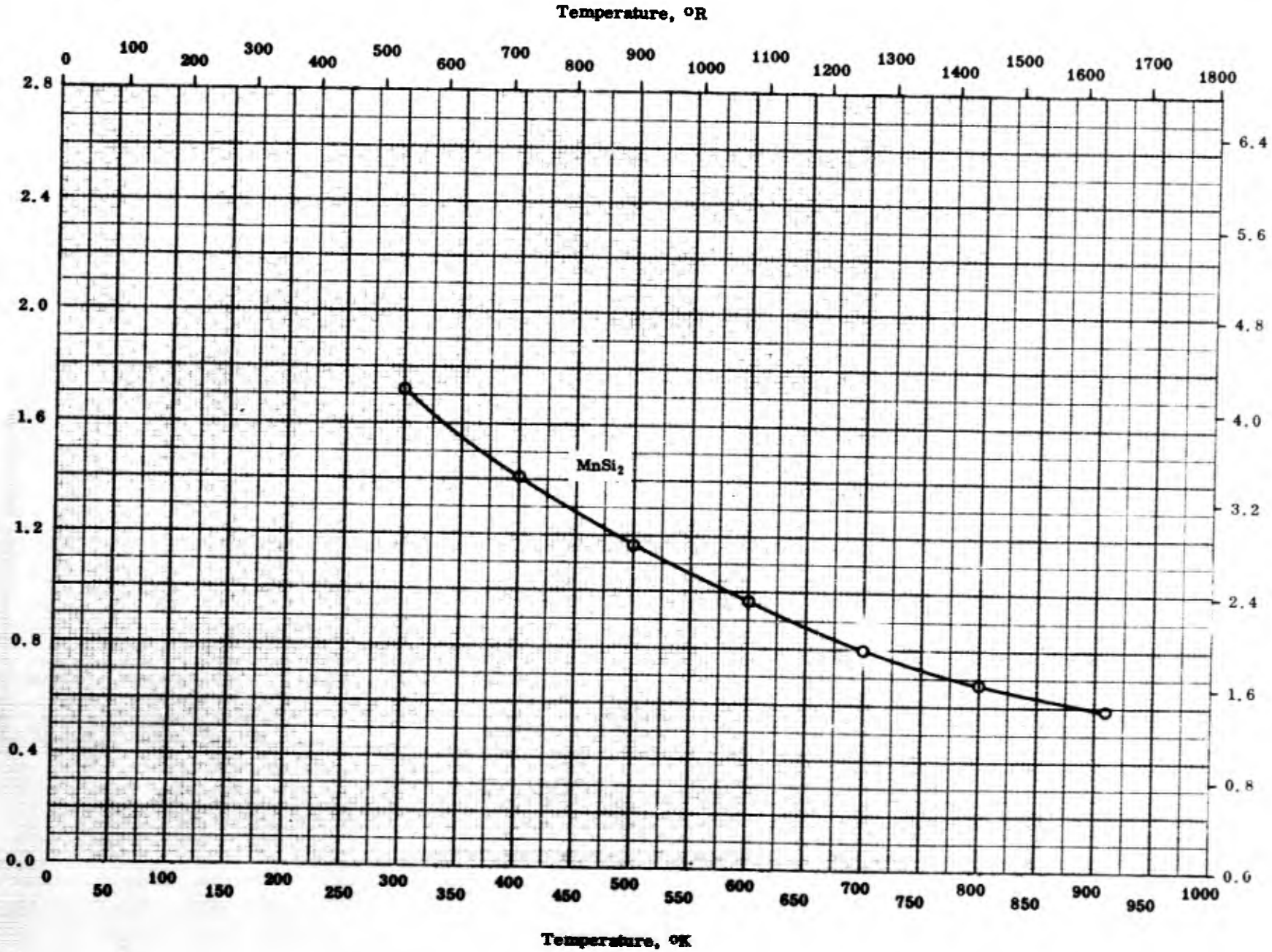


SPECIFIC HEAT -- MANGANESE SILICIDES

SPECIFIC HEAT -- MANGANESE SILICIDES

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
○	63-12	588-1241	1.5	$MnSi_{0.3223}$.	
□	63-12	743-1332	1.6	$MnSi_{0.5458}$.	
△	63-12	792-1418	1.1	$MnSi_{1.000}$.	
◇	63-12	610-1402	2.8	$MnSi_{2.235}$.	

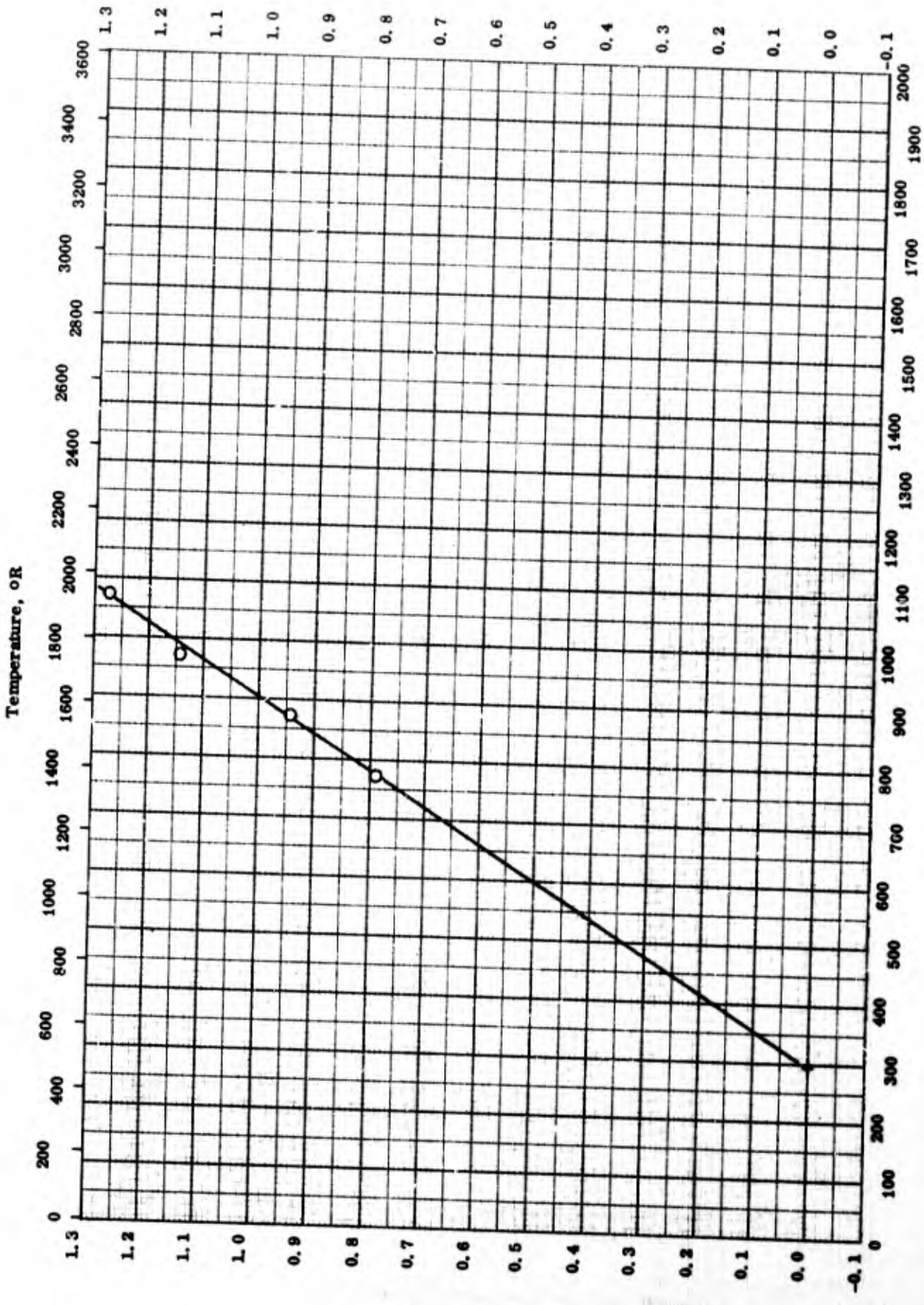


THERMAL CONDUCTIVITY -- MANGANESE DISILICIDE

THERMAL CONDUCTIVITY -- MANGANESE DISILICIDE

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
O	60-11	300-910		$MnSi_2$.	



THERMAL LINEAR EXPANSION -- MANGANESE MONOSILICIDE

THERMAL LINEAR EXPANSION -- MANGANESE MONOSILICIDE

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
O	62-36	293-1073		MnSi.	X-ray method; iron radiation; calculated from lattice parameter.

PROPERTIES OF MOLYBDENUM SILICIDES

REPORTED VALUES

		Density, g cm^{-3}	Density, lb ft^{-3}
○	$MoSi_2$	5.947	371.3
□	$MoSi_2$	6.24	390
◇	$MoSi_2$	5.9	370
▽	$MoSi_2$	6.15	384
●	$MoSi_2$	6.24*	390*
■	Mo_5Si_3	7.94	496

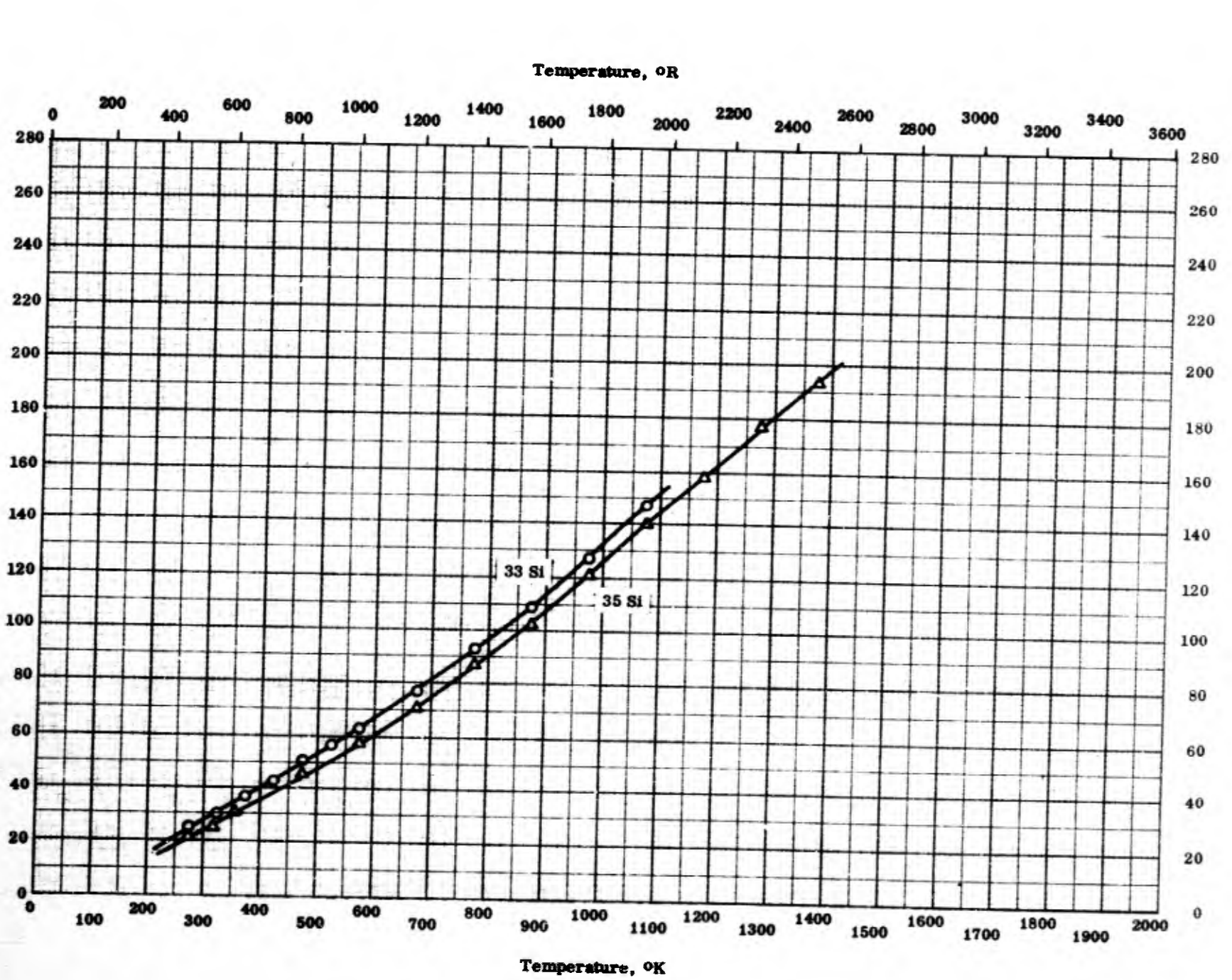
		Melting Point, K	Melting Point, R
△	$MoSi_2$	2220	4000
▲	Mo_3Si-Mo	2430	4374
▼	$MoSi_{0.85}$-Mo_3Si	2120	3816
◆	$MoSi_2$-$MoSi_{0.85}$	2120	3816
◁	$MoSi_2$	2253 ± 10	4055 ± 18
	Mo_5Si_3	2358 ± 10	4244 ± 18

*Most probable value for this compound.

PROPERTIES OF MOLYBDENUM SILICIDES

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
○	54-2	298		97.8 $MoSi_2$, 1.4 Fe_2O_3, and 0.89 SiO_2; excess in Si.	
□	49-6	298		$MoSi_2$; average of several samples ranging from 61.5-62.7 Mo, balance Si, and 0.01 > Fe, Ni, Cu, Co, Cr, V, Zr, and Na; body-centered tetragonal crystal.	Density computed from x-ray measurements.
△	55-28	2220		$MoSi_2$; α-phase at room temperature.	Arc melted; M.P. by calibrated optical pyrometer sighting on liquid-solid interface.
◇	50-1	298		$MoSi_2$.	Hot-pressed at 3000 ± 500 psi and 2950 ± 100 F.
▽	56-24	298		$MoSi_2$; 62.1 Mo, 35.3 Si, and 0.3 Fe; 98.5 % of theoretical density.	Mo, Si mixed and compressed, heated to 1050 C, held 20 min at 1100 C in A atm to produce $MoSi_2$, crushed, ball-milled 24 hrs, compacted at 38,000 psi, and sintered 2 hrs at 1490 C.
●	55-29 also 56-24	298		Same as above.	Same as above; density computed from x-ray measurement of lattice.
■	55-32	298		Mo_5Si_3; from 99.9+ pure Mo and Si with 1.0 Ti, 0.1-1.0 Cr, and 0.1 Al, Fe each.	Density computed from x-ray measurement of lattice.
▲	50-4	298		Mo_3Si-Mo; from spetroscopically pure Mo and Si powders.	Induction heated in argon atm.
▼	50-4	298		$MoSi_{0.65}$-Mo_3Si; same as above.	Same as above.
◆	50-4	298		$MoSi_2$- $MoSi_{0.65}$; same as above.	Same as above.
◁	64-21	2243-2368		Series of Mo silicides.	Measured in vacuum.



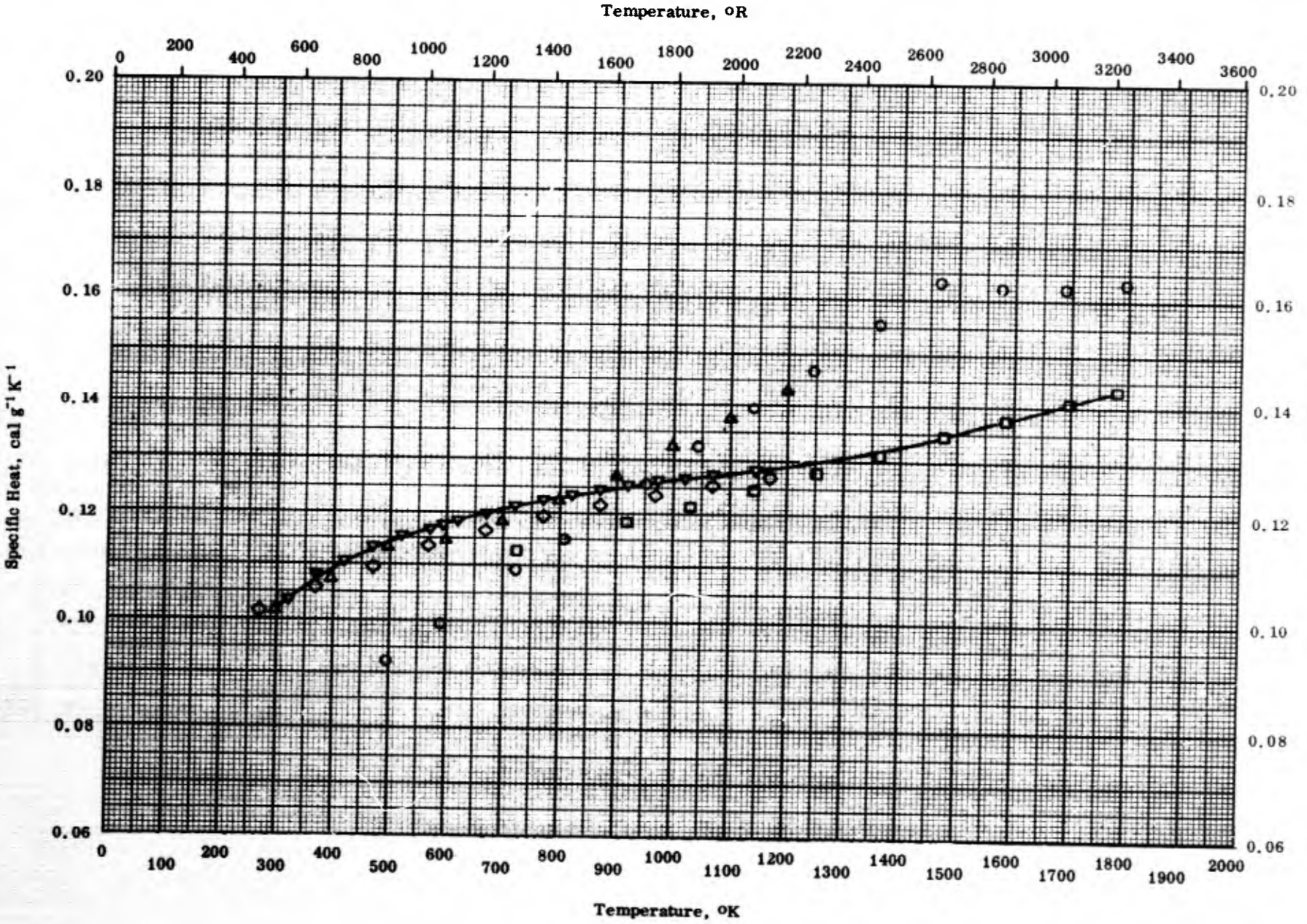
TPRC

ELECTRICAL RESISTIVITY -- MOLYBDENUM DISILICIDE

ELECTRICAL RESISTIVITY -- MOLYBDENUM DISILICIDE

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
O	52-7	273-1373		$MoSi_2$; 62.23 Mo, 32.70 Si, 1.2 O_2, and 0.29 C.	Cold pressed and sintered.
Δ	52-7	273-1373		$MoSi_2$; 62.15 Mo, 34.79 Si, 0.42 O_2, and 0.34 C.	Hot pressed.

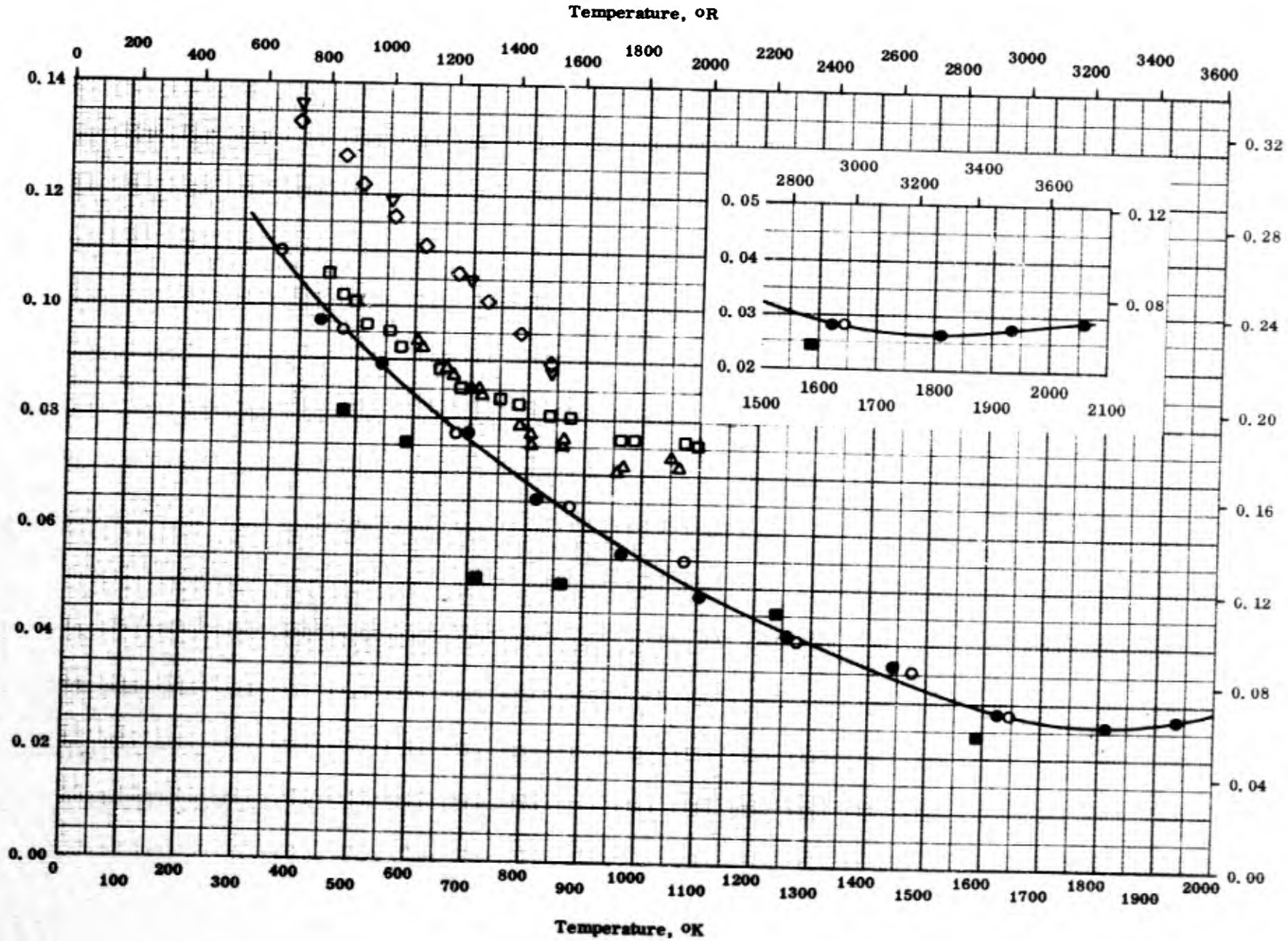


SPECIFIC HEAT-- MOLYBDENUM DISILICIDE

SPECIFIC HEAT -- MOLYBDENUM DISILICIDE

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
○	61-7	502-1797	3.0	$MoSi_2$; 61.5-63.5 Mo and 35-37 Si.	Slip cast; under helium atm.
□	61-9	697-1787		$MoSi_2$; single phase composition.	Hot pressed.
△	65-2	478-1251	0.7	$MoSi_2$; composition not given.	
◇	53-11	298-1200	3.0	$MoSi_2$; 0.8 Fe, 0.50 O_2, 0.34 N_2, and 0.17 C.	
▽	54-9 also 56-12	302-1148		$MoSi_2$; 97.8 $MoSi_2$, 1.4 Fe_2O_3, and 0.89 SiO_2; density 371 lb ft^{-3}.	



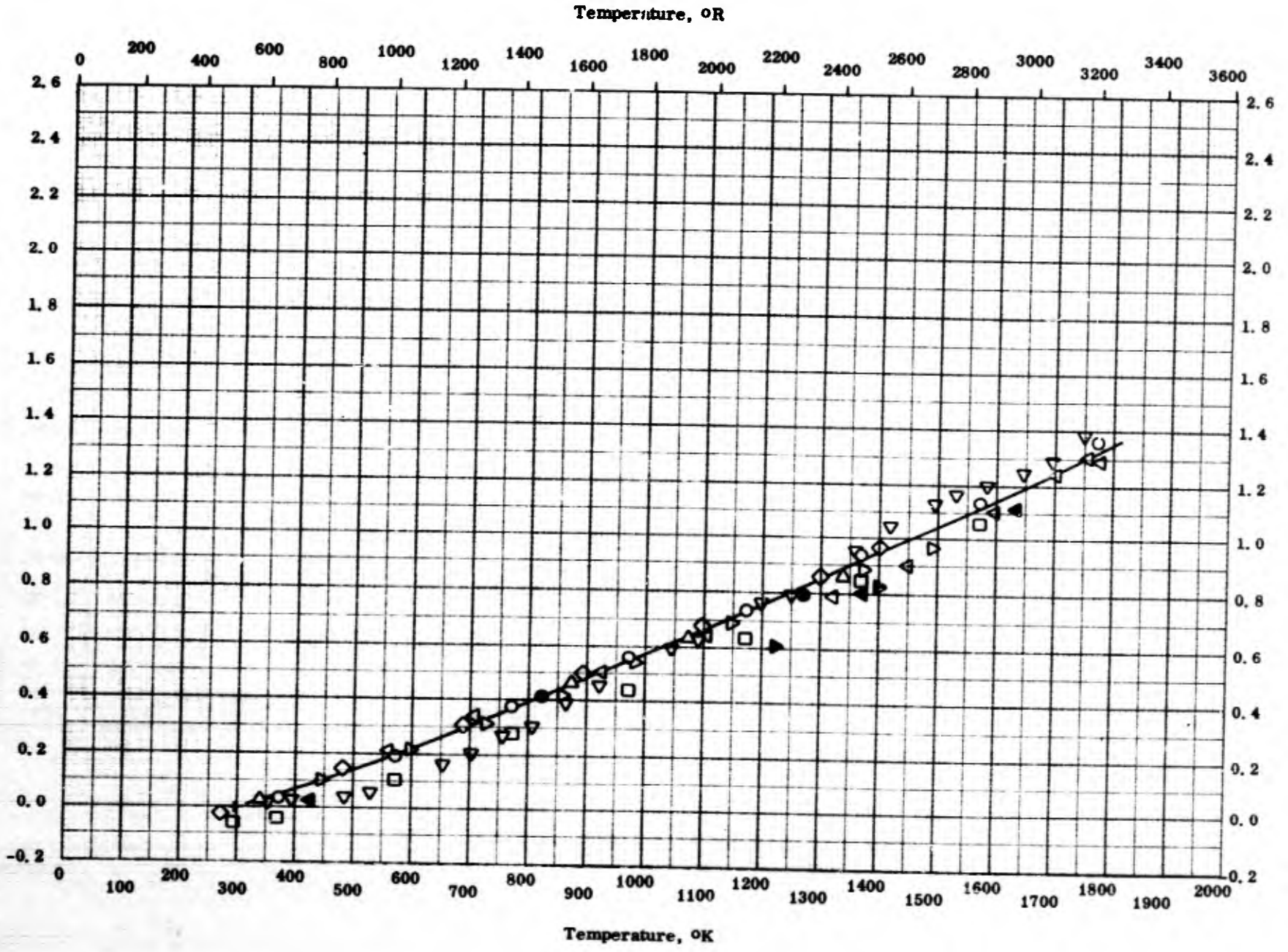
TPRC

THERMAL CONDUCTIVITY — MOLYBDENUM DISILICIDE

THERMAL CONDUCTIVITY -- MOLYBDENUM DISILICIDE

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
○	54-1	363-1643		$MoSi_2$ prepared by G. E. Company, A. N. P. Lab.	
□	54-2	449-1097	< 5	$MoSi_2$; 62.0 Mo, 36.3 Si, 1.0 Fe, and 0.8 O_2 (est.); density 375.65-379.39 lb ft^{-3}.	Conductivity lowered 2% for ea; 1% reduction in density.
△	54-3	603-1063		$MoSi_2$; 0.8 Fe, 0.50 O_2, 0.34 N_2, and 0.17 C; density 98% of theoretical (390 lb ft^{-3}).	
◇	50-1	395-839		$MoSi_2$; density 368 lb ft^{-3}.	Hot pressed at 3000 ± 500 psi and 2950 ± 100 F.
▽	51-1	398-839	± 4	$MoSi_2$.	
●	61-7	437-2058	< 5	$MoSi_2$; 61.5-63.5 Mo and 35-37 Si.	Sample contained 5 one-inch dia disks.
■	61-10	478-1589		$MoSi_2$.	

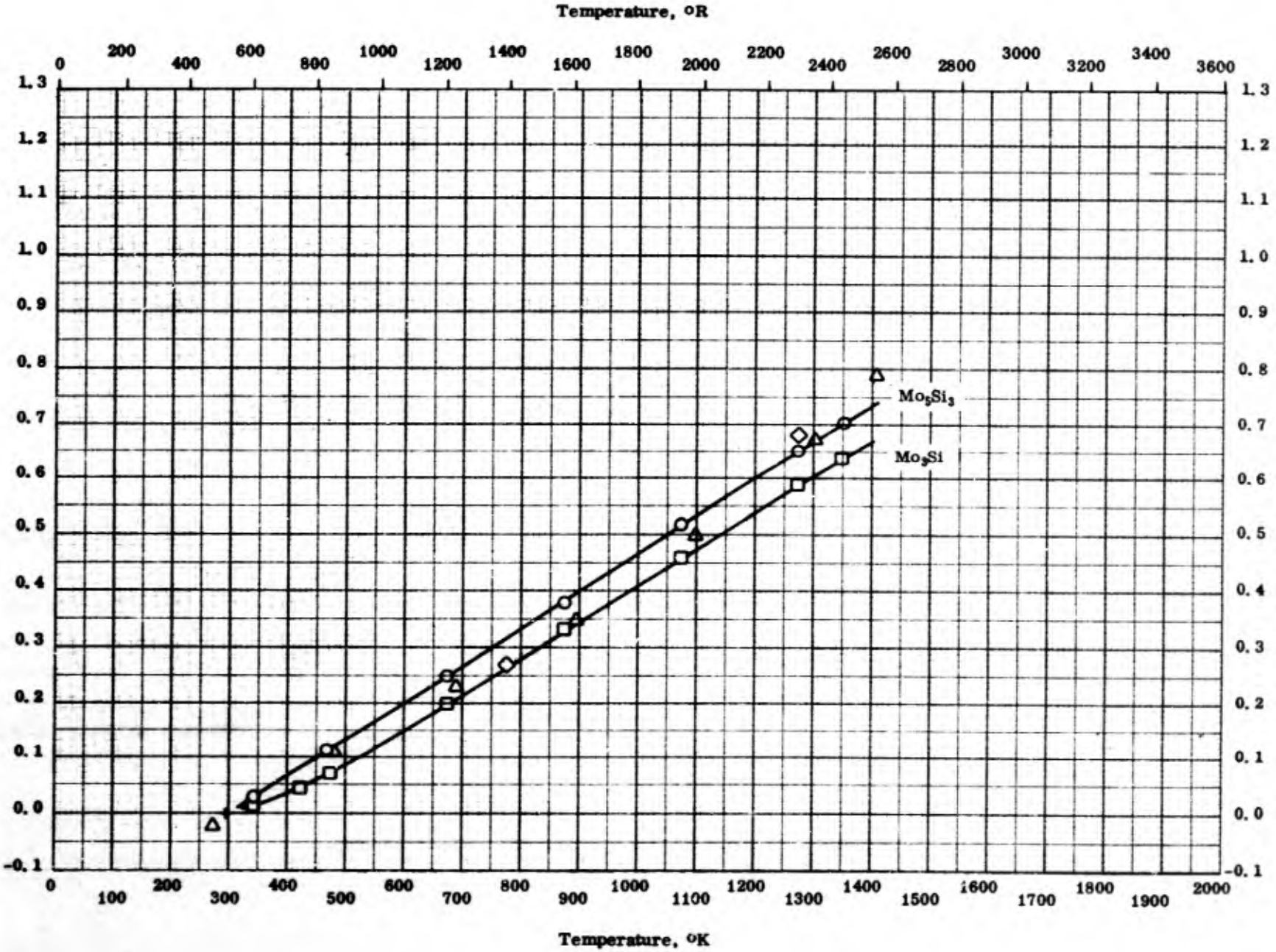


THERMAL LINEAR EXPANSION -- MOLYBDENUM DISILICIDE

THERMAL LINEAR EXPANSION -- MOLYBDENUM DISILICIDE

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
○	50-1	293-1773		Density 368 lb ft^{-3}.	Hot pressed at 3000 ±500 psi and 2950 ± 100 F; heating.
□	50-1	293-1773		Same as above.	Cooling data of above specimen.
◇	54-13	273-1406		36.2 total Si, 0.01 - 0.1 Al, Fe each, 0.001 - 0.01 Ca, Cr, Cu, Mg, Mn, Ni each, and 0.0001 - 0.001 B.	Sintered at 1100 C; measured in helium; x-ray diffraction method.
△	63-28	293-1343		63.2 Mo and 37.0 total Si (0.2 free).	Sintered, hot pressed, and annealed; fusion temperature 2303 K.
▷	60-28	300-1493		Grain size 33μ; 96.6 absolute density; dimension 3-1/4 by 1/2 by 1/4 in.[3] [Author's design.: H. P. 305].	Hot pressed; max pressing temperature 2760 F and max pressure 2000 psi; heating in argon.
▶	60-28	1222-1493		Same as above.	Cooling data of above specimen.
◁	60-28	300-1780		Same as above.	Same as above except pre-oxidized at 2700 F and heating in air.
◀	60-28	422-1780		Same as above.	Cooling data of above specimen.
▽	61-7	300-1753		61.5 - 63.5 Mo, 35.0 - 37.0 Si; density 5.80 g cm^{-3}.	Slip cast.
●	60-23	300-1275		62 - 63.5 Mo and 36 - 37 Si. [Author's design.: E-34].	Ball-milled several hrs, dried, slip cast, and dried again, then sintered.

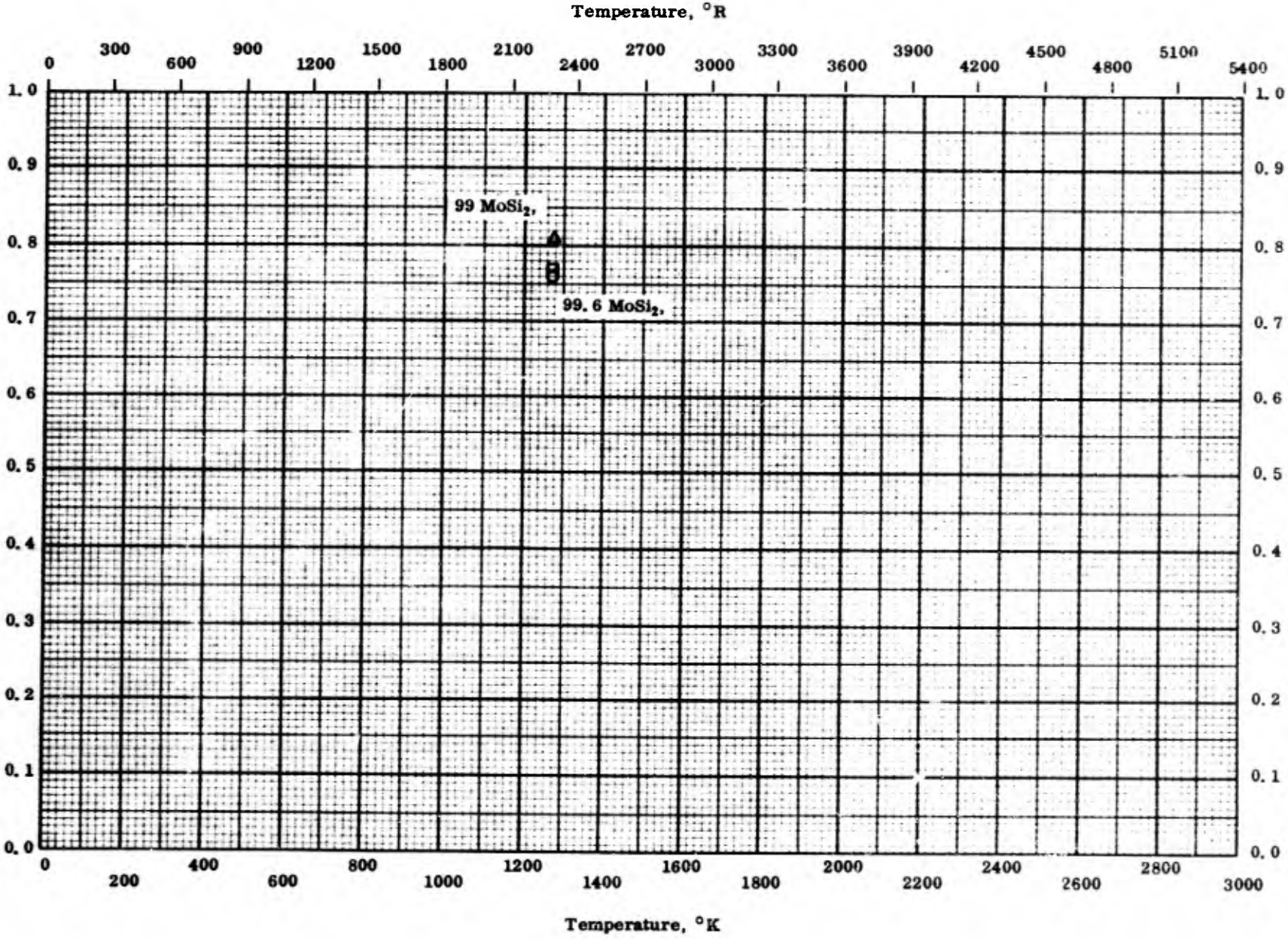


THERMAL LINEAR EXPANSION -- OTHER MOLYBDENUM SILICIDES

THERMAL LINEAR EXPANSION -- OTHER MOLYBDENUM SILICIDES

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
○	63-28	293-1353		Mo_5Si_3; 85.1 Mo and 14.8 total Si (0.8 free).	Sintered, hot pressed, and annealed; fusion temperature 2373 K.
□	63-28	293-1343		Mo_3Si; 90.0 Mo and 8.9 total Si (0.4 free).	Sintered, hot pressed, and annealed; fusion temperature 2323 K.
◇	60-27	298-1273		Mo_3Si.	
△	57-22	273-1406		Mo_3Si; prepared from 99.7 pure Si and 99.9 pure Mo.	Sintered at 1200 C for 2 hrs in vacuum; x-ray diffraction method; measured in vacuum.



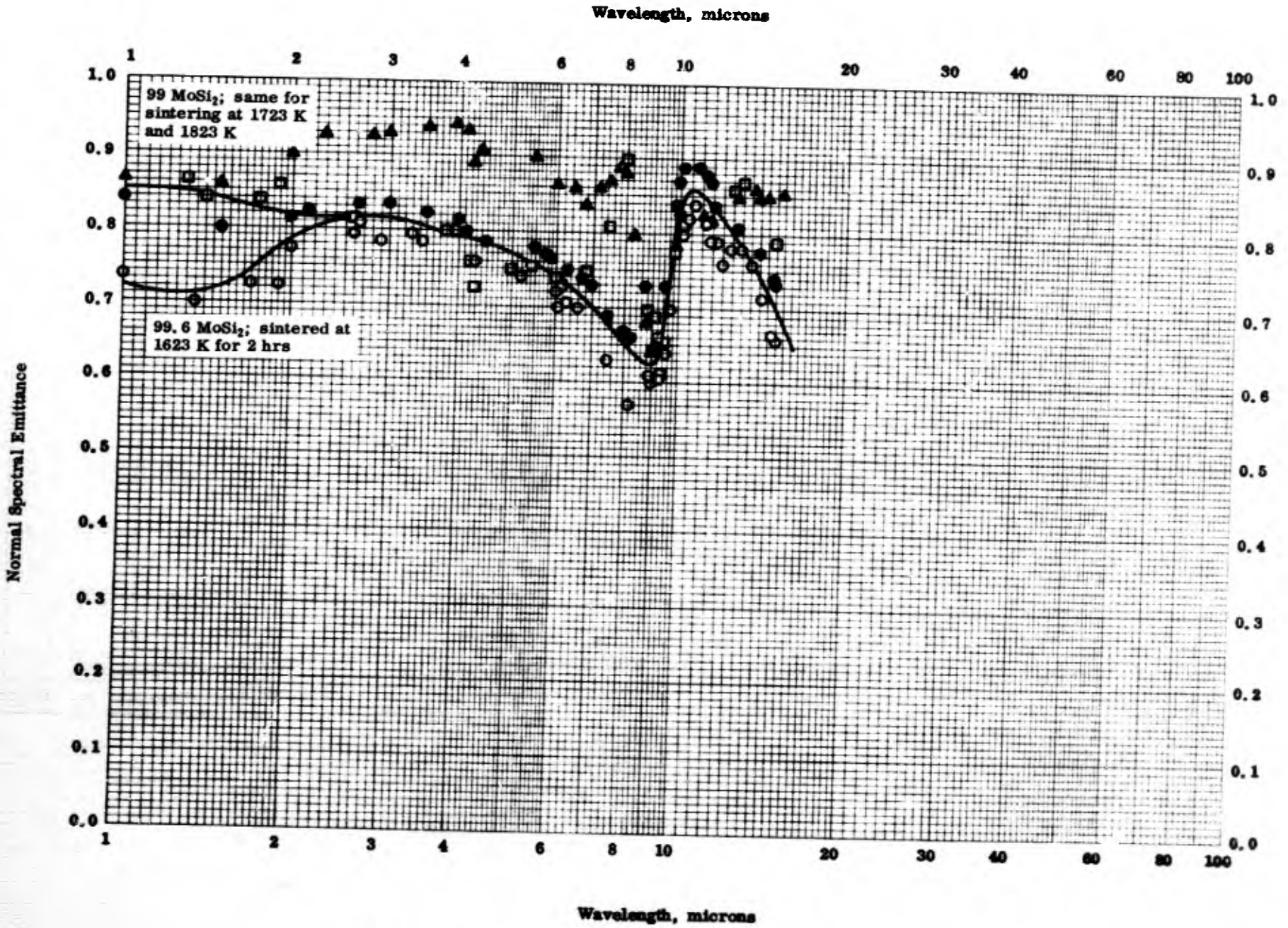
NORMAL TOTAL EMITTANCE — MOLYBDENUM DISILICIDE

TPRC

NORMAL TOTAL EMITTANCE -- MOLYBDENUM DISILICIDE

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
○	63-16	1273	±8	93.6 $MoSi_2$ and 0.4 SiO_2; 0.045 in. thickness plate; density 4.67 g cm^{-3}.	Sintered at 1623 K for 2 hrs; measured in argon atm; calculated from spectral data.
△	63-16	1273	±8	99 $MoSi_2$ and 1 MoO_3; 0.066 in. thickness plate; density 4.9 g cm^{-3}.	Same as above except sintered at 1723 K for 2 hrs.
□	62-32	1273		98.6 pure $MoSi_2$; 0.07 in. thickness plate.	Sintered at 1773 K for 1 hr; calculated from spectral data.

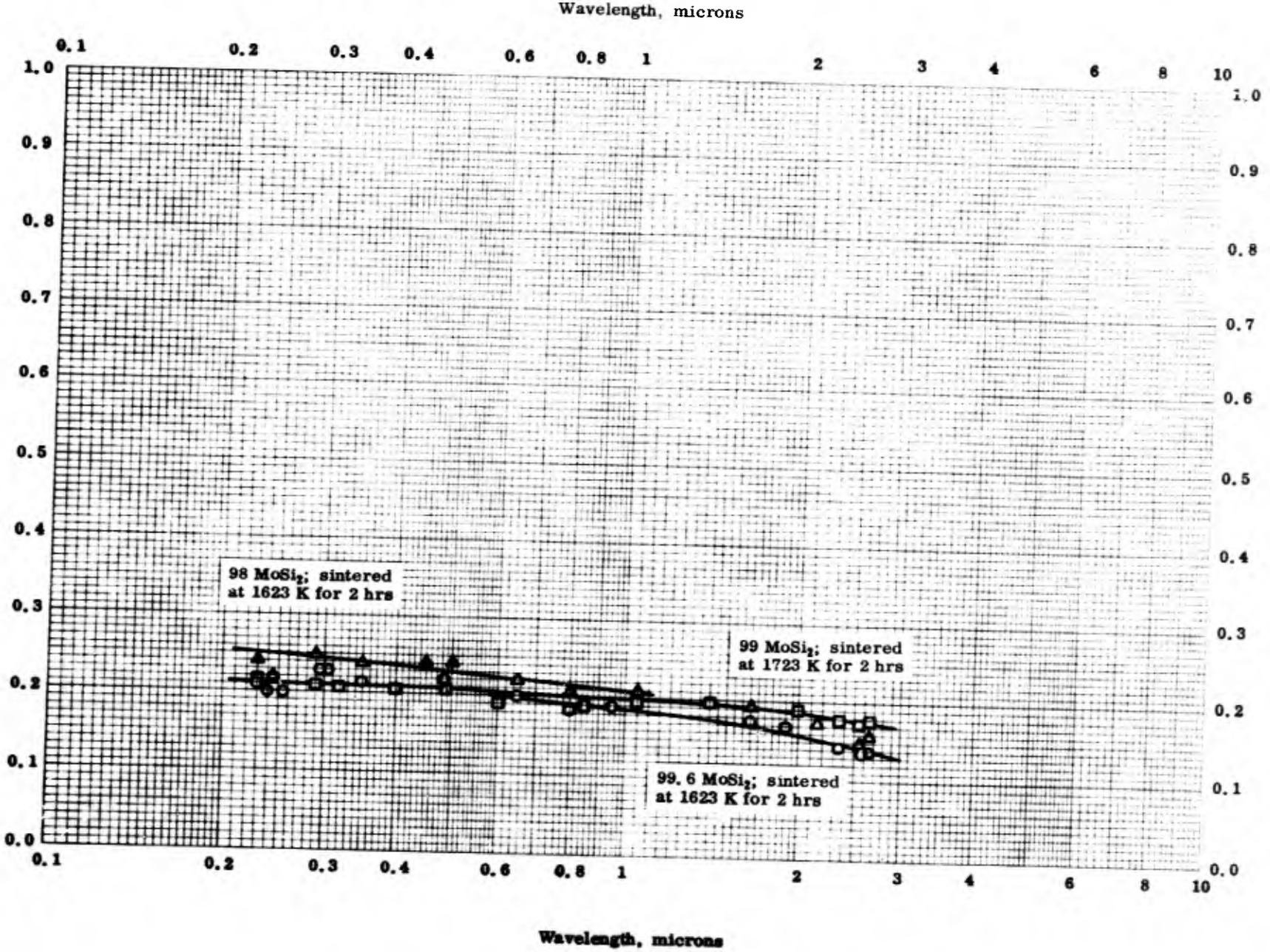


NORMAL SPECTRAL EMITTANCE -- MOLYBDENUM DISILICIDE

NORMAL SPECTRAL EMITTANCE -- MOLYBDENUM DISILICIDE

REFERENCE INFORMATION

Symbol	Ref.	Temp. °K	Wavelength Range μ	Rept Error%	Sample Specifications	Remarks
○	63-16	1273	1-15		99.6 $MoSi_2$ and 0.4 SiO_2; 0.045 in. thickness plate; density 4.67 g cm^{-3}.	Sintered at 1623 K for 2 hrs; measured in argon; data taken from a curve.
●	63-16	1273	1-15		99 $MoSi_2$ and 1 MoO_3; 0.066 in. thickness plate; density 4.9 g cm^{-3}.	Same as above except sintered at 1723 K for 2 hrs.
▲	63-16	1273	1-15		98 pure $MoSi_2$; 0.051 in. thickness plate; density 4.84 g cm^{-3}.	Same as above except sintered at 1623 K for 2 hrs.
□	62-32	1273	1-15		99 $MoSi_2$ and 1 Cr_2O_3; 0.045 in. thickness plate.	Sintered at 1823 K for 1 hr.

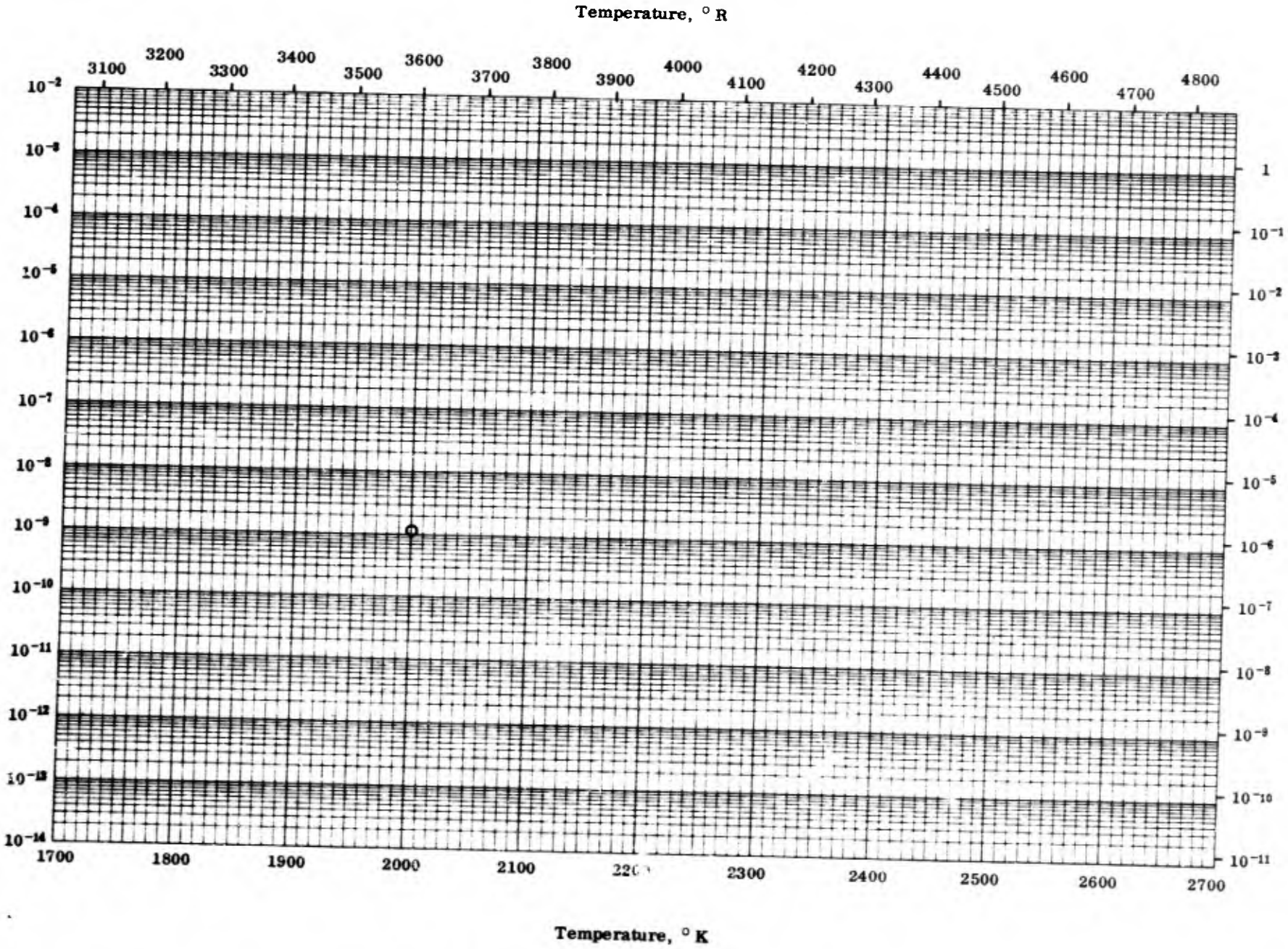


NORMAL SPECTRAL REFLECTANCE -- MOLYBDENUM DISILICIDE

NORMAL SPECTRAL REFLECTANCE -- MOLYBDENUM DISILICIDE

REFERENCE INFORMATION

Symbol	Ref.	Temp. °K	Wavelength Range μ	Rept. Error%	Sample Specifications	Remarks
O	63-16	298	0.23-2.65	5	99.6 $MoSi_2$ and 0.4 SiO_2; 0.045 in. thickness plate; density 4.67 g cm^{-3}.	Sintered at 1623 K for 2 hrs; data taken from a curve; normal incidence, hemispherical viewing; MgO as reference standard.
□	63-16	298	0.23-2.65	5	99 $MoSi_2$ and 1 MoO_3; 0.066 in. thickness plate; density 4.9 g cm^{-3}.	Same as above except sintered at 1723 K for 2 hrs.
△	63-16	298	0.23-2.65	5	98 $MoSi_2$; 0.051 in. thickness plate; density 4.84 g cm^{-3}.	Same as above except sintered at 1623 K for 2 hrs.



TPRC

VAPOR PRESSURE -- TRIMOLYBDENUM SILICIDE

VAPOR PRESSURE -- TRIMOLYBDENUM SILICIDE

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
O	52-3	2000		Mo_3Si.	Heated in graphite crucibles with graphite lids in vacuum of 10^{-5} mm Hg.

PROPERTIES OF NICKEL SILICIDES

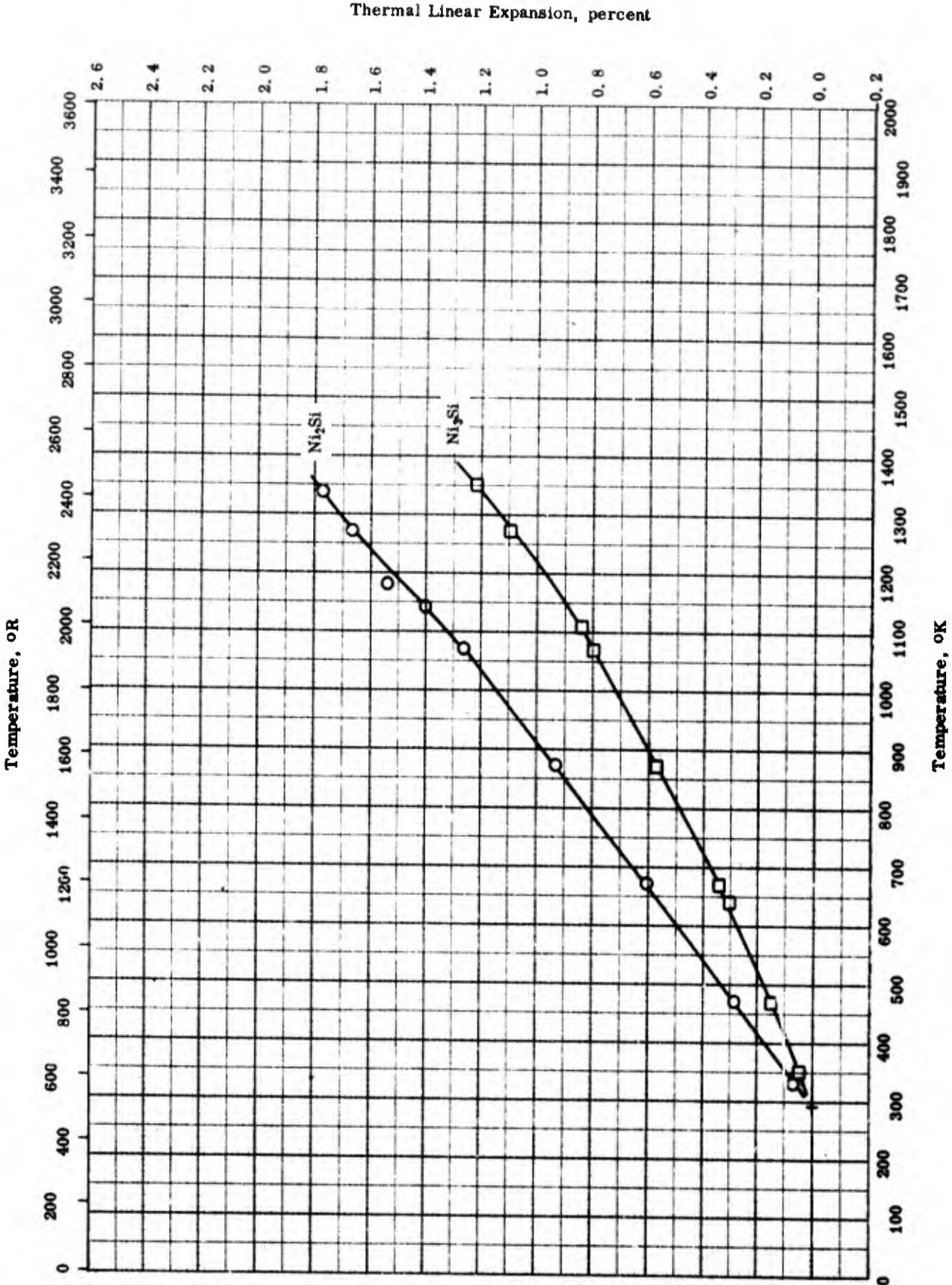
REPORTED VALUES

Melting Point		K	R
○	$NiSi_2$	1280	2304
	NiSi	1273	2291
	Ni_3Si_2	1103	1985
	Ni_2Si	1563	2813
	Ni_3Si	1523	2741

PROPERTIES OF NICKEL SILICIDES

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
O	59-28	1103-1563		Series of nickel silicides.	Decomp. temperatures for $NiSi_2$ and Ni_2Si_2.



THERMAL LINEAR EXPANSION -- NICKEL SILICIDES

THERMAL LINEAR EXPANSION -- NICKEL SILICIDES

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
O	63-28	293-1338		Ni_2Si; 80.8 Ni and 19.1 total Si.	Sintered, hot pressed, and annealed; fusion temperature 1563 K.
□	63-28	293-1353		Ni_3Si; 85.6 Ni and 13.5 total Si.	Sintered, hot pressed, and annealed; fusion temperature 1423 K.

PROPERTIES OF NIOBIUM SILICIDES

REPORTED VALUES

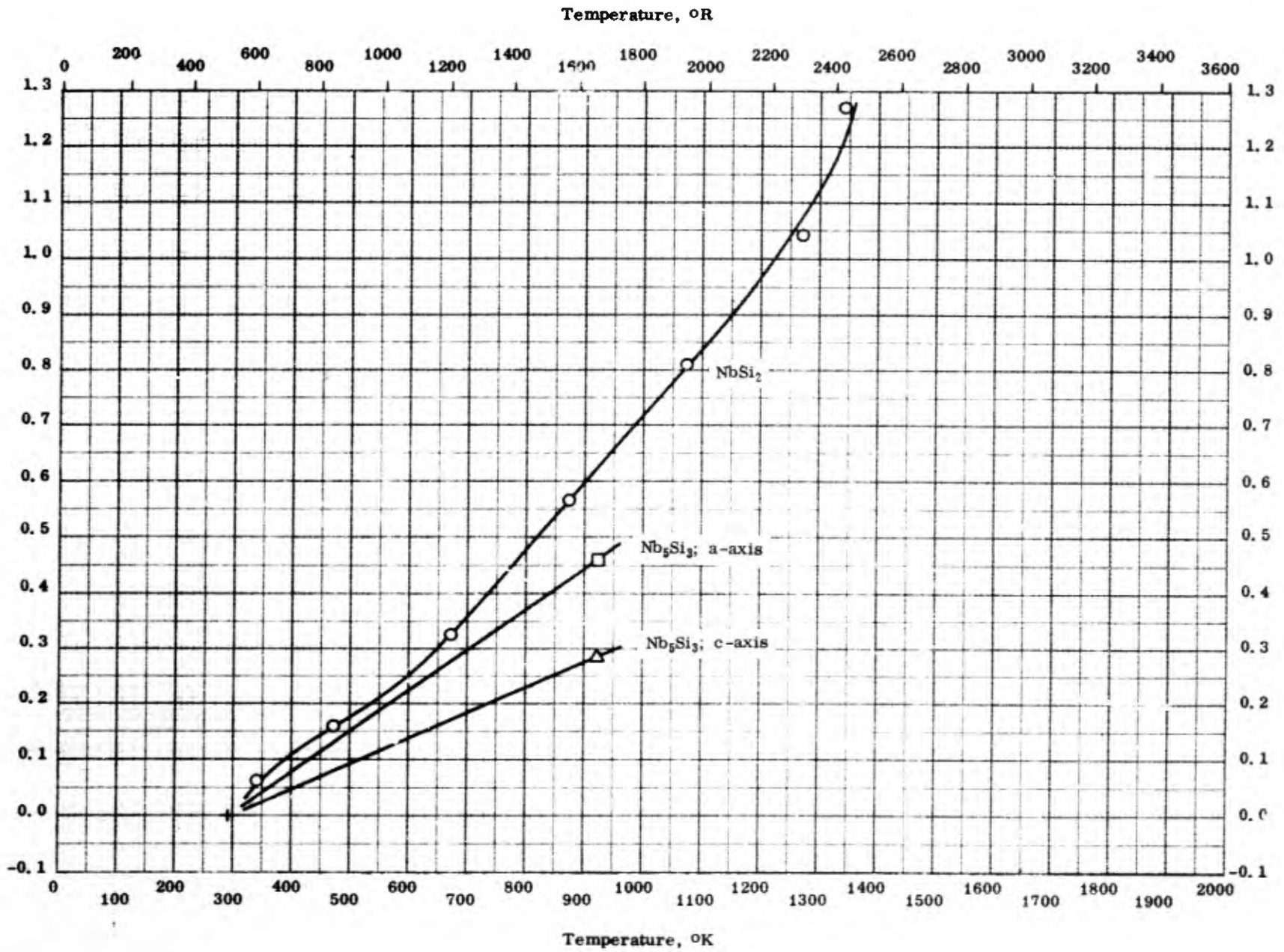
Melting Point		K	R
○	Nb_5Si_3	2683	4830
□	$NbSi_2$	2423	4361
	Nb_4Si	≈2853	≈5135
△	$NbSi_2$; hexagonal	2222	4000
	Nb_5Si_3	2756*	4961*
	Nb_4Si	2222	4000
▽	$NbSi_2$	2247 ± 25*	4045 ± 45*
◇	Nb_5Si_3	2713 ± 40	4883 ± 72

*Most probable value for this compound.

PROPERTIES OF NIOBIUM SILICIDES

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
○	55-28	2683		Nb_5Si_3; phase at room temperature: α	Arc-melted; optical pyrometer sighting on liquid-solid interface.
□	59-28	2423-2853		Series of niobium silicides.	Decomp. temperature for Nb_4Si.
△	55-37	2222-2756		Series of niobium silicides; hexagonal crystal for $NbSi_2$.	Nb_4Si isomorphous with Ta_4Si and Zr_4Si.
▽	56-35	2222-2272		$NbSi_2$.	
◇	56-33	2673-2753		Nb_5Si_3.	



Thermal Linear Expansion, percent

THERMAL LINEAR EXPANSION -- NIOBIUM SILICIDES

THERMAL LINEAR EXPANSION -- NIOBIUM SILICIDES

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
○	63-28	293-1343		$NbSi_2$; 63.8 Nb and 36.9 total Si (0.4 free).	Sintered, hot pressed, and annealed; fusion temperature 2233 K.
□	61-25	293-923		Nb_5Si_3.	Calculated from lattice parameter; measured parallel to the a-axis direction.
△	61-25	293-923		Nb_5Si_3.	Same as above except c-axis direction.

PROPERTIES OF RHENIUM SILICIDES

REPORTED VALUES

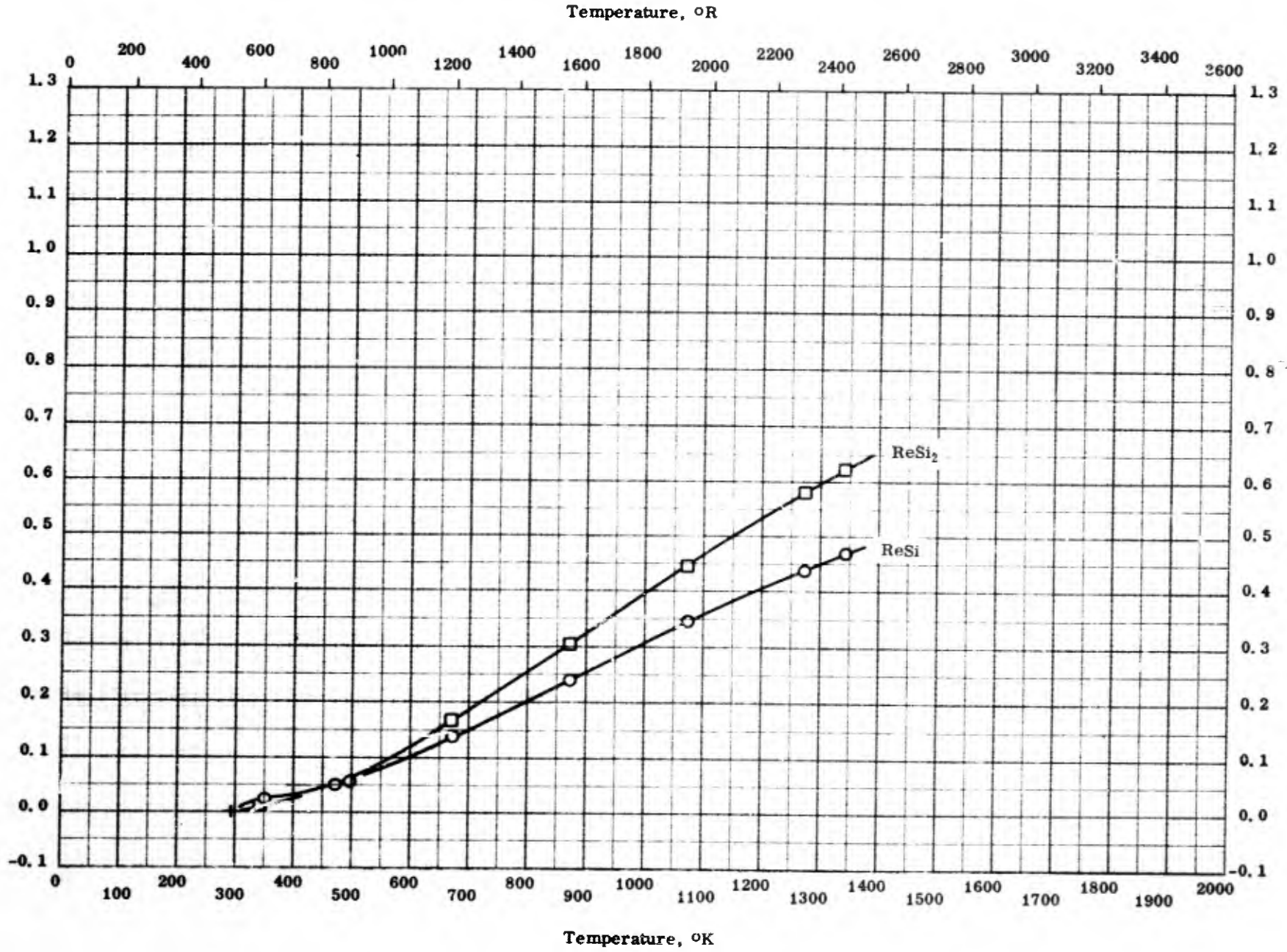
Melting Point		K	R
○	$ReSi_2$	≈2203*	≈3961*
	ReSi	≈2173*	≈3911*
	Re_3Si	2193*	3947*
□	$ReSi_2$	1972	3550
	ReSi	1972	3550
	Re_3Si	>1972	>3550

*Most probable value for this compound.

PROPERTIES OF RHENIUM SILICIDES

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
○	59-29	2173-2203		Series of rhenium silicides.	
□	53-28	1972		Series of rhenium silicides.	

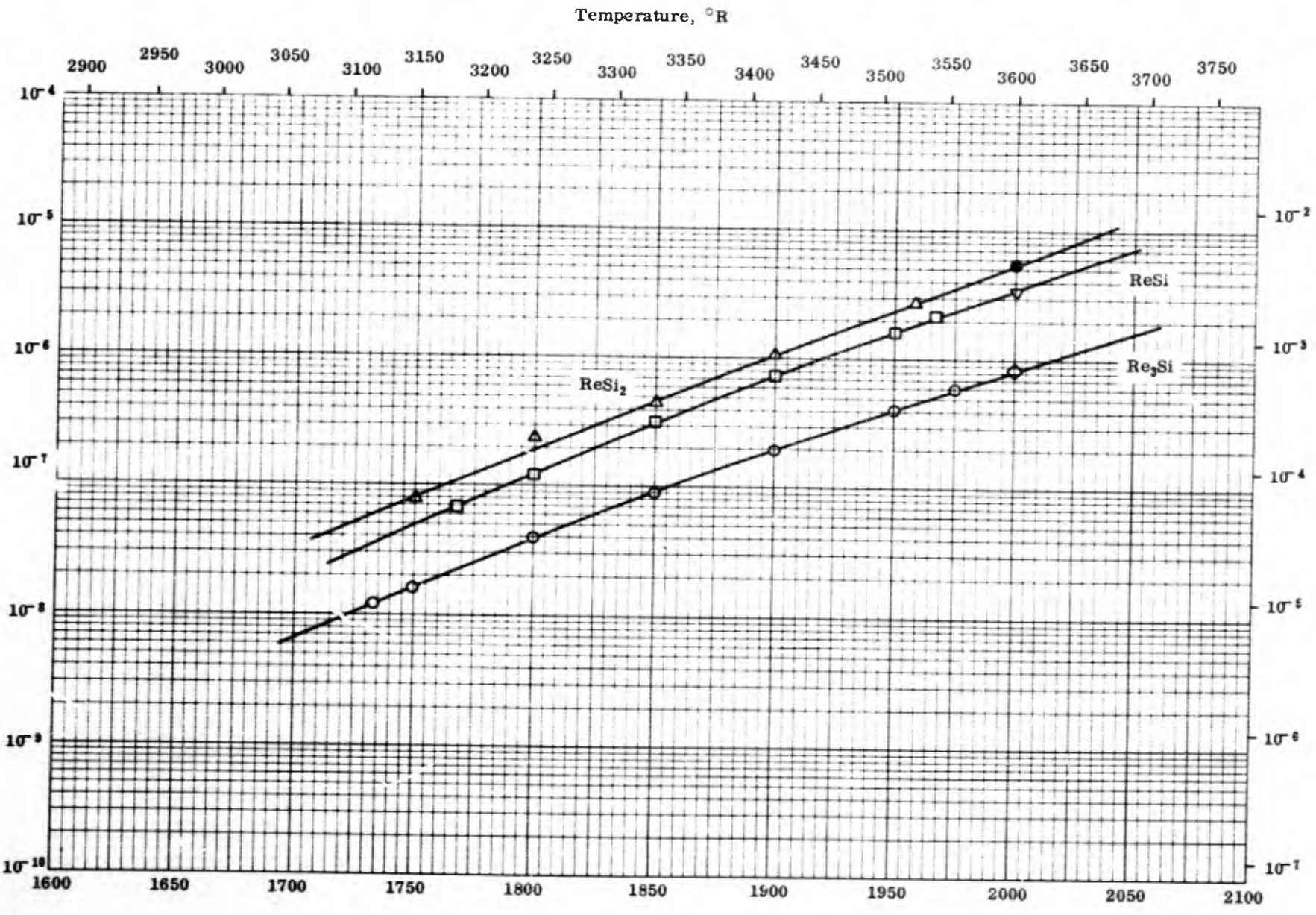


THERMAL LINEAR EXPANSION -- RHENIUM SILICIDES

THERMAL LINEAR EXPANSION -- RHENIUM SILICIDES

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
O	63-28	293-1343		ReSi.	Sintered, hot pressed, and annealed; fusion temperature 2173 K.
□	63-28	293-1343		$ReSi_2$; 76.3 Re and 23.8 total Si (0.7 free).	Sintered, hot pressed, and annealed; fusion temperature 2253 K.



TPRC

VAPOR PRESSURE -- RHENIUM SILICIDES

VAPOR PRESSURE -- RHENIUM SILICIDES

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
○	53-2	1734-1975		Re_3Si.	Author uses three different size orifices; increases data as much as 25% as correction for tapered holes.
□	53-2	1768-1967		ReSi.	Same as above.
△	53-2	1751-1958		$ReSi_2$.	Same as above.
◇	52-3	2000		Re_3Si.	Graphite cell; vacuum: 10^{-5} mm Hg.
▽	52-3	2000		ReSi.	Same as above.
●	52-3	2000		$ReSi_2$.	Same as above.

PROPERTIES OF TANTALUM SILICIDES

REPORTED VALUES

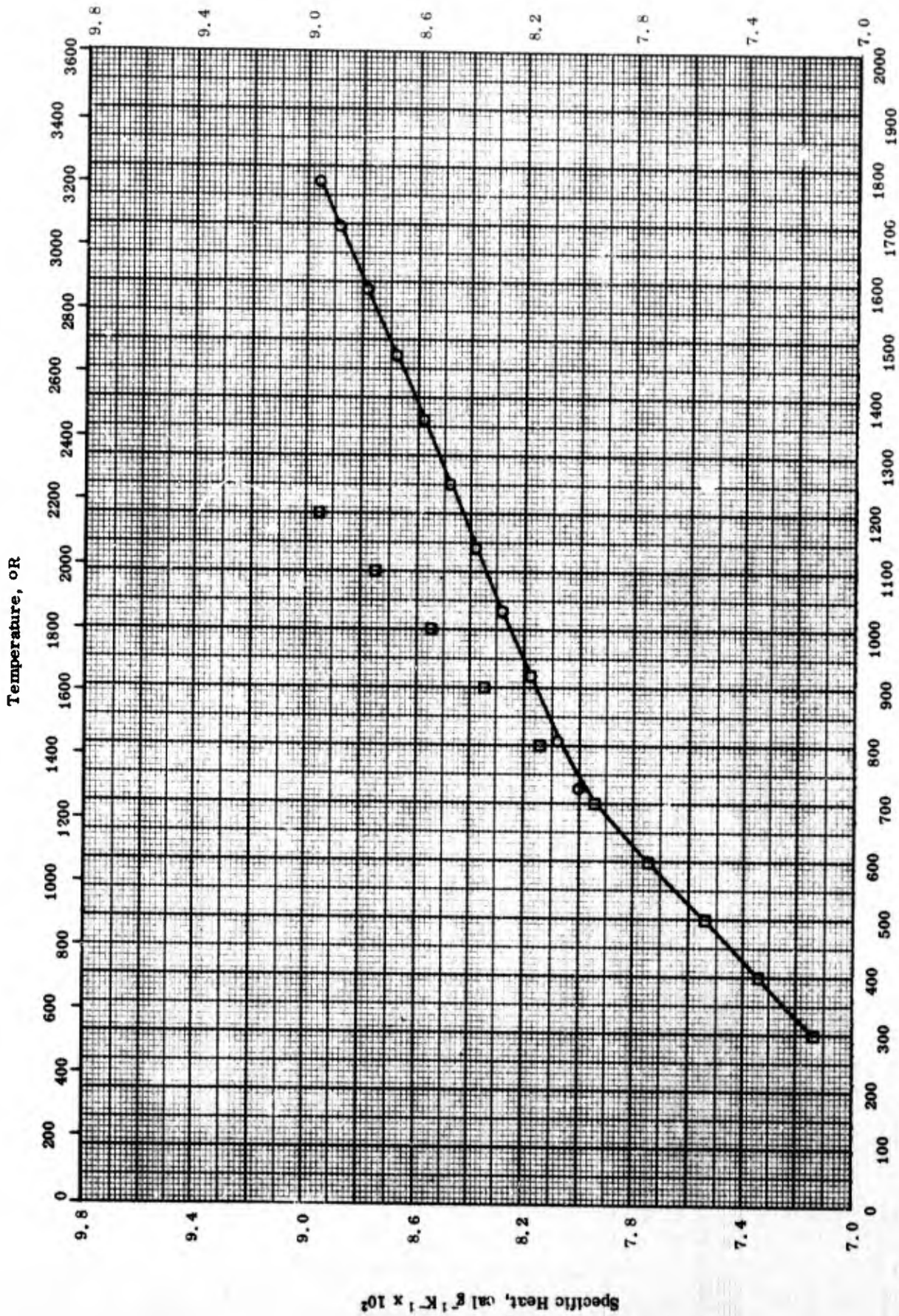
Melting Point		K	R
○	$TaSi_2$ to $TaSi_{0.60}$	2040	3672
	$TaSi_{0.60}$ to $TaSi_{0.40}$	1880	3384
	$TaSi_{0.40}$ to $TaSi_{0.20}$	2180	3924
	$TaSi_{0.20}$ to Ta	2380	4284
□	Ta_5Si_3	2768	4982
△	$TaSi_2$	2473*	4451*
▽	Ta_2Si	1880	3384
◇	$TaSi_2$	2473	4451
	Ta_5Si_3	2773*	4991*
	Ta_2Si	≈2733*	≈4919*
●	Ta_5Si_3	>2045	>3681
	Ta_3Si_2	>1933	>3479
	$Ta_{4.5}Si$	>2383	>4289
■	$Ta_{4.5}Si$	2788*	5018*

*Most probable value for this compound.

PROPERTIES OF TANTALUM SILICIDES

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
○	50-4	1880-2380		Ingredients x-ray spectroscopically pure.	Mixed from pure powder and induction heated in argon.
▽	50-4	1880		Ta_2Si.	Same as above.
□	55-28	2768		Ta_5Si_3.	Arc-melted.
△	55-28	2473		Ta_2Si.	Arc-melted.
◇	53-23	2473-2733		Series of tantalum silicides.	Decomp. temperature for Ta_2Si.
●	49-13	1933-2383		Series of tantalum silicides.	Auth. indicated that Ta_3Si_2 could be Ta_5Si_3.
■	59-28	2788		$Ta_{4.5}Si$.	

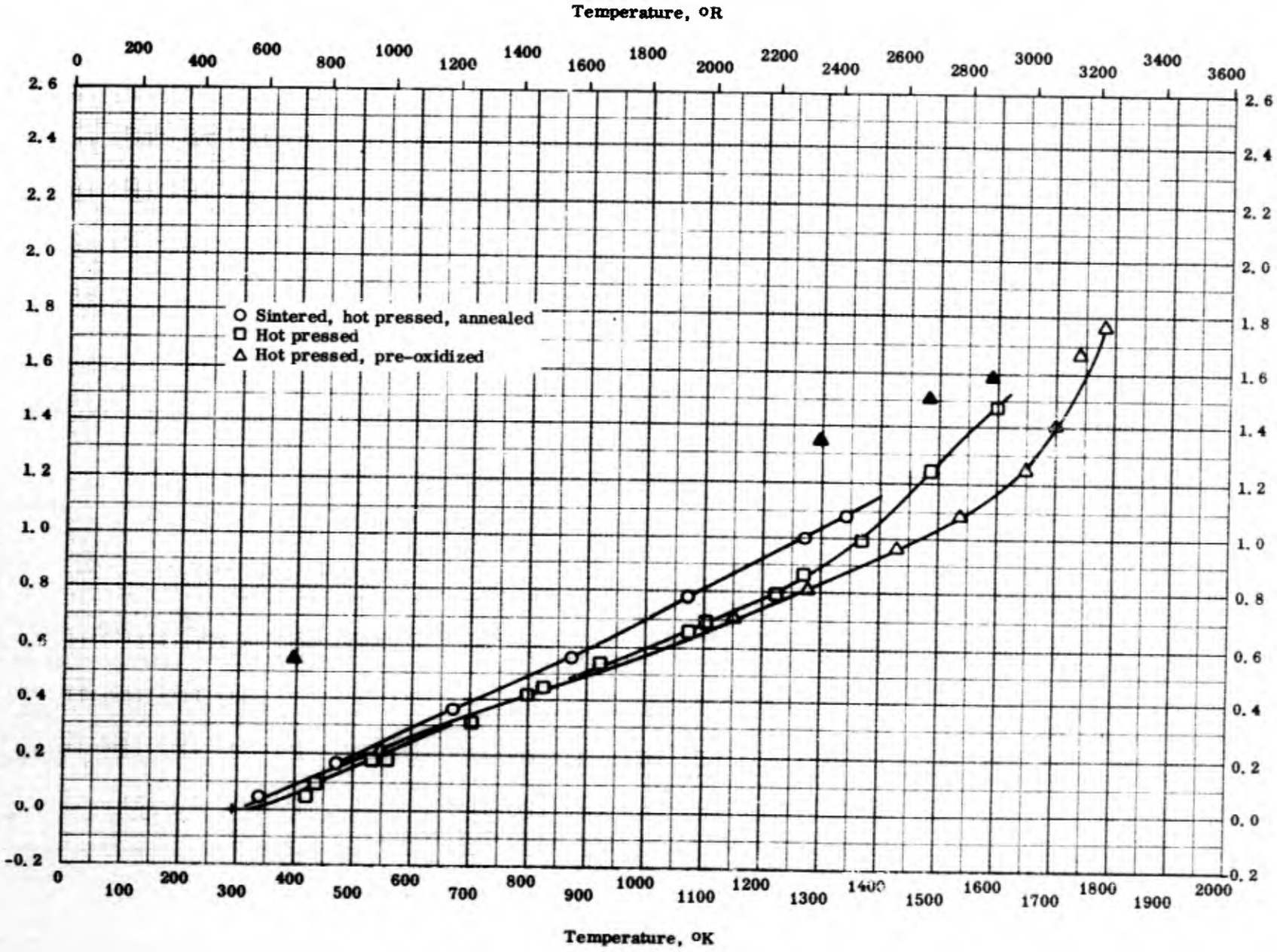


SPECIFIC HEAT -- TANTALUM SILICIDE

SPECIFIC HEAT -- TANTALUM SILICIDE

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
○	61-9	706-1800		$TaSi_2$, single phase.	Prepared by solid-state reaction of constituents elements at 2370 F; hot-pressed;
□	65-2	484-1176	2	$TaSi_2$; 73.40 Ta, 24.35 Si, and 1.30 C.	

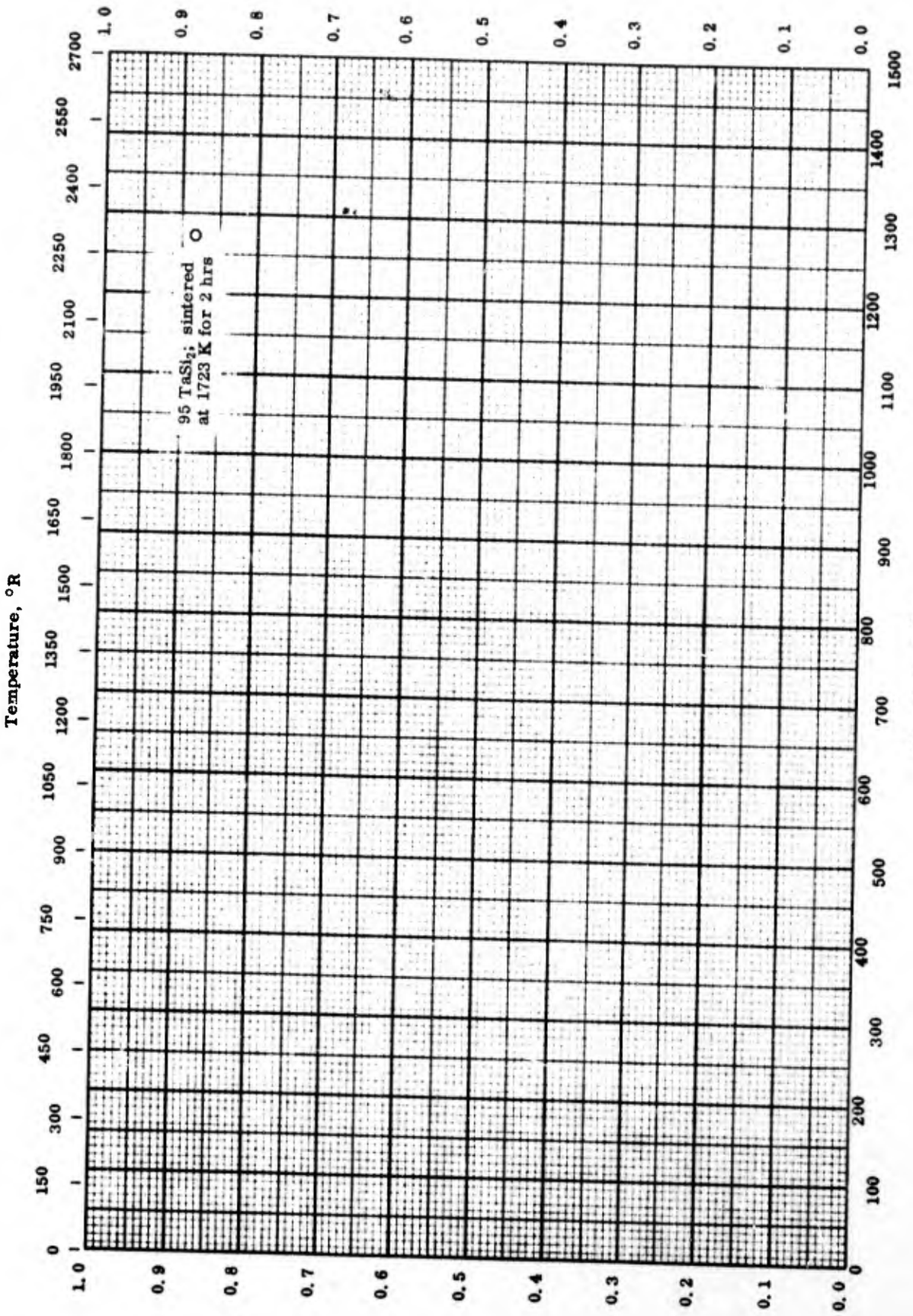


THERMAL LINEAR EXPANSION -- TANTALUM SILICIDE

THERMAL LINEAR EXPANSION -- TANTALUM SILICIDE

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
○	63-28	293-1343		$TaSi_2$; 77.4 Ta, 23.9 total Si (0.6 free).	Sintered, hot pressed, and annealed.
□	60-28	300-1597		Specimen dimension 3-1/4 by 1/2 by 1/4 in.^{3}; grain size 55μ; 98.8% absolute density. [Author's design.: H. P. 301]	Hot pressed; max pressing temperature 2955 F and max pressure 2000 psi; measured in air; the formation of an oxide scale affecting the expansion at about 1800 F.
△	60-28	300-1780		Same as above.	Same as above specimen except pre-oxidized at 2700 F and oxidation affecting results at about 2400 F; heating.
▲	60-28	396-1780		Same as above.	Cooling data of above specimen.

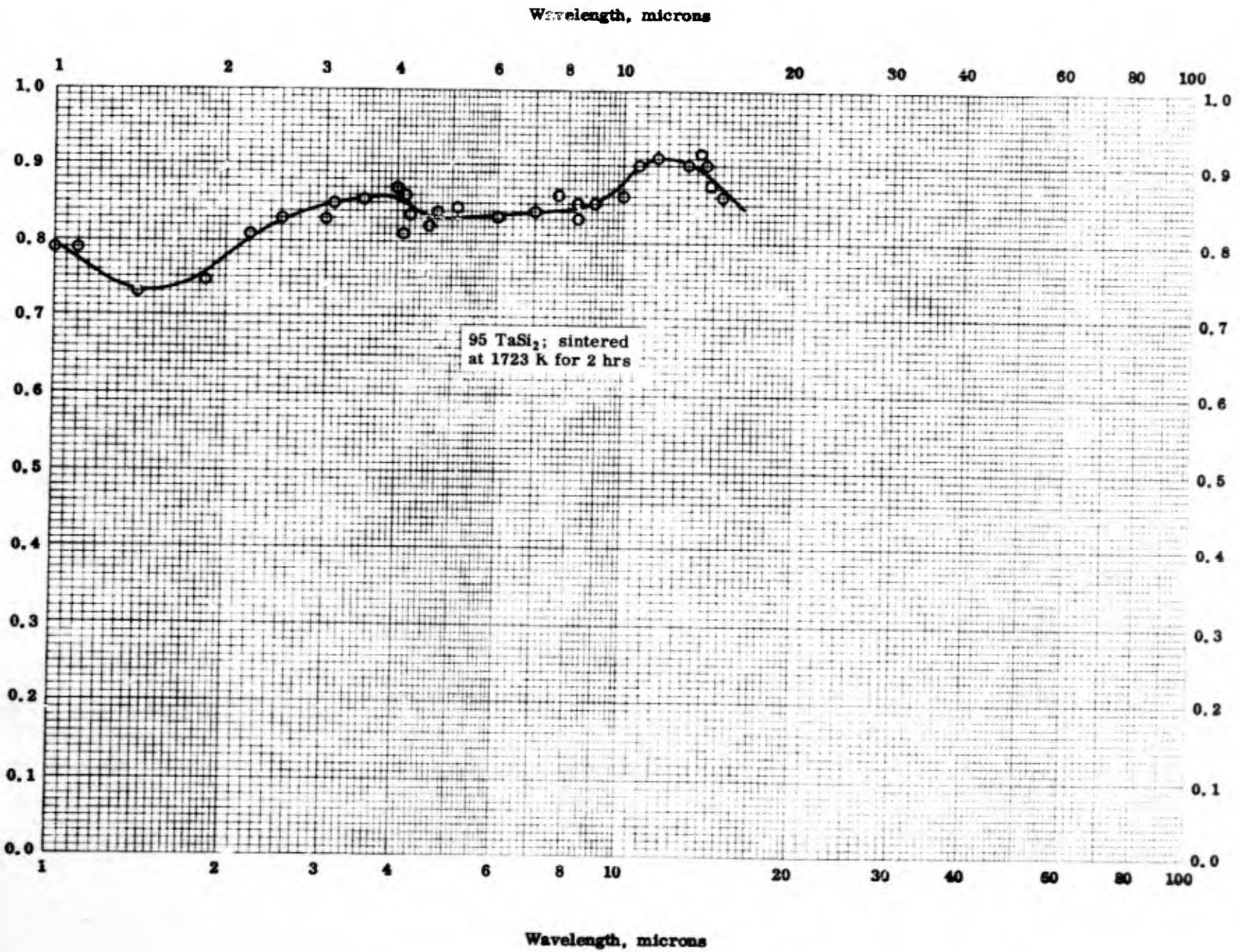


NORMAL TOTAL EMITTANCE -- TANTALUM SILICIDE

NORMAL TOTAL EMITTANCE -- TANTALUM SILICIDE

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
O	63-16	1273	± 8	95 pure $TaSi_2$; 0.048 in. thickness plate; density 4.78 g cm^{-3}.	Sintered at 1723 K for 2 hrs.; measured in argon atm.; calculated from spectral data.



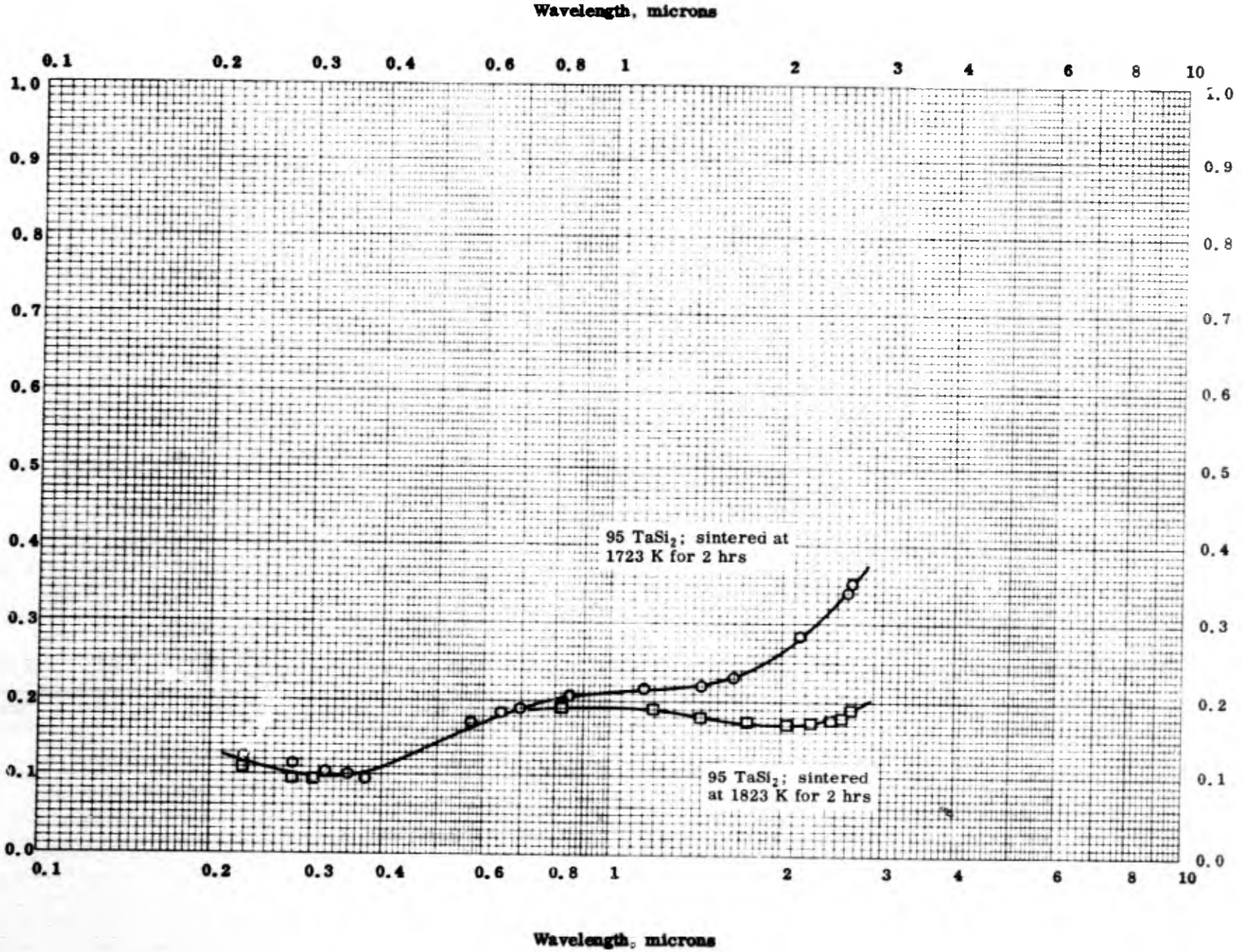
TPRC

NORMAL SPECTRAL EMITTANCE -- TANTALUM SILICIDE

NORMAL SPECTRAL EMITTANCE — TANTALUM SILICIDE

REFERENCE INFORMATION

Symbol	Ref.	Temp. ° K	Wavelength Range, μ	Rept. Error %	Sample Specifications	Remarks
O	63-16	1273	1-15		95 pure $TaSi_2$; 0.048 in. thickness plate; density 4.78 g cm^{-3}.	Sintered at 1723 K for 2 hrs; measured in argon atmosphere; data taken from a curve.



NORMAL SPECTRAL REFLECTANCE -- TANTALUM SILICIDE

NORMAL SPECTRAL REFLECTANCE — TANTALUM SILICIDE

REFERENCE INFORMATION

Symbol	Ref.	Temp. ° K	Wavelength Range, μ	Rept. Error %	Sample Specifications	Remarks
○	63-16	298	0.23-2.65	5	95 pure $TaSi_2$; 0.048 in. thickness plate; density 4.78 g cm^{-3}.	Sintered at 1723 K for 2 hrs; data taken from a curve; normal incidence, hemispherical viewing; MgO as reference standard.
□	63-16	298	0.23-2.65	5	95 pure $TaSi_2$; 0.054 in. thickness plate; density 4.38 g cm^{-3}.	Same as above except sintered at 1823 K for 2 hrs.

PROPERTIES OF TITANIUM SILICIDES

REPORTED VALUES

Density	g cm^{-3}	lb ft^{-3}
○ $TiSi_2$	3.85*	240*
□ $TiSi_2$	3.9	243

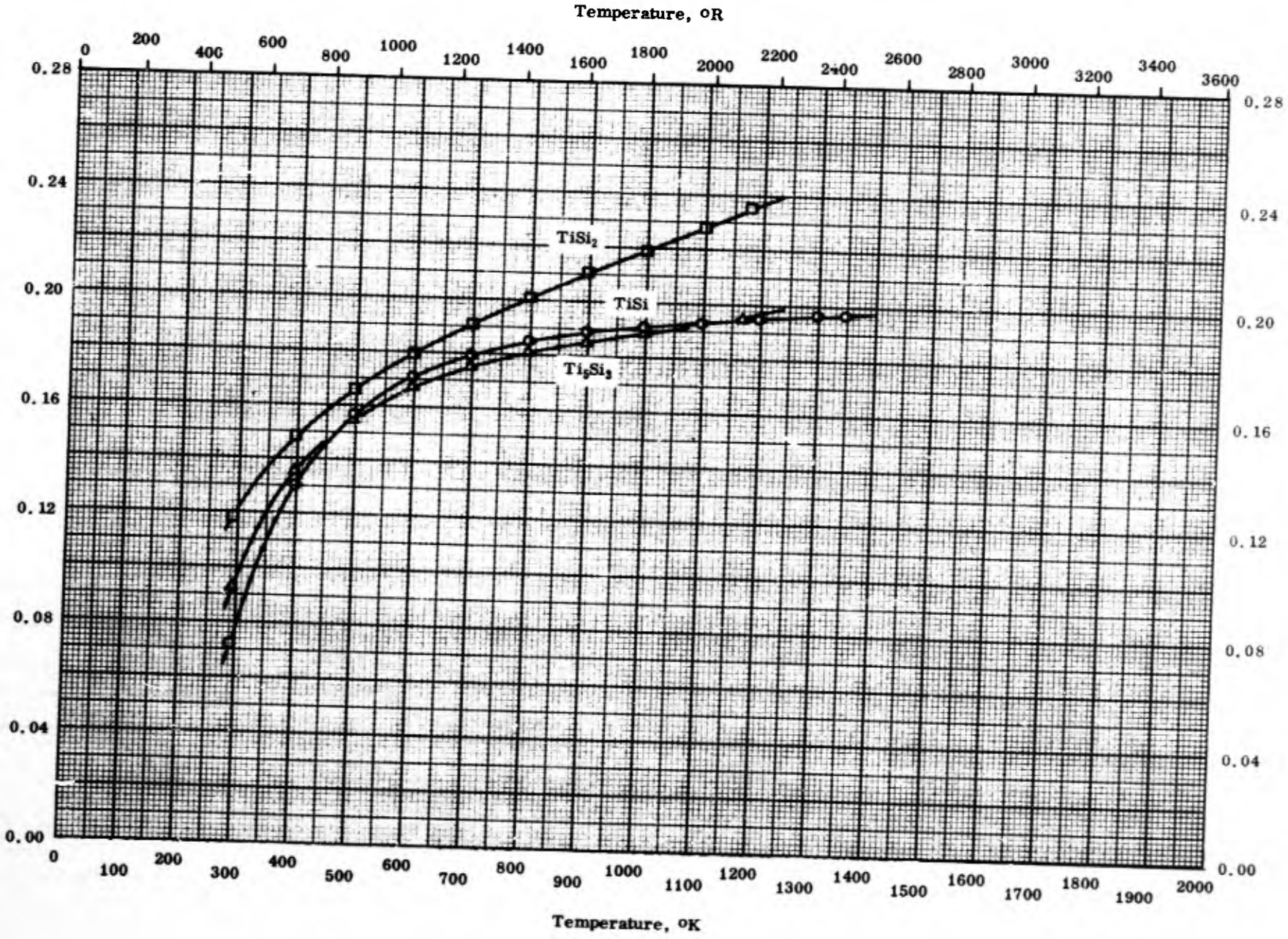
Melting Point	K	R
△ $TiSi_2$	1773 ± 40	3191 ± 72
TiSi	2193	3947
▽ $TiSi_2$; orthorhombic	1811	3261
TiSi; orthorhombic	2033	3659
Ti_5Si_3; hexagonal	2395	4311
◇ Ti_5Si_3; hexagonal	2395	4311
● Ti_5Si_3	2393	4307

*Most probable value for this compound.

PROPERTIES OF TITANIUM SILICIDES

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
○	56-30	298		$TiSi_2$, actual $TiSi_{1.8}$; 49.9 Si and 46.3 Ti.	Prepared by alumino-thermic reduction of the metallic oxide and silica; computed from x-ray measurements of lattice.
□	56-30	298		Same as above.	Same as above; density measured.
△	51-9	1733-2193		TiSi and $TiSi_2$.	Decomp. temperature for TiSi.
▽	51-9 also 53-13	1811-2395		Series of titanium silicides.	
◇	54-36	2395		Ti_5Si_3.	
●	58-20	2393		Ti_5Si_3.	

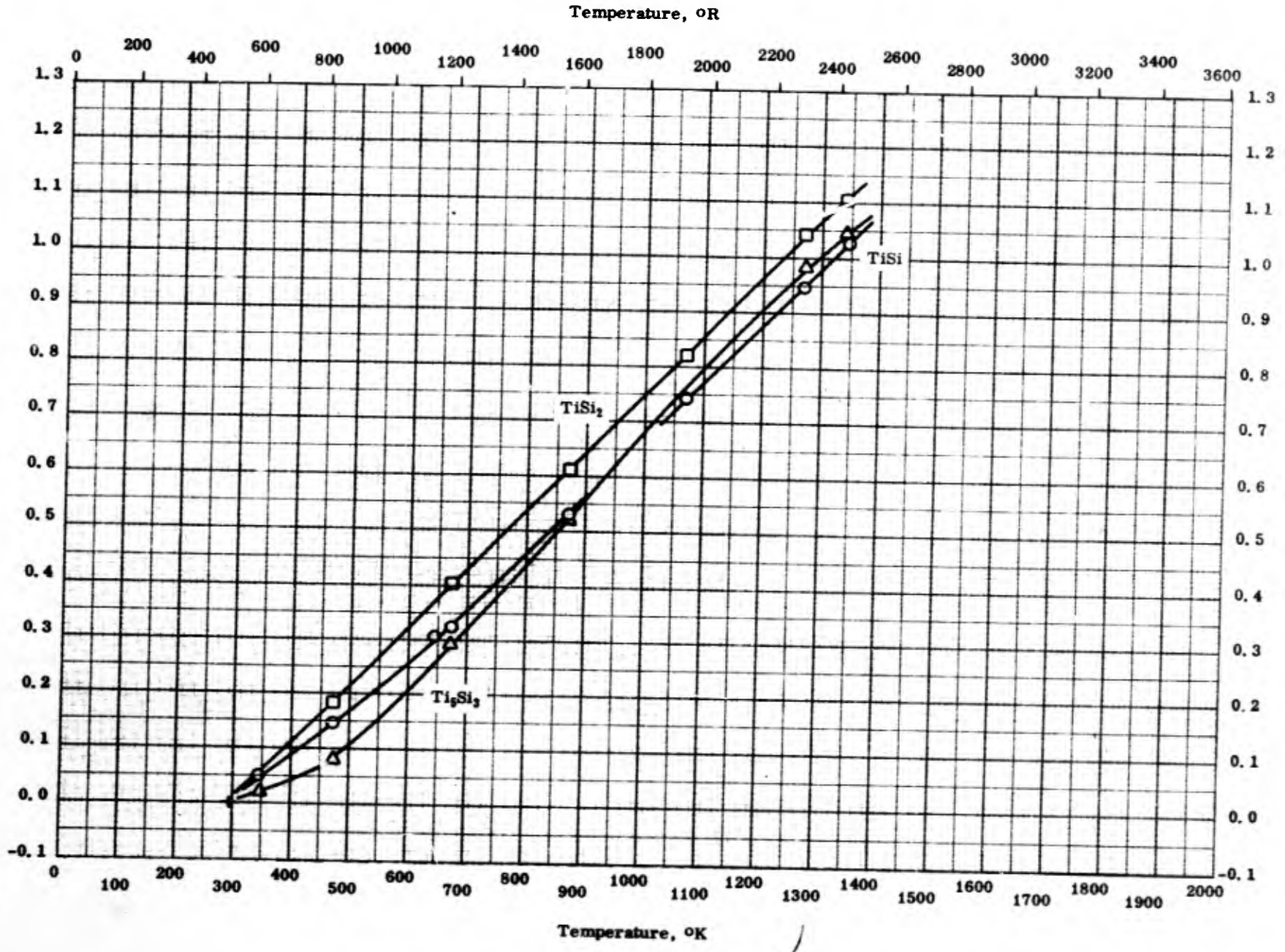


SPECIFIC HEAT -- TITANIUM SILICIDES

SPECIFIC HEAT -- TITANIUM SILICIDES

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
○	59-14	298-1350	± 1.8	TiSi.	
□	59-14	298-1180	± 1.9	$TiSi_2$.	
△	59-14	298-1170	± 3.0	Ti_5Si_3.	

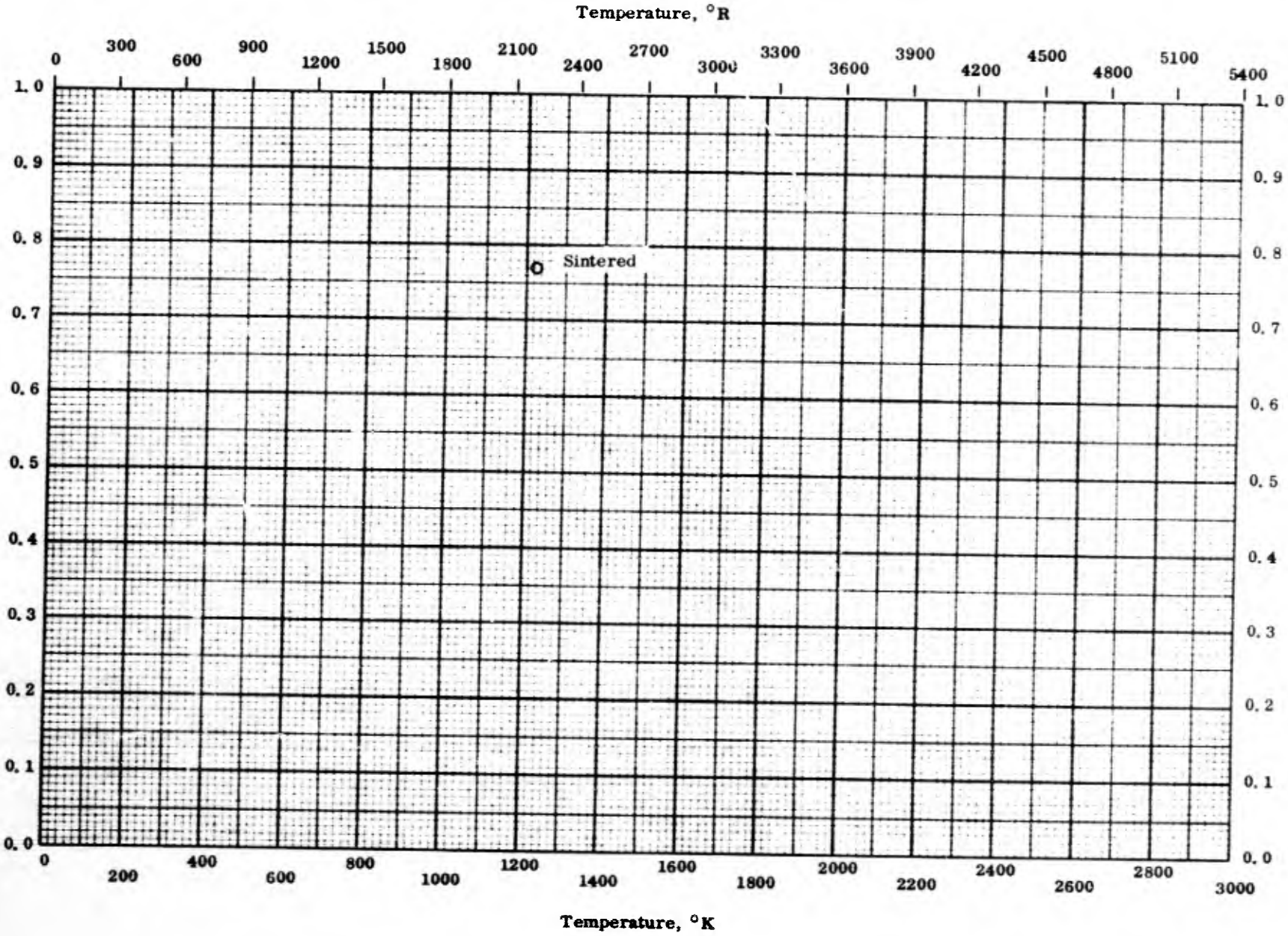


THERMAL LINEAR EXPANSION -- TITANIUM SILICIDES

THERMAL LINEAR EXPANSION -- TITANIUM SILICIDES

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
○	63-28	293-1349		TiSi; 62.8 Ti and 36.8 total Si (0.3 free).	Sintered, hot pressed, and annealed; fusion temperature 2033 K.
□	63-28	293-1343		$TiSi_2$; 46.4 Ti and 53.9 total Si (0.6 free).	Same as above except fusion temperature 1813 K.
△	63-28	293-1343		Ti_5Si_3; 73.0 Ti and 26.8 total Si (0.5 free).	Same as above except fusion temperature 2393 K.

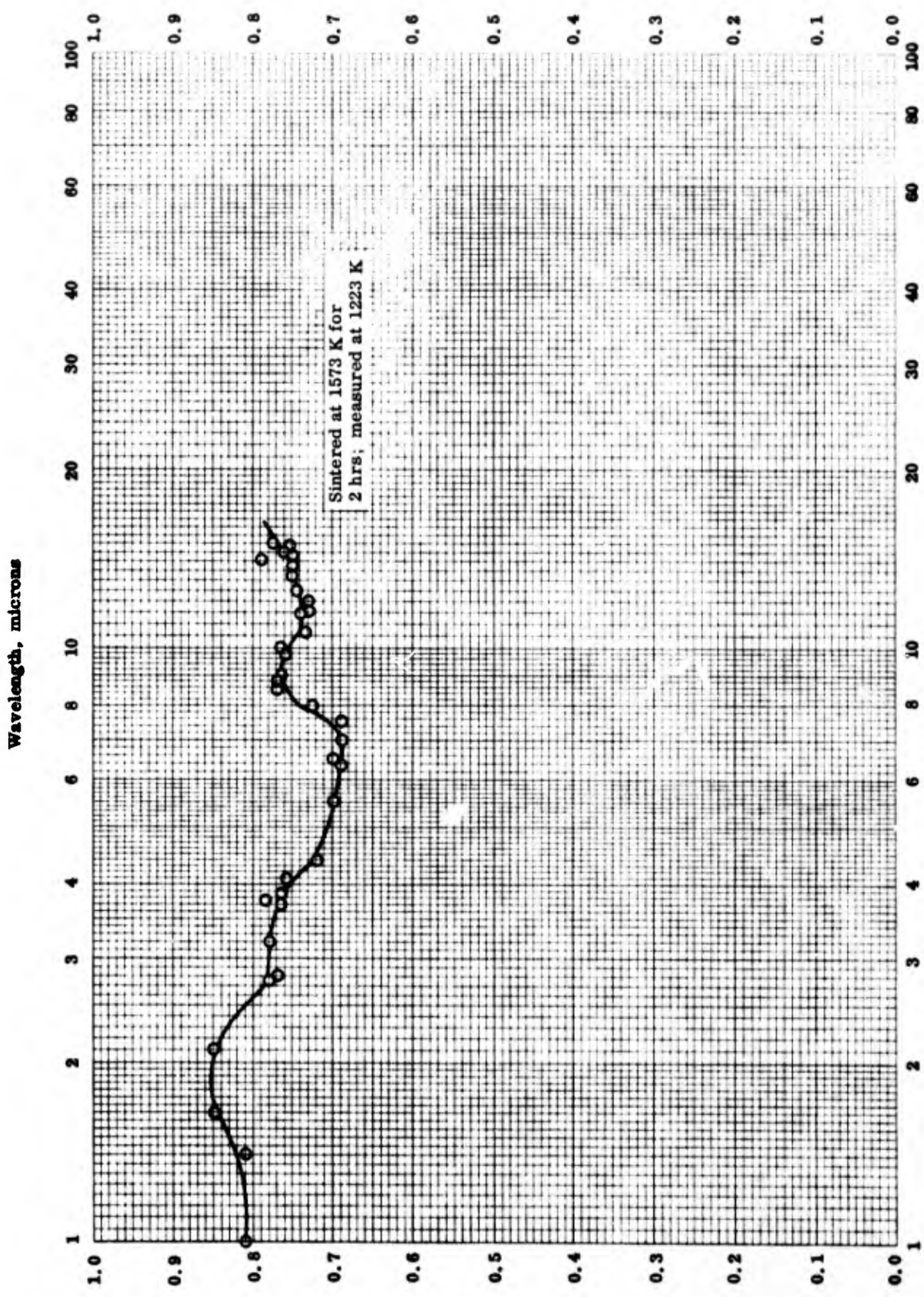


NORMAL TOTAL EMITTANCE -- TITANIUM DISILICIDE

NORMAL TOTAL EMITTANCE -- TITANIUM DISILICIDE

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
O	63-16	1223	± 8	$TiSi_2$; 0.057 in. thickness plate; density 2.82 g cm^{-3}.	Sintered at 1573 K for 2 hrs; measured in argon; calculated from spectral data.

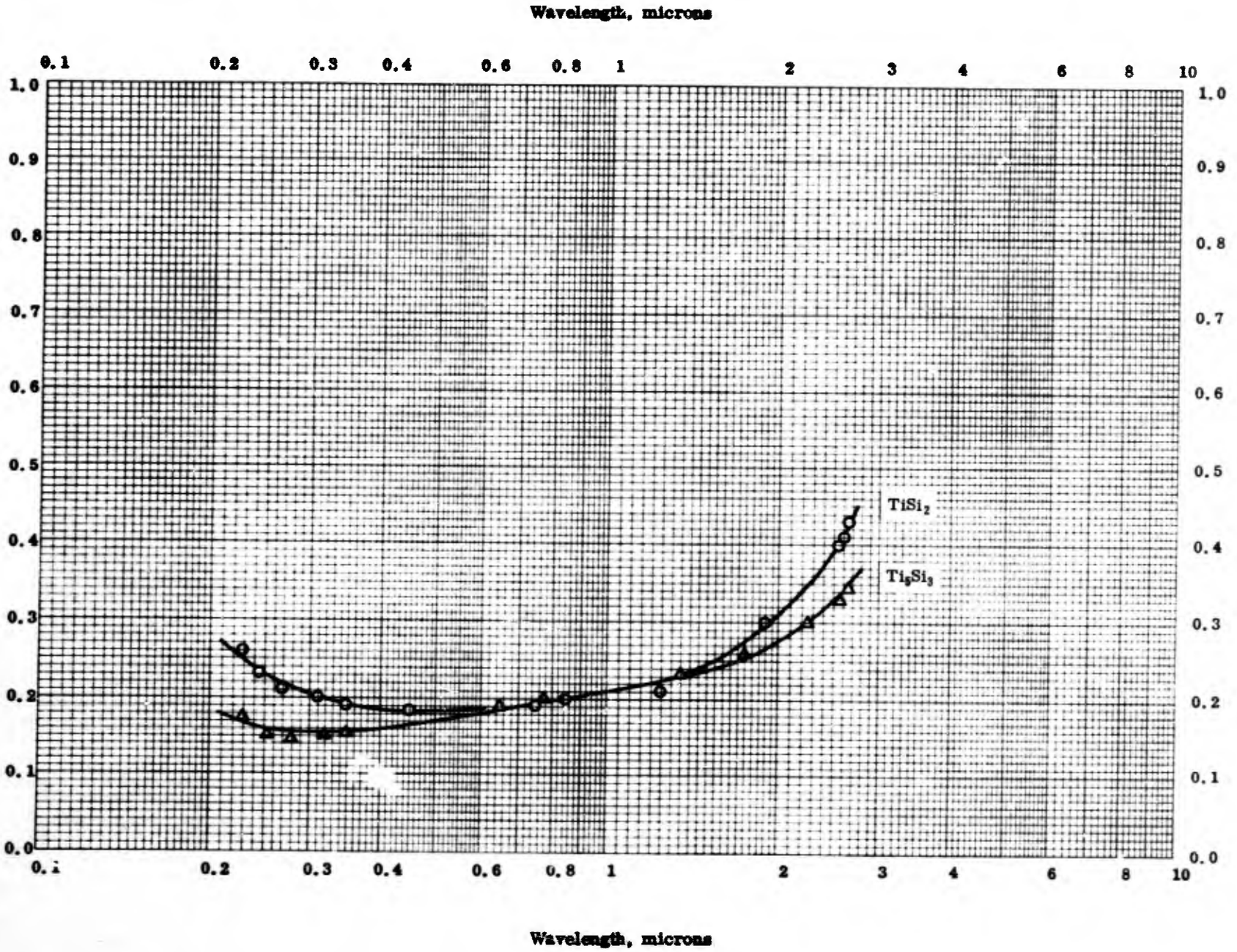


NORMAL SPECTRAL EMITTANCE -- TITANIUM DISILICIDE

NORMAL SPECTRAL EMITTANCE -- TITANIUM DISILICIDE

REFERENCE INFORMATION

Symbol	Ref.	Temp. °K	Wavelength Range μ	Rept. Error%	Sample Specifications	Remarks
O	63-12	1223	1-15		$TiSi_2$; 0.057 in. thickness plate; density 2.82 g cm^{-3}.	Sintered at 1573 K for 2 hrs; measured in argon atm; data taken from a curve.



NORMAL SPECTRAL REFLECTANCE -- TITANIUM SILICIDES

NORMAL SPECTRAL REFLECTANCE -- TITANIUM SILICIDES

REFERENCE INFORMATION

Symbol	Ref.	Temp. °K	Wavelength Range, μ	Rept. Error %	Sample Specifications	Remarks
O	63-16	298	0.23-2.65	5	$TiSi_2$; 0.057 in. thickness plate; density 2.82 g cm^{-3}.	Sintered at 1573 K for 2 hrs; data taken from a curve normal incidence, hemispherical viewing; MgO as reference standard.
Δ	63-16	298	0.23-2.65	5	Ti_5Si_3; 0.048 in. thickness plate; density 1.93 g cm^{-3}.	Same as above.

PROPERTIES OF TUNGSTEN SILICIDES

REPORTED VALUES

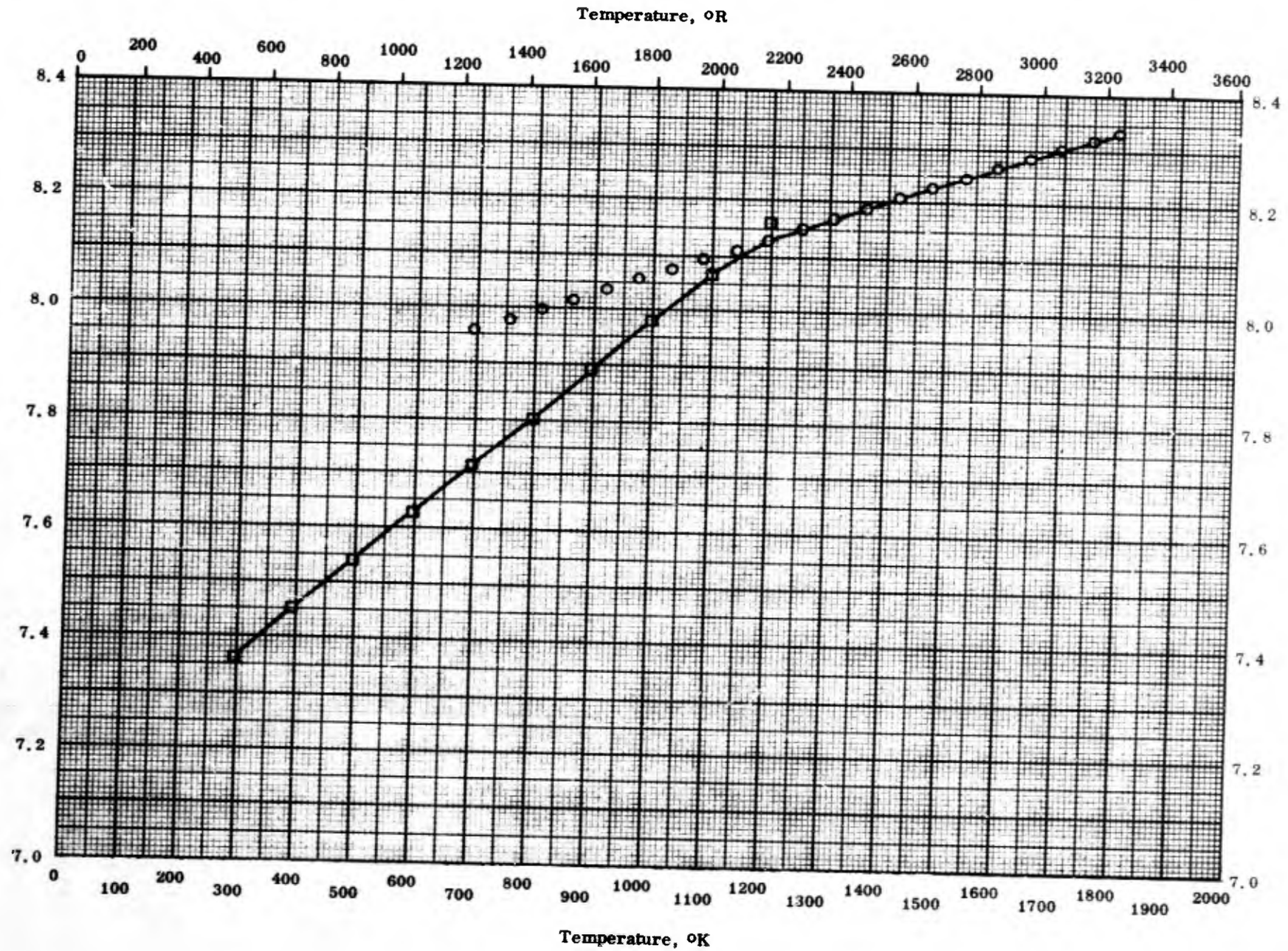
Melting Point		K	R
○	WSi_2 to $WSi_{0.7}$	2160	3888
□	$WSi_{0.7}$ to W	2290	4122
△	WSi	2438	4388
	W_5Si_3	2593	4667
▽	WSi	2456*	4421*
	W_3Si_2	2595	4671

*Most probable value of this compound.

PROPERTIES OF TUNGSTEN SILICIDES

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
○	50-4	2160		WSi_2 to $WSi_{0.7}$; x-ray spectroscopically pure.	Mixed from pure powders and induction heated in argon.
□	50-4	2290		$WSi_{0.7}$ to W; same as above.	Same as above.
△	52-25	2438-2593		Series of tungsten silicides.	Decomp. temperature for W_5Si_3.
▽	55-33	2456-2595		Same as above.	

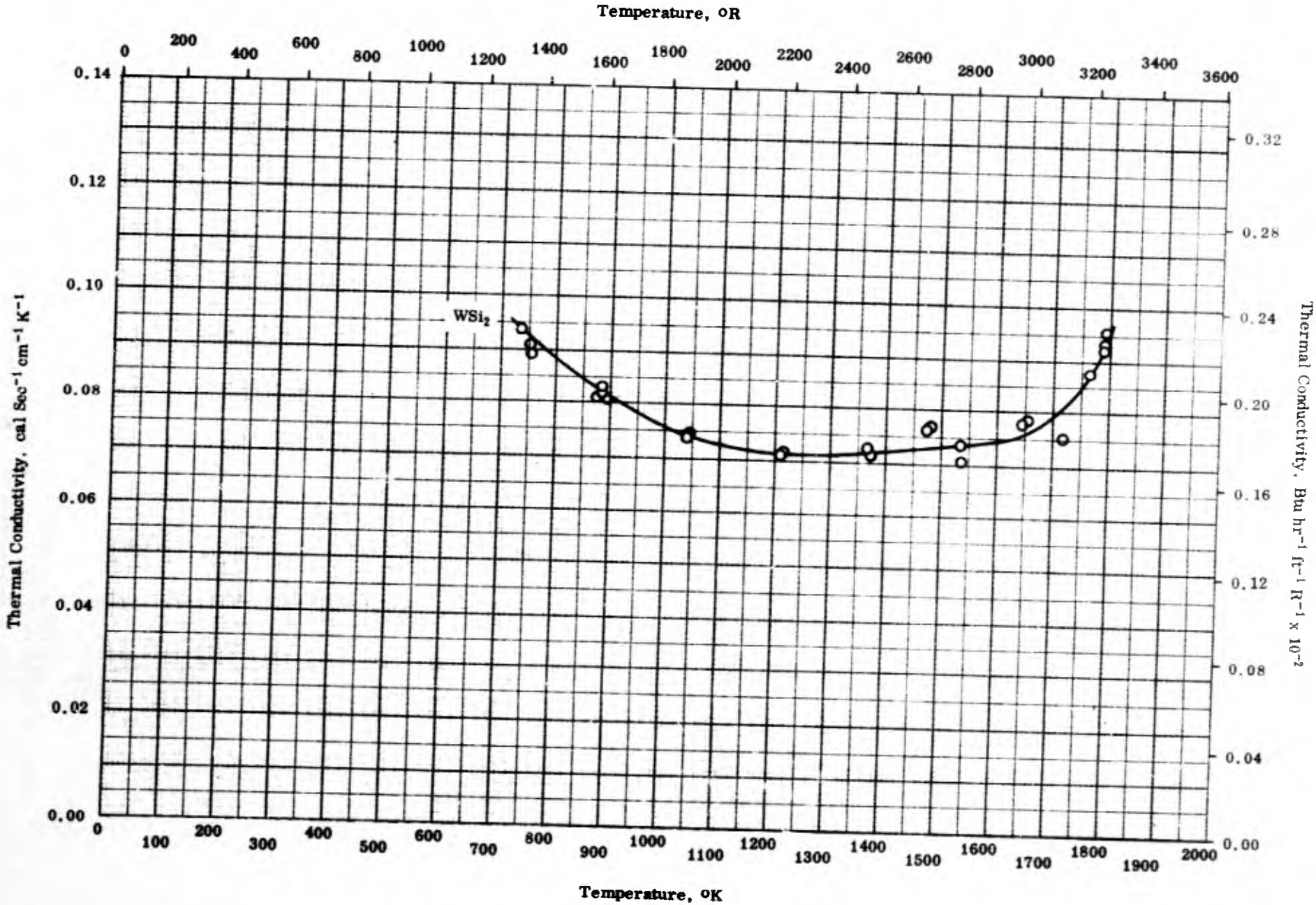


SPECIFIC HEAT -- TUNGSTEN SILICIDE

SPECIFIC HEAT -- TUNGSTEN SILICIDE

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
O	61-9	704-1794		WSi_2; single phase.	Prepared by solid-state reaction of constituent elements at 2370 F; hot-pressed.
□	65-2	460-1068		WSi_2; 75.97 W and 23.32 Si.	

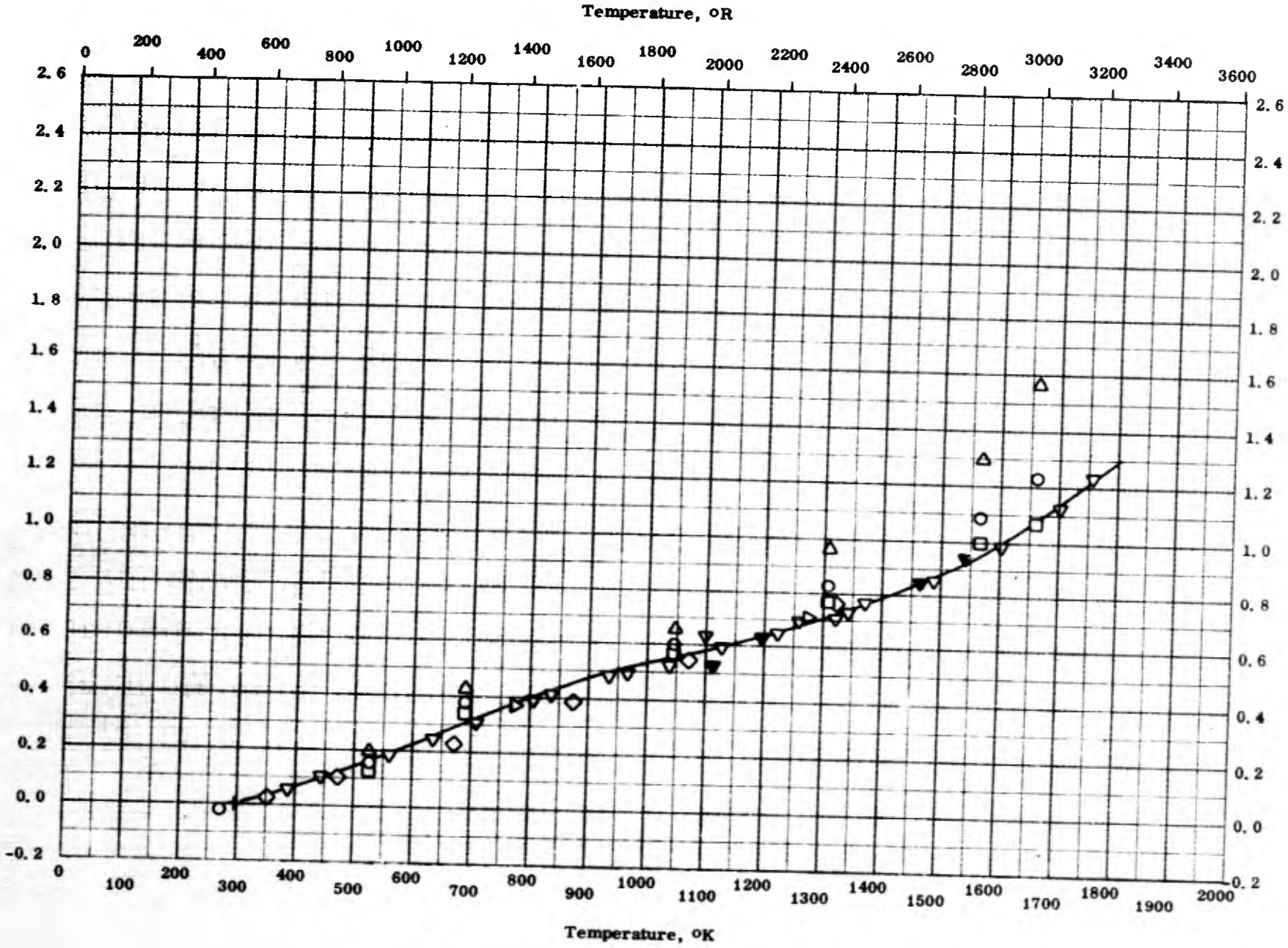


THERMAL CONDUCTIVITY -- TUNGSTEN SILICIDE

THERMAL CONDUCTIVITY -- TUNGSTEN SILICIDE

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
O	61-9	733-1793		WSi_2.	

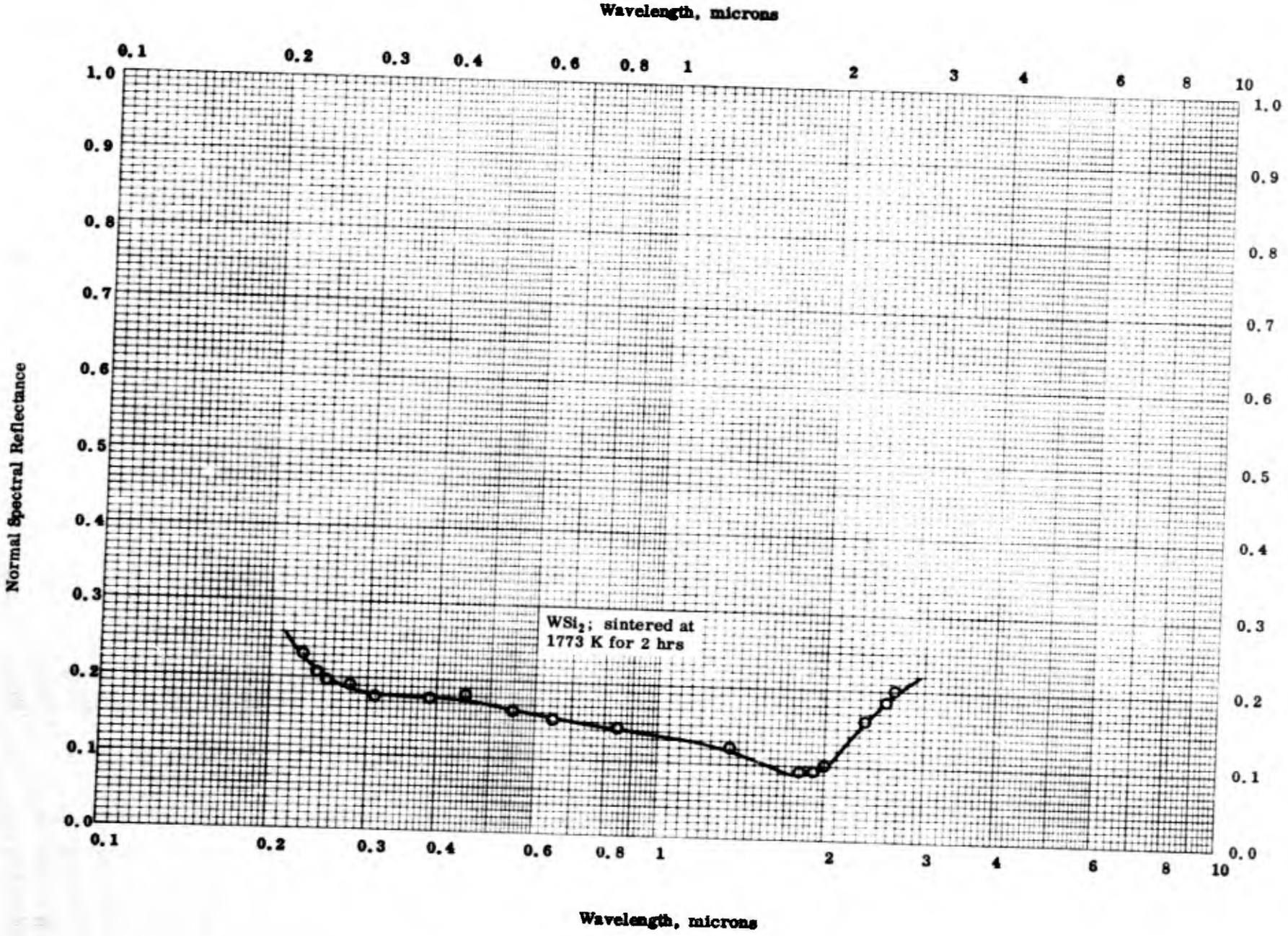


THERMAL LINEAR EXPANSION -- TUNGSTEN SILICIDE

THERMAL LINEAR EXPANSION -- TUNGSTEN SILICIDE

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
○	57-22	273-1663		Prepared from high purity W and 99.7 pure Si.	Heated 1 hr at 1300 C; tested in He; data plotted for polycrystalline material, calculated from measurements of unit cell dimensions.
□	57-22	273-1663		Same as above.	Measured parallel to a-axis.
△	57-22	273-1663		Same as above.	Measured parallel to c-axis.
◇	63-28	293-1323		76.0 W and 23.8 total Si (0.2 free).	Sintered, hot pressed, and annealed; fusion temperature 2438 K.
▽	60-29	300-1773		Grain size 27 μ; 100% absolute density; specimen dimension 3-1/4 by 1/2 by 1/4 in.^{3} [Author's design.: H. P. 347]	Hot pressed with Mo linear; pre-oxidized for 1 hr at 2600 F; measured in argon (for T < 2200 F) and in air (for T > 2200 F); heating.
▼	60-29	300-1772		Same as above.	Cooling data of above specimen.
▷	60-27	298-1273		Not given.	



NORMAL SPECTRAL REFLECTANCE -- TUNGSTEN SILICIDE

NORMAL SPECTRAL REFLECTANCE -- TUNGSTEN SILICIDE

REFERENCE INFORMATION

Symbol	Ref.	Temp. ° K	Wavelength Range, μ	Rept. Error %	Sample Specifications	Remarks
O	63-16	298	0.23-2.65	5	WSi_2; 0.045 in. thickness plate; density 5.16 g cm^{-3}.	Sintered at 1773 K for 2 hrs; data taken from a curve; normal incidence, hemispherical viewing; MgO as reference standard.

PROPERTIES OF URANIUM SILICIDES

REPORTED VALUES

Density		g cm^{-3}	lb ft^{-3}
○	U_3Si	15.5 ± 1	968 ± 6
□	U_3Si	15.57 ± 0.02	972 ± 1.3
◇	U_3Si	15.45 ± 0.05	965 ± 3
△	U_3Si	15.34 ± 0.2	958 ± 12
◁	U_3Si	15.58*	972.6*
▷	U_3Si_2	12.20	761.6
●	USi	10.40	649.2
■	β - USi_2	9.25	578
▲	α - USi_2	8.98	561
▼	USi_2	8.98	561
◆	U_3Si_2	12.2*	762*
◀	USi_3	8.15	509
▶	USi	10.4	649

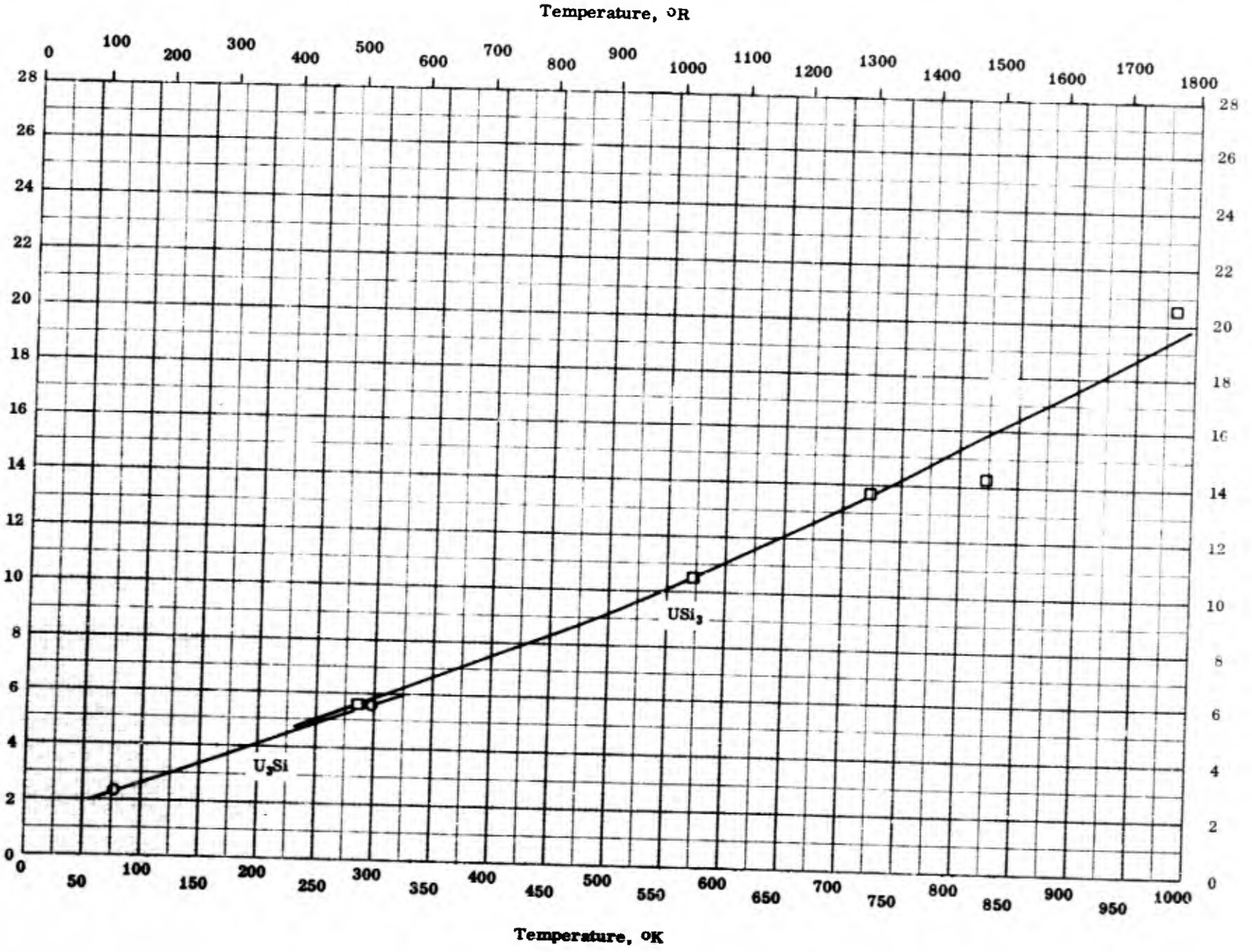
Melting Point		K	R
◑	U_3Si	1258*	2264*
▽	U_3Si	1203	2166
◐	α-USi_2	1973	3552
⊖	USi	1973*	3552*
⊖	USi_3	1893	3407
	USi	≈1873	≈337.
	U_3Si_2	1938	3488

*Most probable value of this compound.

PROPERTIES OF URANIUM SILICIDES

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
○	55-2	298	±0.04	U_3Si; 3.8 Si; α-phase.	Density by weight in air and in CCl_4.
◑	55-2	1258	±0.04	Same as above.	
□	55-2	298	±0.04	U_3Si; 3.8 Si and 0.05 > C.	Epsilonized; density by weight in air and in CCl_4.
△	55-2	298	±0.04	Same as above; made from U + U_3Si_2.	As melted; density obtained same as above.
◇	55-2	298	±0.04	U_3Si; 3.4 Si and 0.1 C.	Density obtained same as above.
◁	48-3	298		U_3Si.	Density from x-ray measurement.
▷	48-3	298		U_5Si_2.	Same as above.
●	48-3	298		USi.	Same as above.
■	48-3	298		USi_2; β - phase.	Same as above.
▲	48-3	298		USi_2; α - phase.	Same as above.
▽	56-29	1203		U_3Si.	Decomposes.
◐	56-29	1973		USi_2; α - phase.	Arc-melted.
▼	57-19	298		USi_2.	Density from x-ray measurement.
◆	57-19	298		U_3Si_2.	Same as above.
◀	57-19	298		USi_3.	Same as above.
▶	57-19	298		USi.	Same as above.
⊖	60-38	1973		USi.	
⊖	59-28	1873-1938		Series of uranium silicide.	Decomp. temperatures for USi_3 and USi.

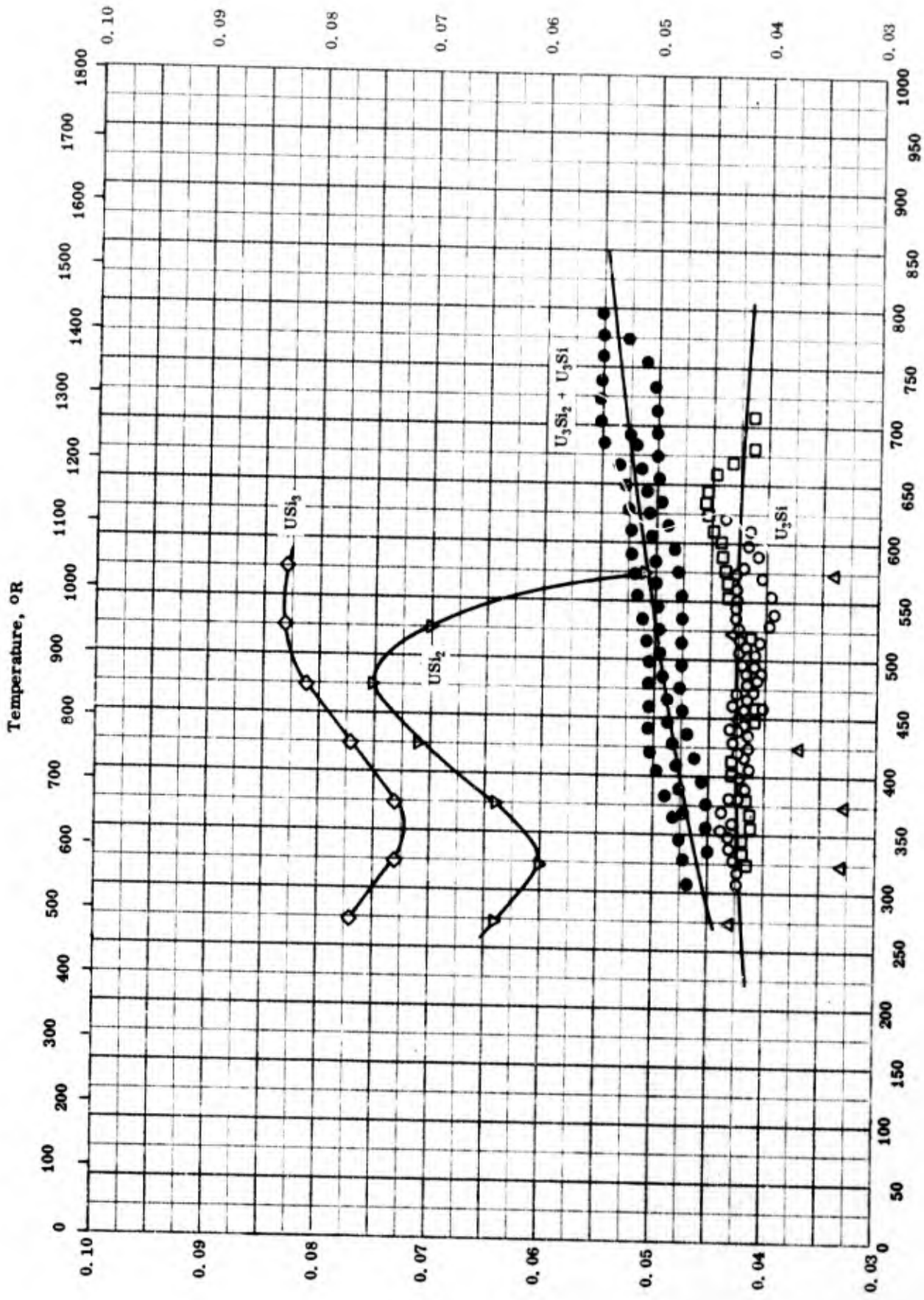


ELECTRICAL RESISTIVITY -- URANIUM SILICIDES

ELECTRICAL RESISTIVITY -- URANIUM SILICIDES

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
○	55-2	77-298		U_3Si; 3.8 Si.	∈ phase produced by heating 24 hrs at 800 C.
□	62-22	286-983		USi_3; 0.01-0.1 Be; prepared by HNO_3 cleaned uranium (0.1 total impurities; in the form of turnings) and as received Si (99.99 pure; chips); sample consisted of 1.0 USi_2.	Mixed by melting several times of stoichiometric amounts of U and Si by direct induction RF heating under argon at about 1/2 atm: zone melted.

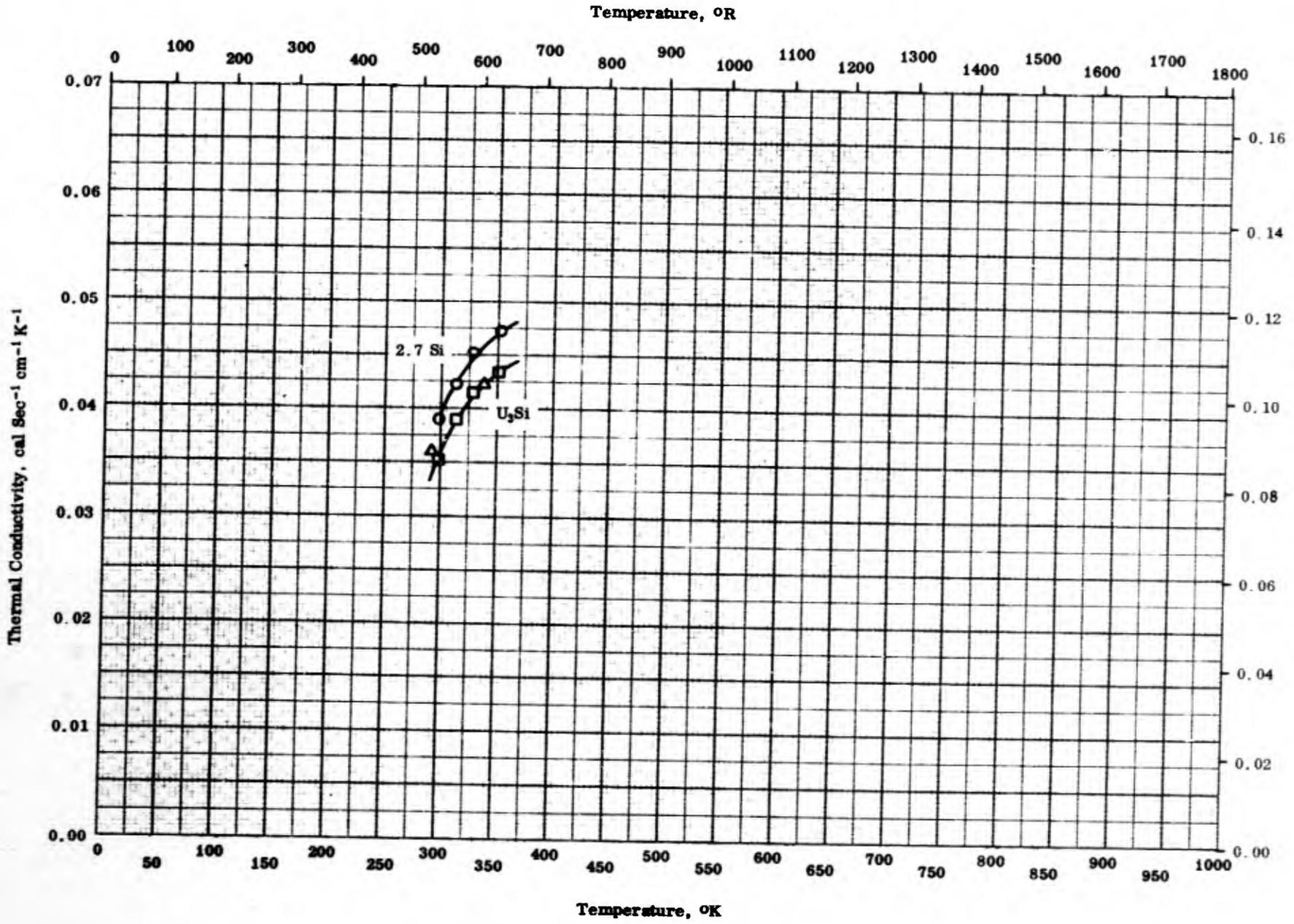


SPECIFIC HEAT -- URANIUM SILICIDES

SPECIFIC HEAT -- URANIUM SILICIDES

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
○	62-17 also 64-6	307-621	± 5	U_3Si; 96.9 U and 3.9 Si; [Author's design. sample 535].	Prepared by arc-melting and casting uranium and silicon; annealed 24 hrs at 800 C.
□	62-17 also 64-6	324-708	± 5	U_3Si; 96.1 U and 3.9 Si; [Author's design. sample 535].	Same as above.
△	57-19	273-578		U_3Si; 0.05 Fe, 0.01 Al, and Mn, and 0.01> other impurities.	
◇	57-19	273-578		USi_3; 1.0 W, 0.3 Fe, 0.09 Al, 0.05 Cu, and 0.01> other impurities.	
▽	57-19	273-578	U	USi_2; 0.08 Fe, 0.05 Al, 0.03 Cu, and 0.01> other impurities.	
●	62-17 also 64-6	306-795	± 5	U_3Si_2-U_3Si; 93.9 U and 6.1 Si; density 805 lb ft^{-3}. [Author's design.: sample 539].	Sample prepared by arc-melting and casting uranium and silicon; annealed 24 hrs at 800 C.

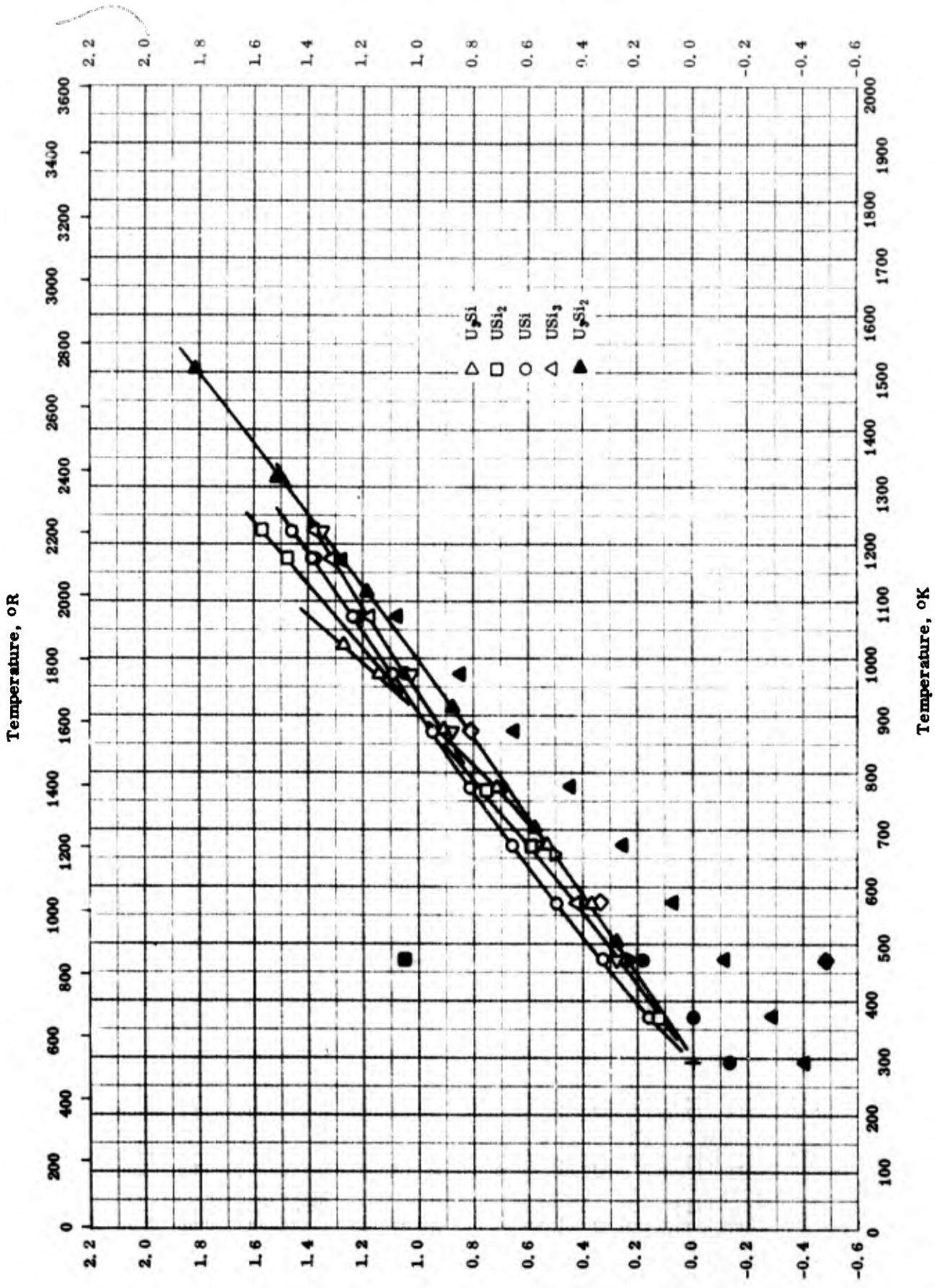


THERMAL CONDUCTIVITY -- URANIUM SILICIDE

THERMAL CONDUCTIVITY -- URANIUM SILICIDE

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
○	45-1	298-351		2.7 Si and 0.05 - 0.10 C.	Chill cast and annealed at 750 - 800 C.
□	45-1	298-351		U_3Si; 3.4 Si and 0.05 - 0.10 C; density 964 lb ft^{-3}.	ϵ phase; same as above.
△	55-2	293-378		U_3Si; 3.8 Si.	ϵ phase produced by heating at 800 C for 24 hrs.



THERMAL LINEAR EXPANSION -- URANIUM SILICIDES

THERMAL LINEAR EXPANSION -- URANIUM SILICIDES

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
○	57-19	293-1223		USi; before sintering: 0.40 W, 0.05 Fe, 0.02 Al, and < 0.01 each of any others.	Sintered; heating; measured in vacuum.
●	57-19	293-1223			Cooling.
□	57-19	293-1223		USi_2; before sintering: 0.08 Fe, 0.07 Al, 0.03 Cu, and < 0.01 each of any others.	Sintered.
△	57-19	293-1223		USi_3; before sintering: 1.00 W, 0.30 Fe, 0.09 Al, 0.05 Cu, and < 0.01 each of any others.	Sintered; heating; measured in vacuum.
▲	57-19	293-1223		Same as above.	Cooling.
◇	57-23	293-1073		U_3Si; 3.9 - 4.0 Si (∈ phase).	Cast; heated 1 week at 800 C to produce ∈ phase.
▽	55-2	373-673		U_3Si; 3.8 Si (∈ phase).	Held 24 hrs at 800 C to produce ∈ phase.
▷	56-15	293-1023		U_3Si.	Held 168 hrs at 800 C to produce ∈ phase.
◁	56-15	293-1223		U_3Si_2.	Powder; sintered 15 hrs at 1400 C in argon.
■	56-14	478		USi_2 (β phase).	X-ray powder diffraction method; measured along a-axis.
◆	56-14	478		Same as above.	Same as above; measured along c-axis.
▼	56-14	478		Same as above.	Same as above; measured along U-Si bond direction.
▶	61-26	298-1503		U_3Si_2.	No substantial difference in results of specimen prepared by cold pressed and sintered from those by reaction hot pressed; measured in argon.

PROPERTIES OF VANADIUM SILICIDES

REPORTED VALUES

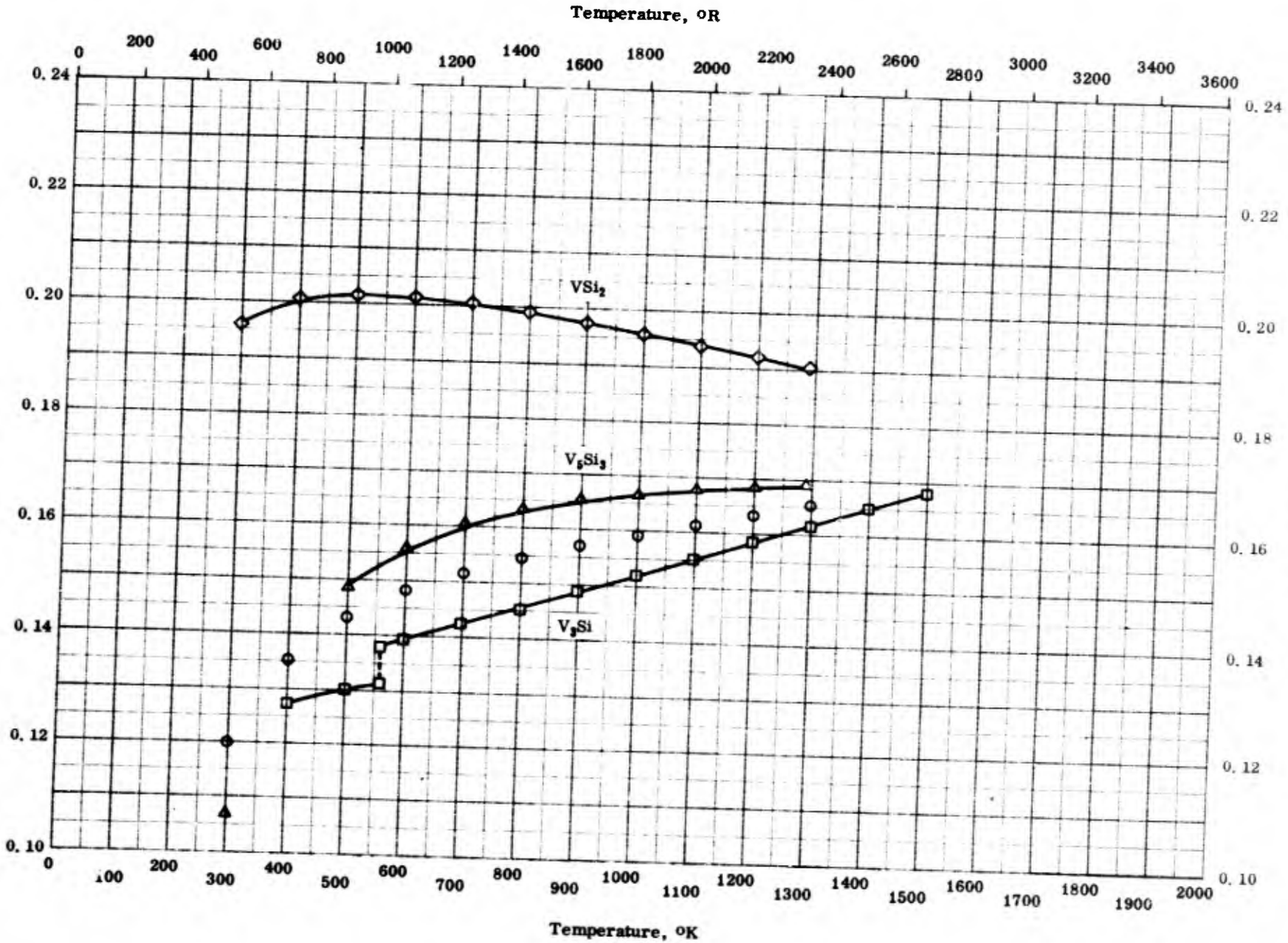
Melting Point		K	R
○	VSi	≈1933*	≈3479*
□	VSi	1927	3469
△	VSi; hexagonal	1922	3460
▽	V_3Si	≈2003	≈3605
	V_5Si_3	≈2423	≈4361

*Most probable value of this compound.

PROPERTIES OF VANADIUM SILICIDES

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
○	[illegible]-20	1933		VSi.	
□	50-4	1927		VSi.	
△	55-33 also 55-41	1922		VSi; hexagonal.	
▽	56-33	2003-2423		V_3Si and V_5Si_3.	Decomp. temperature for V_3Si.

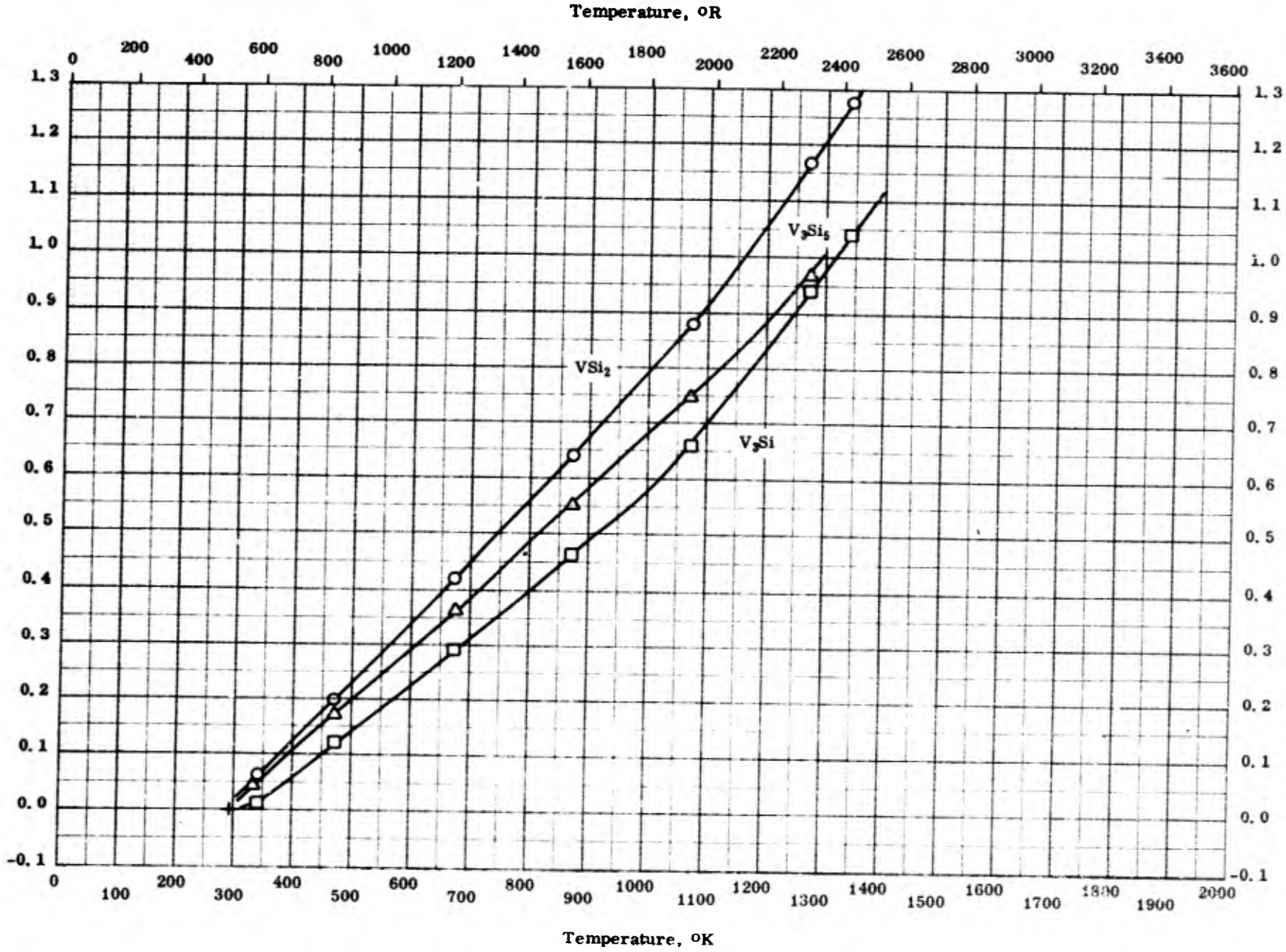


SPECIFIC HEAT -- VANADIUM SILICIDES

SPECIFIC HEAT -- VANADIUM SILICIDES

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
○	62-23	298-1310	± 2.2	V_3Si; 98.0 V_3Si.	
□	63-11	298-1500	0.1	V_3Si; 99.9 V_3Si and 1.0 V_5Si_3; crystalline.	
△	62-23	298-1290	± 1.9	98.0 V_5Si_3.	
◇	62-23	298-1290	1.2	98.0 VSi_2.	



THERMAL LINEAR EXPANSION -- VANADIUM SILICIDES

THERMAL LINEAR EXPANSION -- VANADIUM SILICIDES

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
○	63-28	293-1343		VSi_2; 47.6 V and 51.5 total Si (0.3 free).	Sintered, hot pressed, and annealed; fusion temperature 1943 K.
□	63-28	293-1343		V_3Si; 83.6 V and 15.9 total Si.	Sintered, hot pressed, and annealed; fusion temperature 2003 K.
△	63-28	293-1323		V_5Si_3; 74.4 V and 25.2 total Si.	Sintered, hot pressed, and annealed; fusion temperature 2423 K.

PROPERTIES OF ZIRCONIUM SILICIDES

REPORTED VALUES

Density		g cm^{-3}	lb ft^{-3}
○	$ZrSi_2$	4.90*	306*
□	$ZrSi_2$	5.2	320

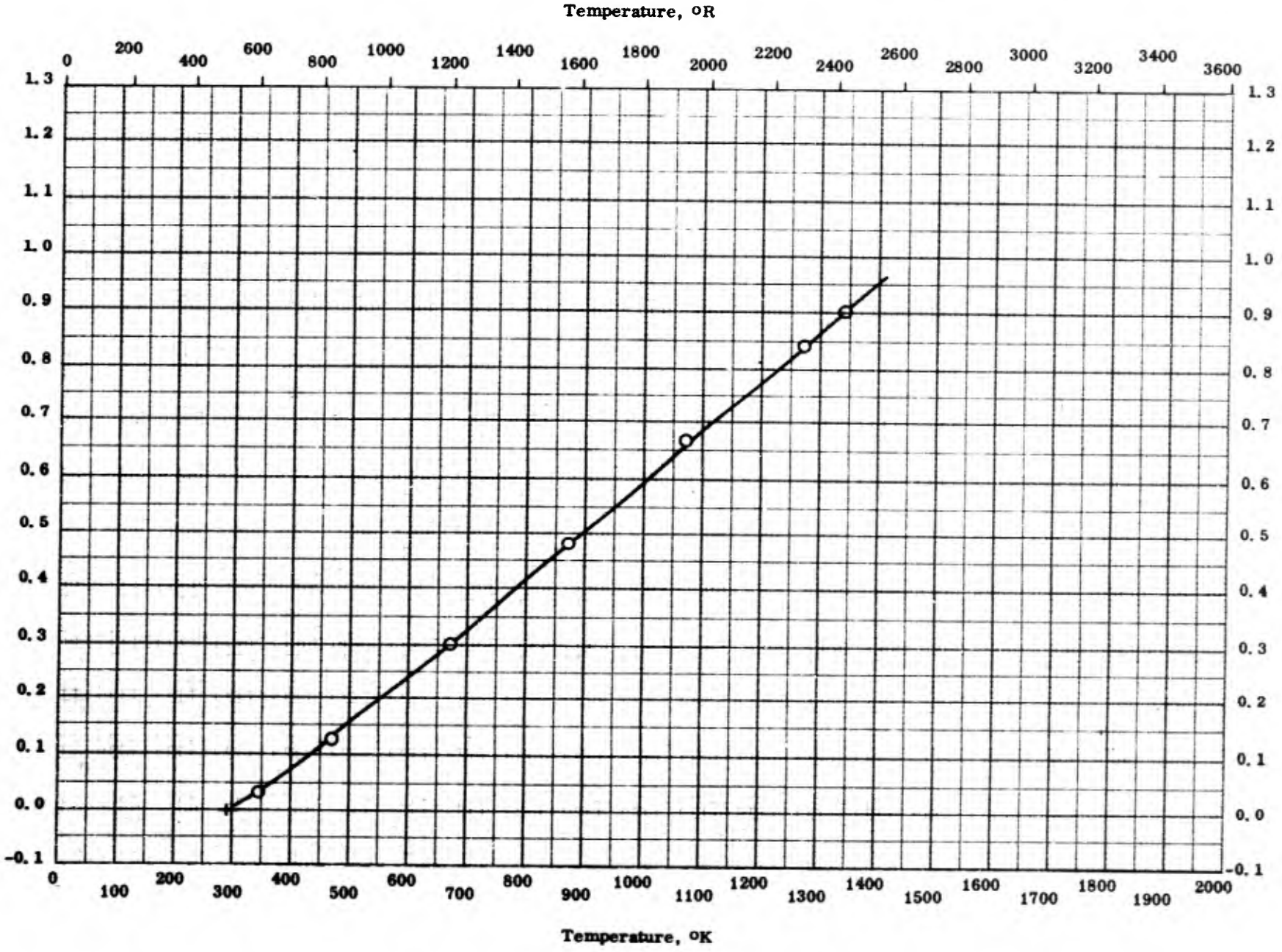
Melting Point		K	R
△	$ZrSi_2$	1973	3551
▽	$ZrSi_2$; tetragonal	1795	3231
	ZrSi; orthorhombic	2372	4270
	Zr_4Si	1906	3431
	Zr_3Si_2; tetragonal	2472	4450
	Zr_4Si_3	2500	4500
	Zr_5Si_6	2522	4540
	Zr_2Si; tetragonal	2383	4289
◇	ZrSi	2423*	4361*
	Zr_5Si_3	2523	4541
	Zr_2Si	2493	4487

*Most probable value of this compound.

PROPERTIES OF ZIRCONIUM SILICIDES

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
○	56-30	298		$ZrSi_2$, actual $ZrSi_{1.6}$; 64.9 Zr and 31.0 Si.	Prepared from alumino-thermic reduction of the metallic oxide and silica; computed from x-ray measurements of lattice.
□	56-30	298		Same as above.	Same as above; density measured.
△	58-20	1973		$ZrSi_2$.	
▽	53-13	1795-2522		Series of zirconium silicides.	
◇	59-28	2423-2523		Series of zirconium silicides.	Decomp. temperatures for ZrSi and Zr_2Si.

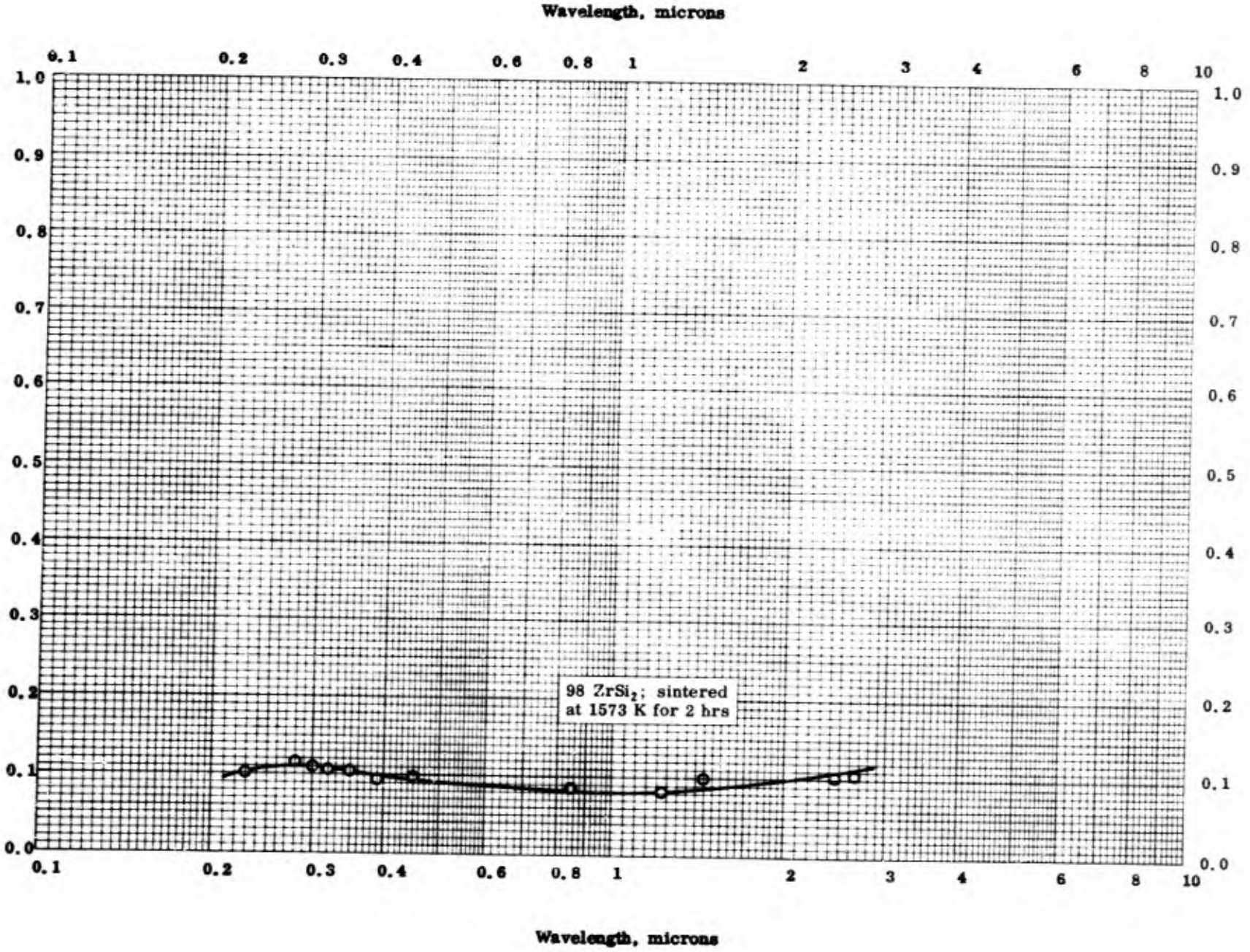


THERMAL LINEAR EXPANSION -- ZIRCONIUM SILICIDE

THERMAL LINEAR EXPANSION -- ZIRCONIUM SILICIDE

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
O	63-28	293-1343		$ZrSi_2$; 61.2 Zr and 38.5 total Si (0.7 free).	Sintered, hot pressed, and annealed; fusion temperature 2233 K.



NORMAL SPECTRAL REFLECTANCE -- ZIRCONIUM SILICIDE

NORMAL SPECTRAL REFLECTANCE — ZIRCONIUM SILICIDE

REFERENCE INFORMATION

Symbol	Ref.	Temp. ° K	Wavelength Range, μ	Rept. Error %	Sample Specifications	Remarks
O	63-16	298	0.23-2.65	5	98 pure $ZrSi_2$; 0.1 in. thickness plate; density 2.18 g cm^{-3}.	Sintered at 1573 K for 2 hrs; data taken from a curve; normal incidence, hemispherical viewing; MgO as reference standard.

PROPERTIES OF OTHER MISCELLANEOUS METAL SILICIDES

REPORTED VALUES

Density	g cm^{-3}	lb ft^{-3}
○ $(Mo,Cr)\ Si_2$	5.96	372
□ $(Mo,Cr)\ Si_2$	6.24	390
△ (Mo,Cr,Si)	9.80	612
▽ $(Mo,Cr,Si) + (Mo,Cr)_3\ Si$	9.20	574
■ $HfSi_2$	8.03	501
▲ $HfSi_2$	7.2	450
▼ β-$PuSi_2$	9.18	573
◁ $(Cr,Mo)\ Si_2$	5.12	320
▷ $(Cr,Mo)_3Si$	6.70	418
◀ $NdSi_2$	4.7	293.3
$GdSi_2$	6.4	399
$DySi_2$	5.2	324.5
α-YSi_2	4.5	280.8
β-YSi_2	4.39	273.9
YSi	4.53	282.7
Y_5Si_3	4.556	284.3
α-$GdSi_2$	6.4	399.4
β-$GdSi_2$	6.19	386.3
α-$DySi_2$	6.8	424.3
β-$DySi_2$	6.68	416.8
α-$SmSi_2$	5.14	320.7
β-$SmSi_2$	6.10	380.6
β-$EuSi_2$	5.50	343.2
β-$CeSi_2$	5.31	331.3
α-$NdSi_2$	5.85	365.0
β-$NdSi_2$	5.84	364.4
α-$PrSi_2$	5.38	335.7
β-$PrSi_2$	5.64	351.9
▶ $Ce_2Al_3Si_2$	5.62	350.8

Melting Point	K	R
● $ThSi_2$; β-phase	1913 ± 40	3444 ± 72
◑ $CaSi_2$	1293	2327
CaSi	1518	2732
Ca_2Si	≈1273	≈2291
◐ $CeSi_2$	1710	3078

(Continued onto next page)

PROPERTIES OF OTHER MISCELLANEOUS METAL SILICIDES (Continued)

REPORTED VALUES

Melting Point (continued)	K	R
$CeSi_2$	1711	3080
$DySi_2$	1823	3281
$EuSi_2$	1773	3191
YSi_2	1793	3227
$NdSi_2$	1798	3236
HfSi	2023	3641
ThSi	>1973	>3551
$ThSi_2$	1873	3371
β-$ThSi_2$	1913 ± 40	3443 ± 72
α-$ThSi_2$	1673	3011
Y_3Si_5	1908	3434
YSi	2113	3803
Y_5Si_3	2123	3821

PROPERTIES OF OTHER MISCELLANEOUS METAL SILICIDES

REFERENCE INFORMATION

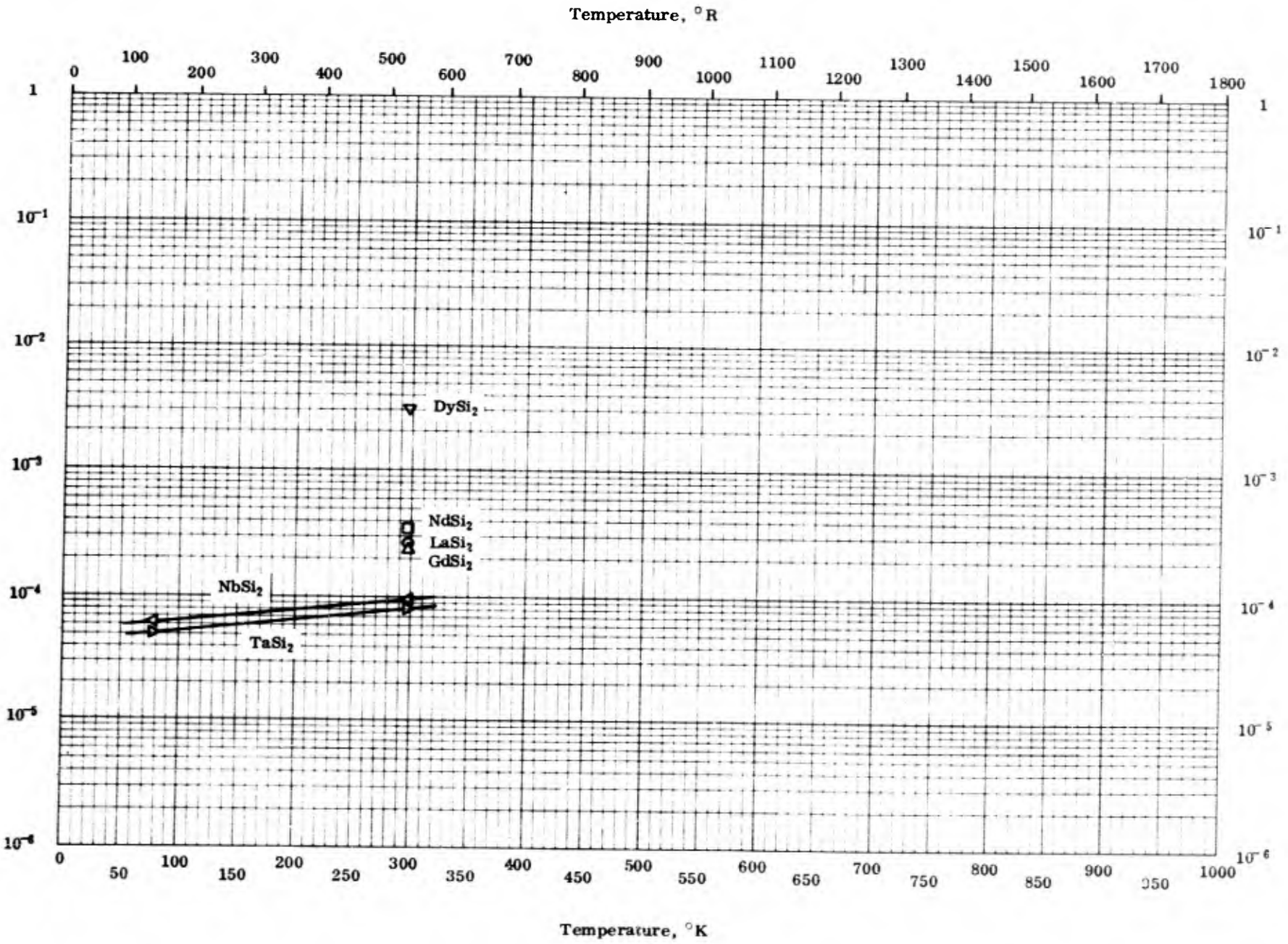
Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
○	56-24	298		$(Mo,Cr)Si_2$; 49.9 Mo, 40.2 Si, and 9.9 Cr.	Mixed element powders; compacted, heated in argon atm without melting, crushed, ball milled, compacted with 2.0 camphor, and sintered in H_2 atm to max. density; density computed from x-ray measurement of lattice.
□	56-24	298		$(Mo,Cr)Si_2$; 59.9 Mo, 35.1 Si, and 5.0 Cr; tegragonal.	Same as above.
△	56-24	298		(Mo, Cr, Si); 83.8 Mo, 13.6 Si, and 2.5 Cr; body centered cubic.	Same as above.
▽	56-24	298		90.6 Mo, 6.1 Cr, and 3.3 Si; (Mo, Cr, Si) body centered cubic and $(Mo,Cr)_3Si$ cubic.	Same as above.
●	53-16	1873-1953		β-$ThSi_2$.	
■	56-30	298		$HfSi_2$; 76.0 Hf and 24 Si.	Prepared by alumino-thermic reduction of metallic oxide and silica; computed by x-ray measurements of lattice.
▲	56-30	298		Same as above.	Same as above; density measured.
▼	55-31	298		β-$PuSi_2$; 80 Pu.	Prepared by reacting 99.8 PuF_3 with 99.99 Si for 15 min at 1300 C in vacuum; computed from x-ray measurements of lattice.
◁	56-24	298		$(Cr,Mo)Si_2$; 50.4 Si, 42.4 Cr, and 7.2 Mo; hexagonal crystal.	Mixed element powders, compacted, heat in argon without melting, crushed, ball-milled, compacted with 2 camphor, and sintered in H_2 to max density.

(Continued onto next page)

PROPERTIES OF OTHER MISCELLANEOUS METAL SILICIDES (Continued)

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
▷	56-24	298		$(Cr,Mo)_3Si$; 70 Cr, 19 Mo, and 11 Si; cubic crystal.	Same as above.
◀	62-21	298		Silicides of rare earth metals.	
▶	62-21	298		$Ce_2Al_3Si_2$.	
◑	26-1	1273-1518		Series of calcium silicides.	Decomp. temperature for $CaSi_2$.
◐	50-4	1710		$CeSi_2$.	
◧	49-13	1711		$CeSi_2$.	
◨	60-38	1773-1823		$DySi_2$, YSi_2, $EuSi_2$, and $NdSi_2$.	
◓	62-35	2023		HfSi.	
◒	59-26	1973		ThSi.	
◓	60-38	1873		$ThSi_2$.	
◒	53-16	1673-1953		α and β $ThSi_2$.	
◪	59-22	1908-2123		Series of Yttrium silicides.	



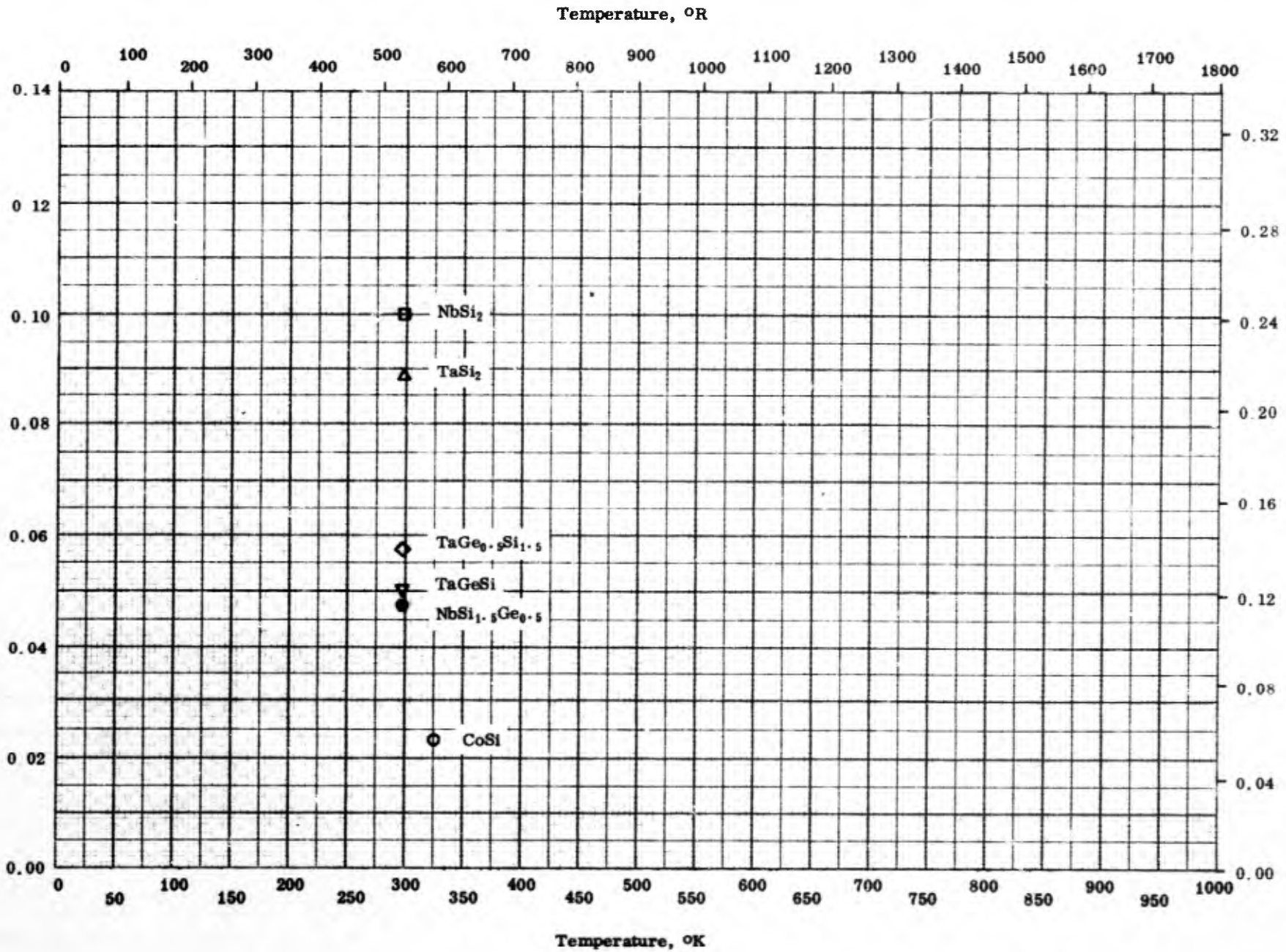
TPRC

ELECTRICAL RESISTIVITY -- MISCELLANEOUS SILICIDES

ELECTRICAL RESISTIVITY -- MISCELLANEOUS SILICIDES

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
○	62-21	298		$LaSi_2$.	
□	62-21	298		$NdSi_2$.	
△	62-21	298		$GdSi_2$.	
▽	62-21	298		$DySi_2$.	
◁	63-4	77-298	±5	$NbSi_2$; density 5.626 g ml^{-1} by X-ray and 5.59 g ml^{-1} by Pycnom.	Hot-or cold-pressed and subsequently sintered between 1500-1900 C.
▷	63-4	77-298	±5	$TaSi_2$; density 9.104 g ml^{-1} by X-ray and 9.06 g ml^{-1} by Pycnom.	Same as above.



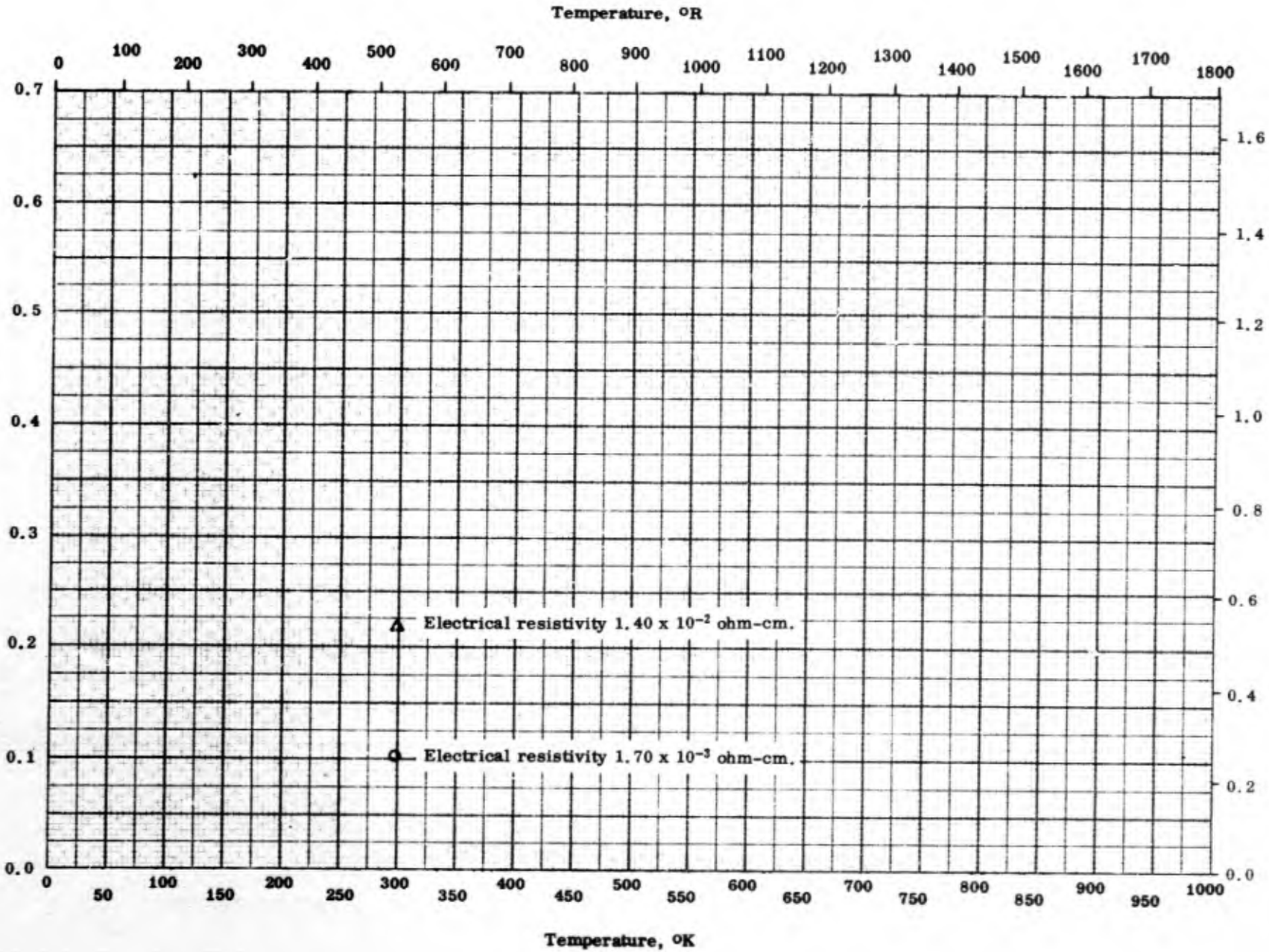
TPRC

THERMAL CONDUCTIVITY -- MISCELLANEOUS SILICIDES

THERMAL CONDUCTIVITY -- MISCELLANEOUS SILICIDES

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
○	59-4	326	± 10	CoSi.	Single crystal.
□	63-4	298	± 10	$NbSi_2$.	Prepared by powder metallurgy.
△	63-4	298	± 10	$TaSi_2$.	Same as above.
▽	63-4	298	± 10	$TaGeSi_2$.	Same as above.
◇	63-4	298	± 10	$TaGe_{0.5}Si_{1.5}$.	Same as above.
●	63-4	298	± 10	$NbGe_{0.5}Si_{1.5}$.	



THERMAL CONDUCTIVITY -- BARIUM STANNIDE

THERMAL CONDUCTIVITY -- BARIUM STANNIDE

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
○	61-6	298		Ba_2Sn; seebeck coeff. (25 C) 14.2 $\mu v K^{-1}$, electrical resistivity (25 C) 1.70×10^{-3} ohm-cm, and figure of merit (25 C) $0.27 \times 10^{-4} K^{-1}$.	Synthesized.
△	61-6	298		Ba_2Sn; seebeck coeff. (25 C) 19.7 $\mu v K^{-1}$, electrical resistivity (25 C) 1.40×10^{-2} ohm-cm, and figure of merit (25 C) $0.303 \times 10^{-5} K^{-1}$.	Synthesized.

PROPERTIES OF MAGNESIUM STANNIDES

REPORTED VALUES

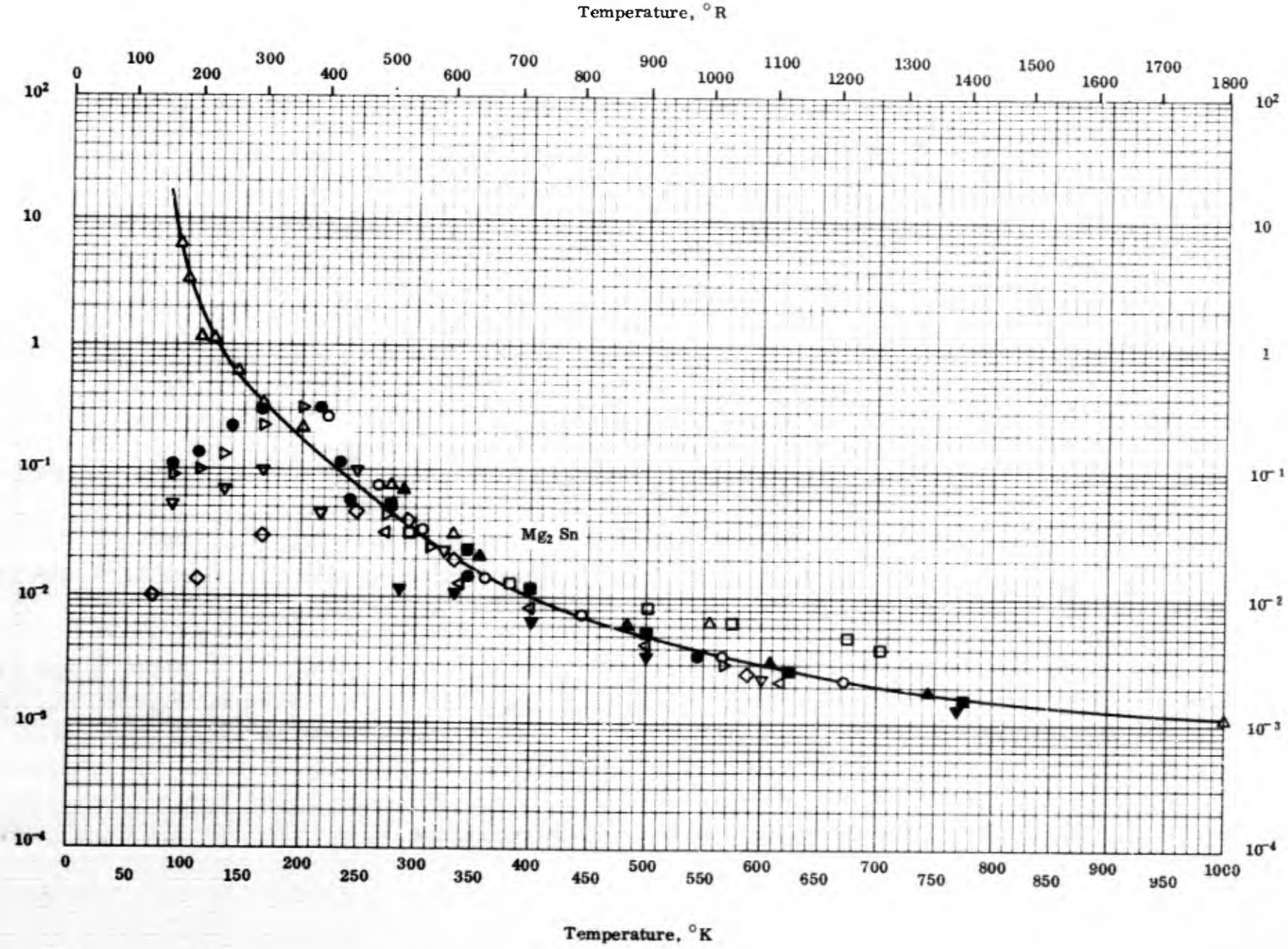
Density		g cm^{-3}	lb ft^{-3}
○	Mg_2Sn	3.661	228.6
□	Mg_2Sn	3.662*	228.6*
Melting Point		**K**	**R**
△	Mg_2Sn	1053	1895
▽	Mg_2Sn	1047.2 ± 1*	1885 ± 2*

*Most probable value for this compound.

PROPERTIES OF MAGNESIUM STANNIDES

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
○	50-3	298		Mg_2Sn; 70.8 Sn and 29.2 Mg.	Melted in Fe crucibles at 350 C or 1230 C; surface removed, milled into fine powder in N_2, annealed 4 hrs at 300 C; measured by using pycnometer.
□	50-3	298		Same as above.	Same as above.
△	55-11	1053		Mg_2Sn; prepared from 99.7 pure Mg and 99.99 pure Sn.	By visual observation.
▽	64-22	1046-1048		Mg_2Sn.	



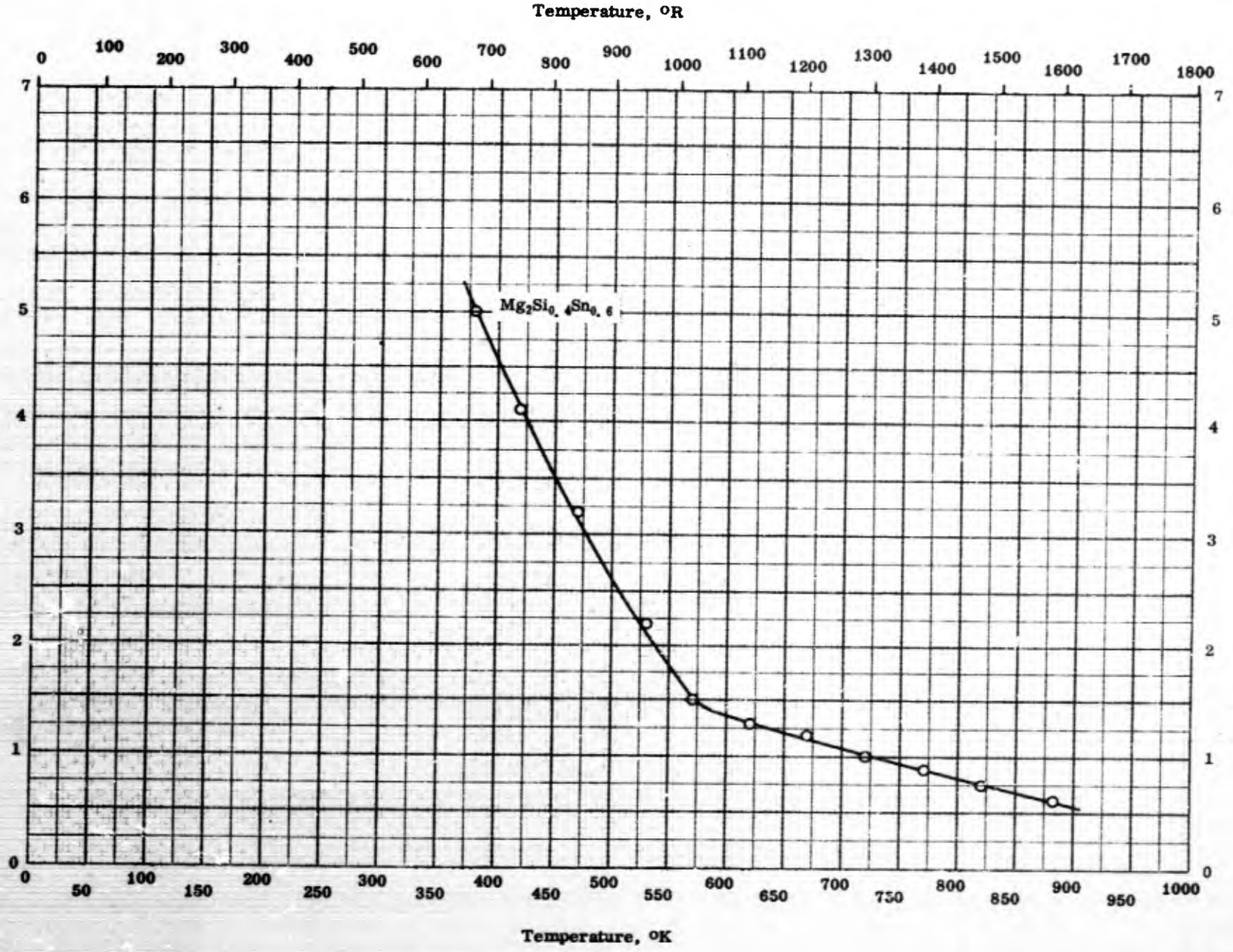
TPRC

ELECTRICAL RESISTIVITY -- MAGNESIUM STANNIDE

ELECTRICAL RESISTIVITY — MAGNESIUM STANNIDE

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
○	53-9	222-671		Mg_2Sn.	Melted spectroscopically pure components in graphite crucible under purified A by high frequency current.
□	49-2	293-703		Mg_2Sn; 71.1 Sn and 28.9 Mg.	Not given.
△	48-1	93-833		Mg_2Sn; 0.002 - 0.01 Si, 0.001 > C, and 0.003 - 0.005 N_2; density 222 lb ft^{-3}; melting point 1800 R.	
◇	55-11	72-589		Mg_2Sn; n-type; 2×10^{16} to 3.5×10^{17} cm^{-3} impurities in the samples; prepared from 99.7+ Mg and 99.997 Sn.	Prepared in H_2 atm.
▽	55-11	91-589		Mg_2Sn; p-type; same as above.	Same as above.
▷	55-11	89-589		Mg_2Sn; n-type; same as above.	Same as above.
●	55-11	91-589		Mg_2Sn; p-type; same as above.	Same as above.
■	55-10	286-770		Mg_2Sn; n-type, prepared from 99.98 Mg and 99.997 Sn.	Prepared by melting and chilling.
▲	55-10	286-770		Two samples of the above raw materials: a. Mg_2Sn, p-type. b. Mg_2Sn + 1 Sn.	Both samples give identical curves; same preparation as above.
▼	55-10	286-770		Mg_2Sn + 6 Mg; same raw materials as above.	Same preparation as above.
◁	55-10	278-589		Mg_2Sn + 8 Sn, same as above.	Same preparation as above.



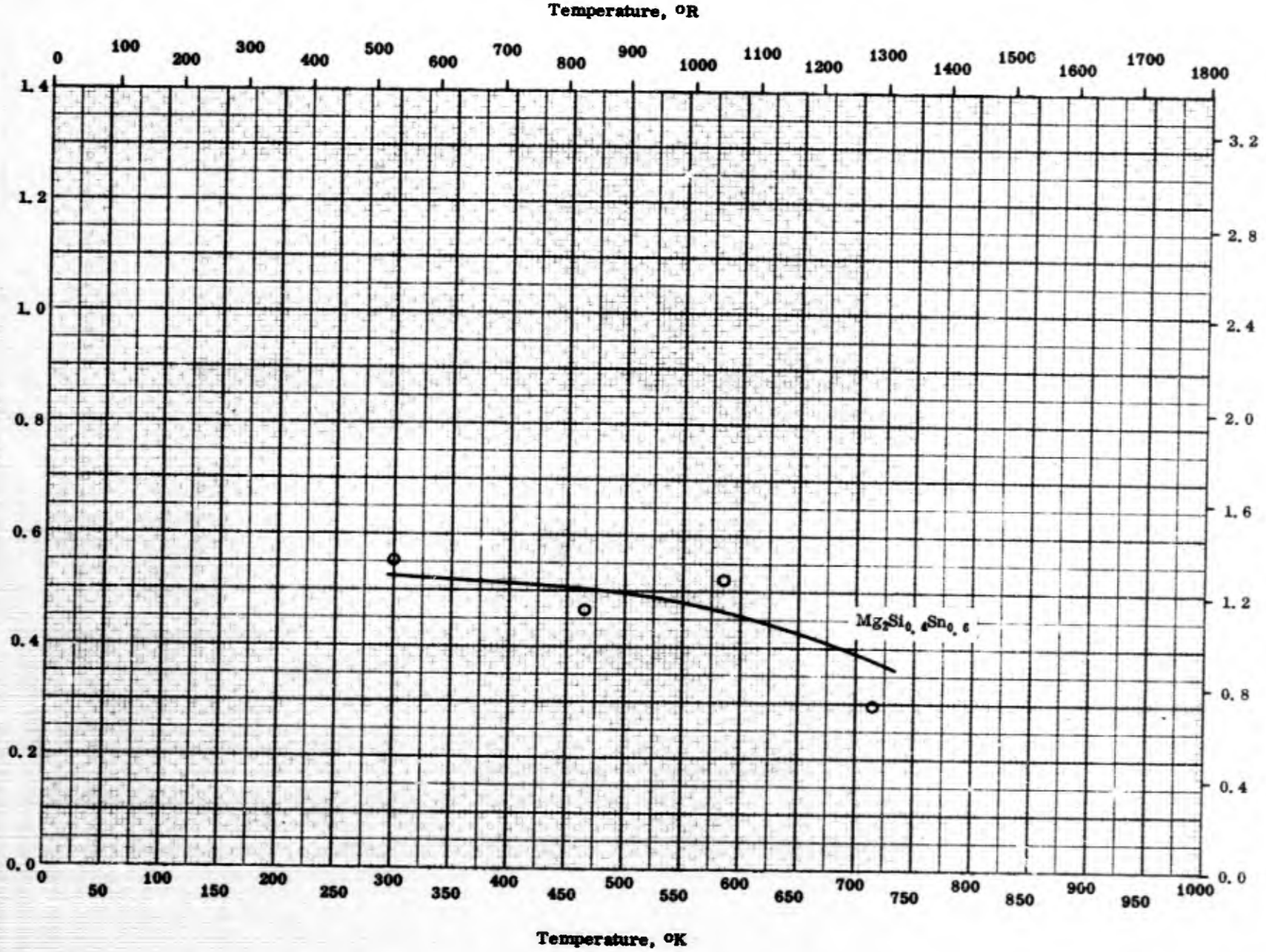
ELECTRICAL RESISTIVITY -- MAGNESIUM SILICIDE STANNIDE

Electrical Resistivity, ohm cm x 10³

ELECTRICAL RESISTIVITY -- MAGNESIUM SILICIDE STANNIDE

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
O	60-11	380-880		$Mg_2Si_{0.4}Sn_{0.6}$.	



Thermal Conductivity, cal Sec^{-1} cm^{-1} K^{-1} x 10^2

Thermal Conductivity, Btu hr^{-1} ft^{-1} R^{-1}

TPRC

THERMAL CONDUCTIVITY -- MAGNESIUM SILICIDE STANNIDE

THERMAL CONDUCTIVITY -- MAGNESIUM SILICIDE STANNIDE

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
O	60-11	300-715		$Mg_2Si_{0.4}Sn_{0.6}$.	

PROPERTIES OF OTHER MISCELLANEOUS METAL STANNIDES

REPORTED VALUES

	Density	g cm^{-3}	lb ft^{-3}
●	$LaSn_3$	7.516	469.8
■	USn_3; 40U	9.95	621

	Melting Point	K	R
○	La_2Sn	1696	3053
	La_2Sn_3	1465	2638
	$LaSn_3$	1408	2535
□	Ce_2Sn	1673	3012
	Ce_2Sn_3	1438	2589
	$CeSn_3$	1436	2585
△	Nb_3Sn	1647 ± 175	2965 ± 315
▽	Pt_3Sn	1700	3060
◇	Pr_2Sn	1682	3082
	Pr_2Sn_3	1433	2580
	$PrSn_3$	1417	2551

PROPERTIES OF OTHER MISCELLANEOUS METAL STANNIDES

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
○	43-1	1408-1696		Prepared from 98 pure La containing 1.02 Mg, 0.55 Fe, and 0.05 Si.	Author considers subcooling also possible sample contamination by crucible or O_2; by visual observation.
□	43-1	1436-1673		Prepared from 98 pure Ce containing 0.14 Fe, 0.14 Mg, and 0.02 Si.	Same as above.
◇	43-1	1417-1682		Series of praseodymium intermetallics prepared from 99 estimated pure Pr.	Same as above.
△	54-31 also 56-35	1472-1822		Nb_3Sn.	
▽	55-33	1700		Pt_3Sn.	
●	62-21	298		$LaSn_3$.	
■	49-8	298		USn_3; 60 Sn and 40 U.	Computed by x-ray measurements of lattice.

PROPERTIES OF ANTIMONY TELLURIDE

MOST PROBABLE VALUES

Property	C.G.S. Units	Brit. Eng. Units
Density	6.50*	405.8*
Melting Point.	891.7	1605.1

*Handbook of Chemistry and Physics (Ref. 64-13)

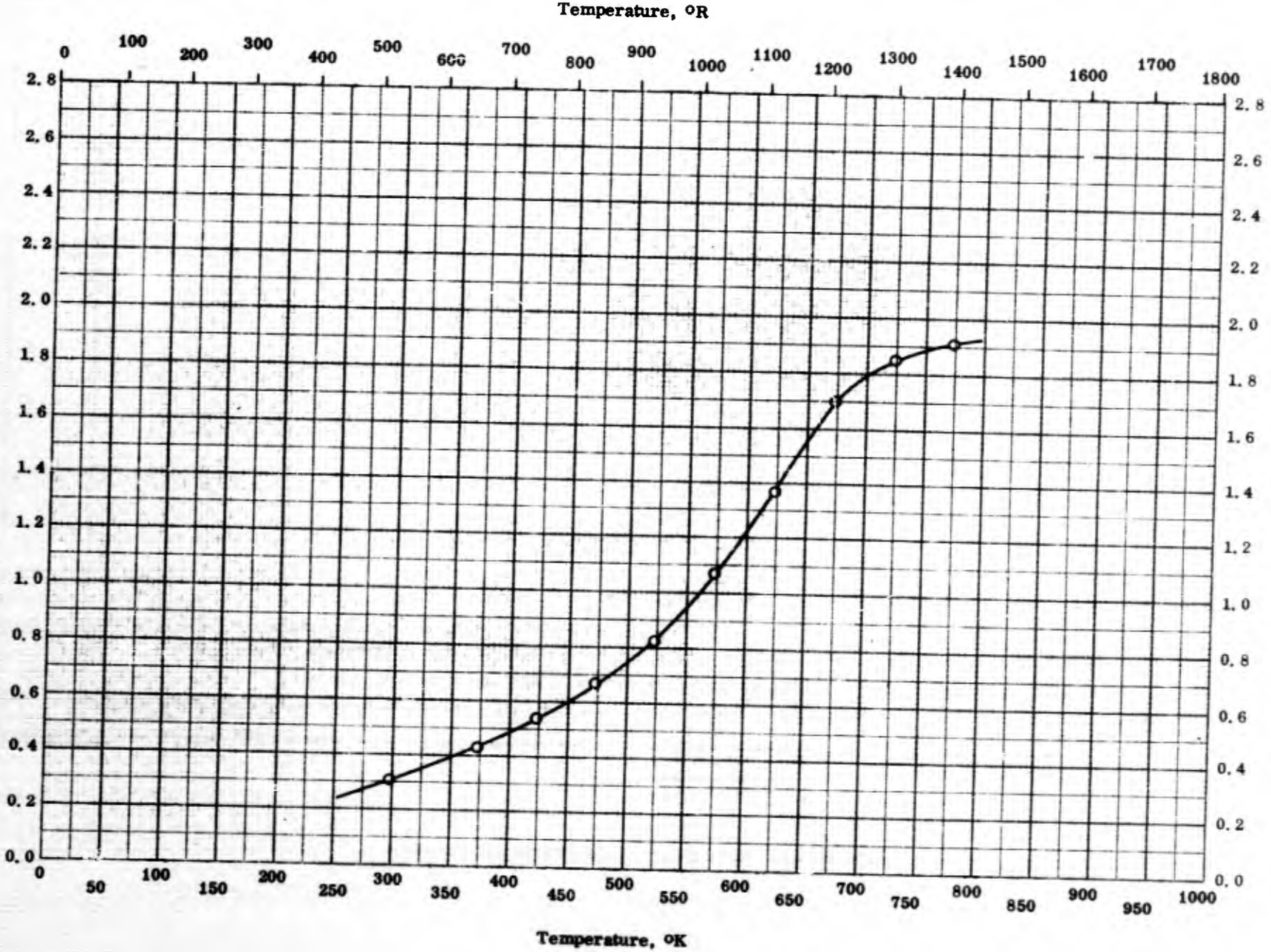
REPORTED VALUES

Melting Point	K	R
○ Sb_2Te_3	885	1593
□ Sb_2Te_3	891.7 ± 1.0	1605 ± 2

PROPERTIES OF ANTIMONY TELLURIDE

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
○	55-24	835		Sb_2Te_3; nominal: 61.5 Te and 38.5 Sb; prepared from Sb with 0.10 Pb, 0.01 As, 0.03 Co-Ni, and traces of Cu-Te and Se.	Heated in vacuum and in air; observed from break in time-temperature curve.
□	64-22	890-893		Sb_2Te_3.	



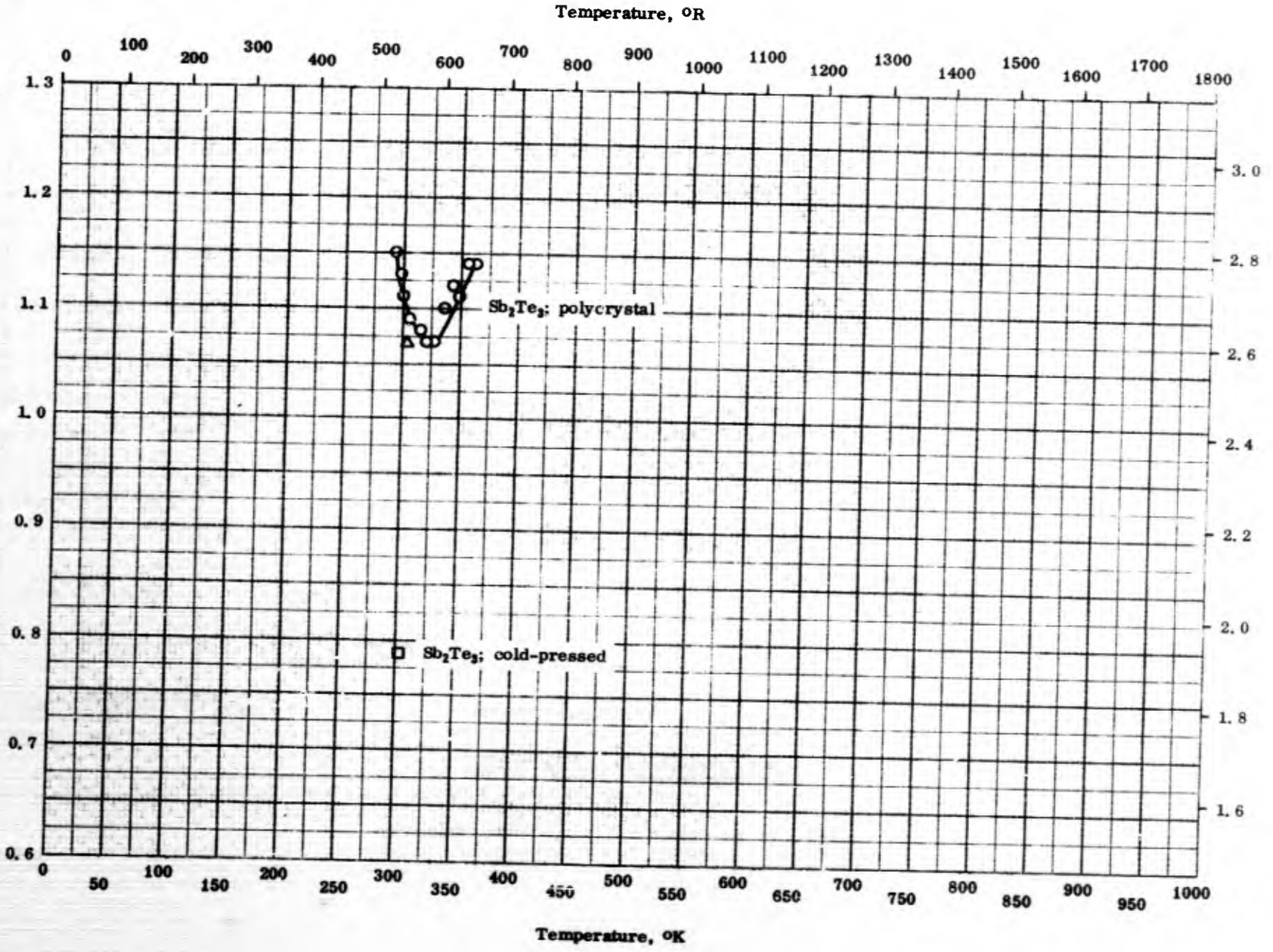
ELECTRICAL RESISTIVITY -- ANTIMONY TELLURIDE

Electrical Resistivity, ohm cm x 10³

ELECTRICAL RESISTIVITY -- ANTIMONY TELLURIDE

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
O	62-3	298-773		61.12 Te and 38.88 Sb; p-type; prepared from 99.99+ pure elements.	Prepared by melting together the proper amounts of pure elements in a Balzer furnace under argon, using graphite crucible; hand-ground to 60 mesh, cold-pressed, and then annealed at 450 C for 3 hrs in pure argon.



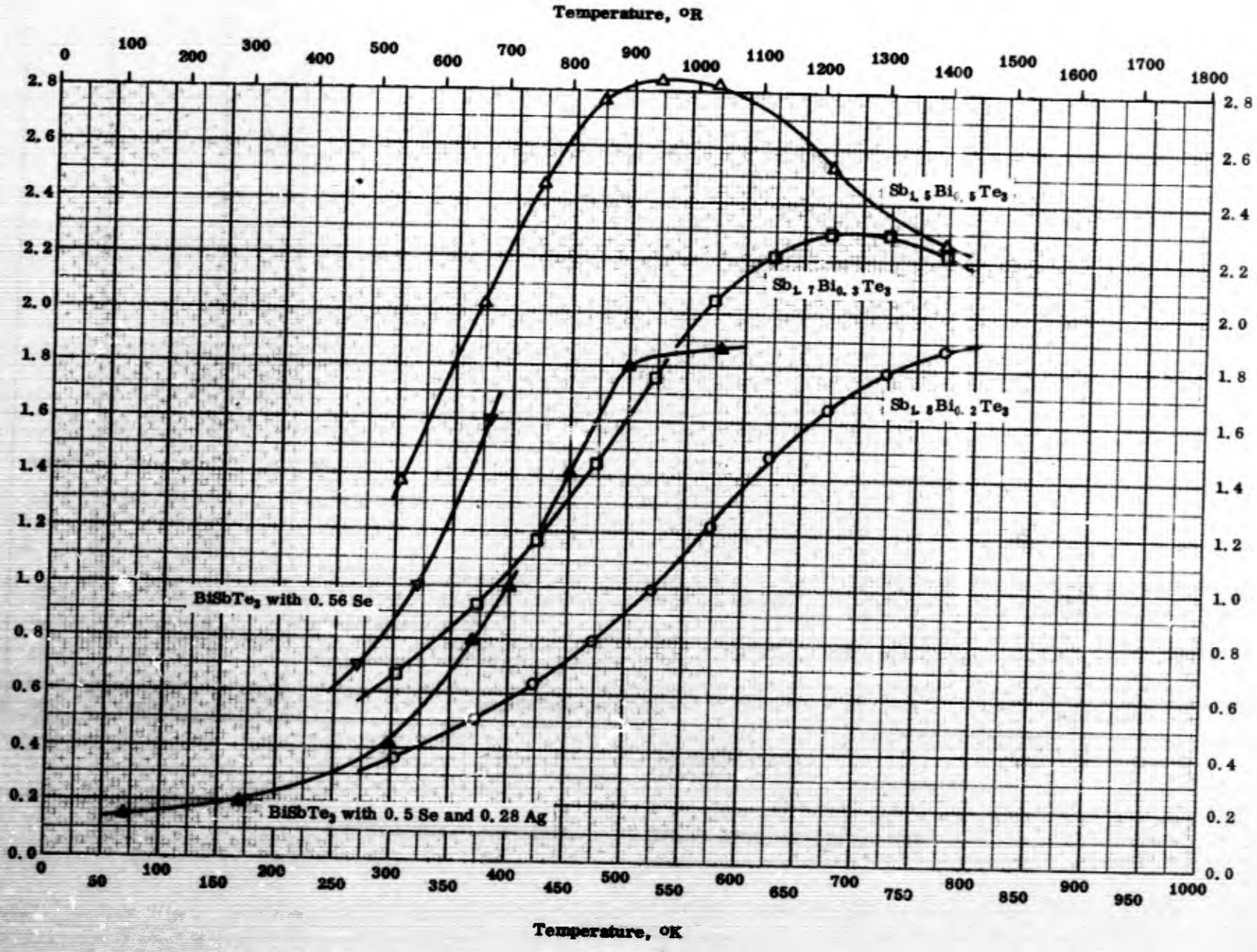
TPRC

THERMAL CONDUC TIVITY -- ANTIMONY TELLURIDE

THERMAL CONDUCTIVITY -- ANTIMONY TELLURIDE

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
○	61-8	293-363		Sb_2Te_3; polycrystal with concentration of current carriers of order of 10^{20} cm^{-3}.	
□	62-3	303		Sb_2Te_3; p-type.	Prepared by powder metallurgical techniques; pressed and sintered; heat flow perpendicular to pressing direction.
△	62-4	303		Same as above.	Prepared by powder metallurgical technique; pressed and cold-pressed.



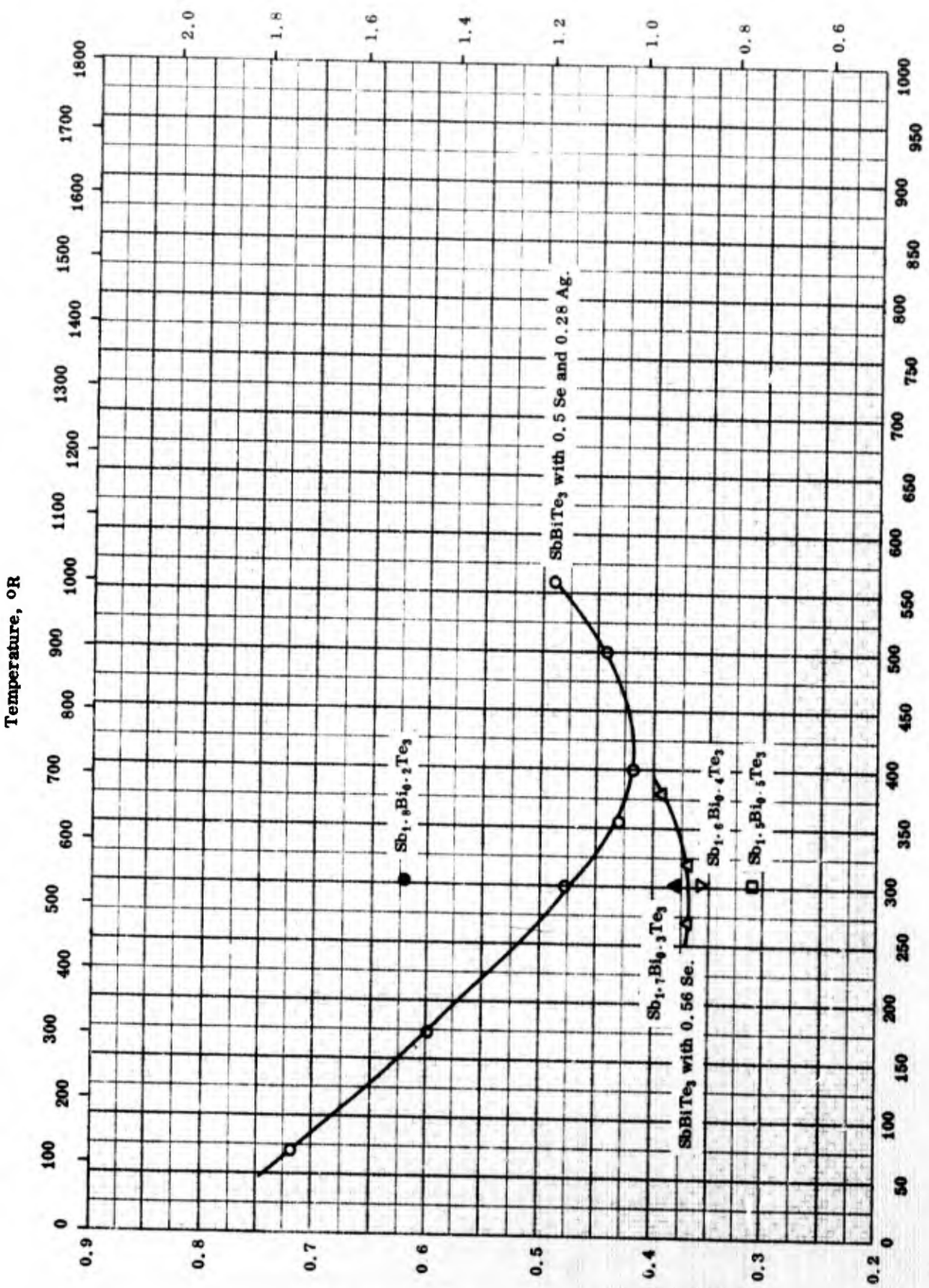
ELECTRICAL RESISTIVITY -- ANTIMONY BISMUTH TELLURIDES

Electrical Resistivity, ohm cm x 10³

ELECTRICAL RESISTIVITY -- ANTIMONY BISMUTH TELLURIDES

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
▲	60-11	70-580		$BiSbTe_3$ with 0.5 Se and 0.28 Ag.	
▽	60-11	270-380		$BiSbTe_3$ with 0.56 Se.	
○	62-3	303-773		$Sb_{1.8}Bi_{0.2}Te_3$; 59.47 Te, 34.04 Sb, and 6.49 Ti; p-type prepared from 99.99+ pure elements.	Hand-ground to 60 mesh after mixed in furnace by melting; cold-pressed and annealed at 450 C for 3 hrs in argon.
□	62-3	303-773		$Sb_{1.7}Bi_{0.3}Te_3$; 58.81 Te, 31.72 Sb, and 9.47 Ti; same as above.	Same as above.
△	62-3	303-773		$Sb_{1.5}Bi_{0.5}Te_3$; 56.55 Te, 28.01 Sb, and 15.44 Ti; same as above.	Same as above.



THERMAL CONDUCTIVITY -- ANTIMONY BISMUTH TELLURIDE

THERMAL CONDUCTIVITY -- ANTIMONY BISMUTH TELLURIDE

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
●	62-3	303		$Sb_{1.8}Bi_{0.2}Te_3$; p-type.	Pressed and sintered; heat flow perpendicular to the pressing direction.
▲	62-3	303		$Sb_{1.7}Bi_{0.3}Te_3$; p-type.	Same as above.
▽	62-3	303		$Sb_{1.6}Bi_{0.4}Te_3$; p-type.	Same as above.
□	62-3	303		$Sb_{1.5}Bi_{0.5}Te_3$; p-type.	Same as above.
○	60-11	70-560		$SbBiTe_3$ with 0.5 Se and 0.28 Ag.	
△	60-11	270-380		$SbBiTe_3$ with 0.56 Se.	

PROPERTIES OF BISMUTH TELLURIDE

MOST PROBABLE VALUES

Property	C.G.S. Units	Brit. Eng. Units
Density	7.7 *	480.7 *
Melting Point	861.7	1551.1

*Handbook of Chemistry and Physics (Ref. 64-13)

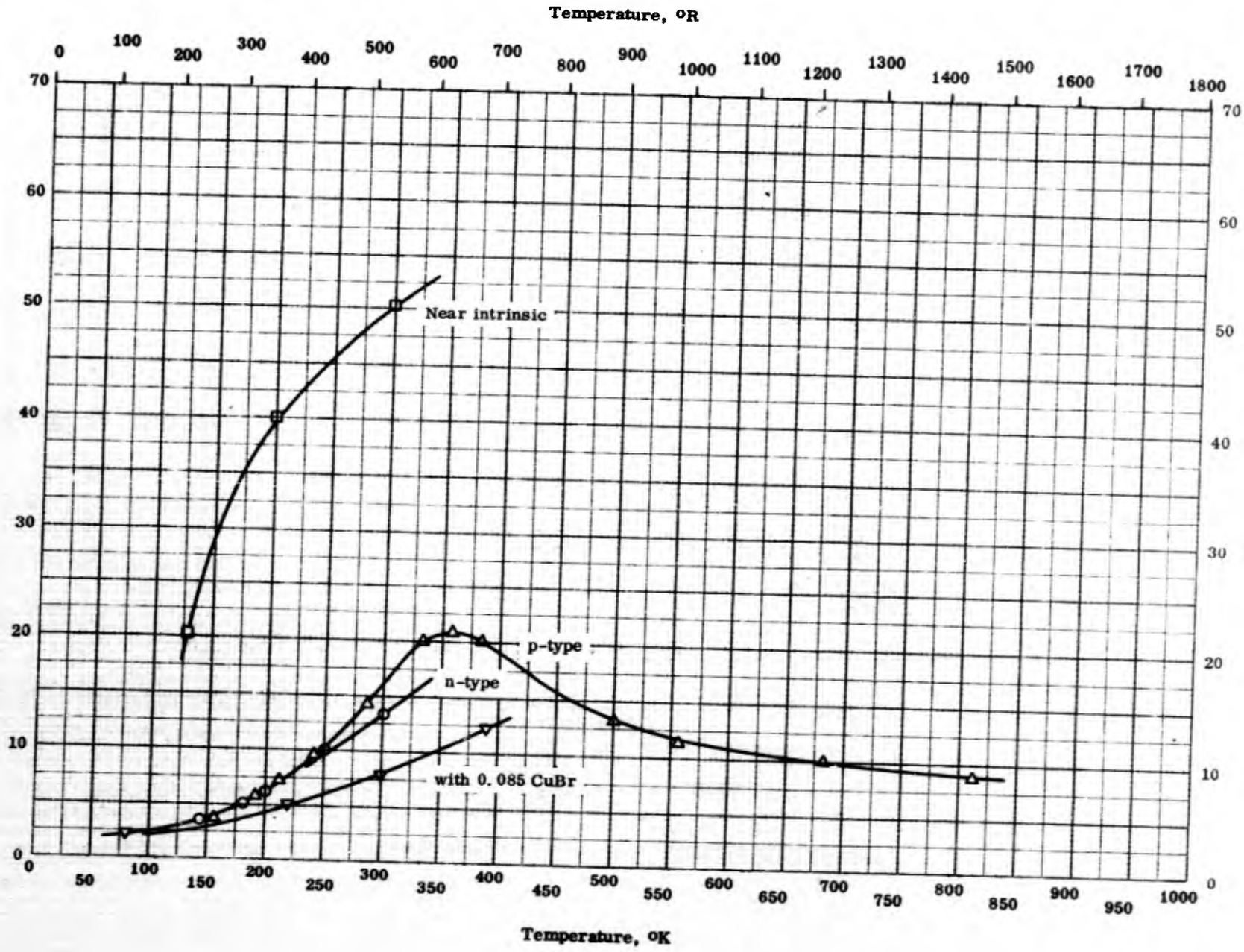
REPORTED VALUES

Melting Point		K	R
	○	853	1536
	□	861.7 ± 1.0	1551 ± 2

PROPERTIES OF BISMUTH TELLURIDE

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
○	56-9	853		Bi_2Te_3; prepared from extra pure Bi, free from As, and 99.997 pure Te.	Melted at 600-700 C from raw materials and then zone melted.
□	64-22	860.7-862.7		Bi_2Te_3.	



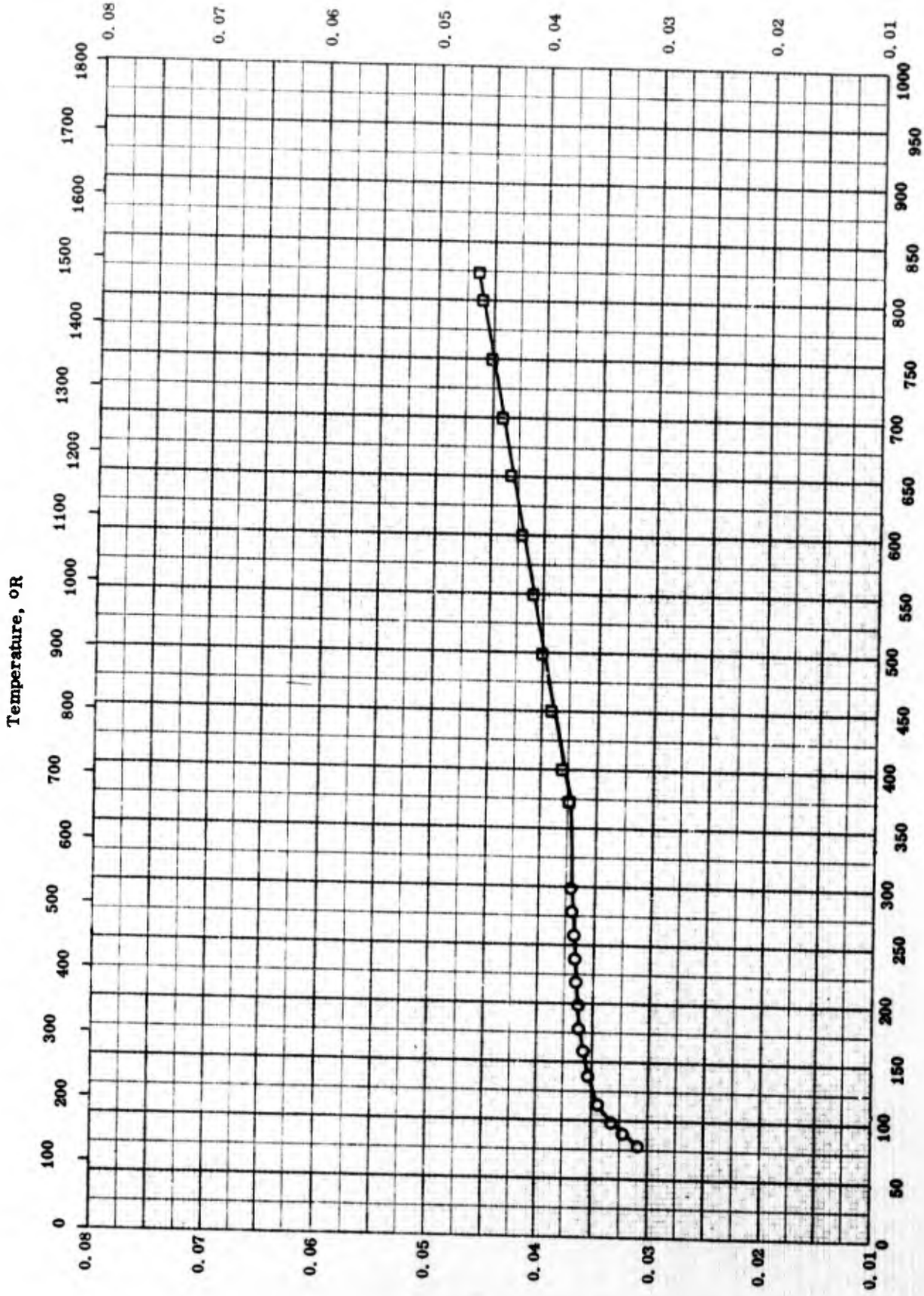
ELECTRICAL RESISTIVITY -- BISMUTH TELLURIDE

Electrical Resistivity, ohm cm x 10⁴

ELECTRICAL RESISTIVITY -- BISMUTH TELLURIDE

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
○	56-1	133-300		Bi_2Te_3; n-type.	Zone-refined; measured with current parallel to cleavage planes.
□	56-1	133-300		Bi_2Te_3; near intrinsic.	Same as above.
△	56-9	152-813		Bi_2Te_3; p-type; prepared from As-free Bi and 99.997 Ta.	Compounded by melting raw materials at 600-700 C; zone-refined.
▽	60-11	80-390		Bi_2Te_3 with 0.085 CuBr.	

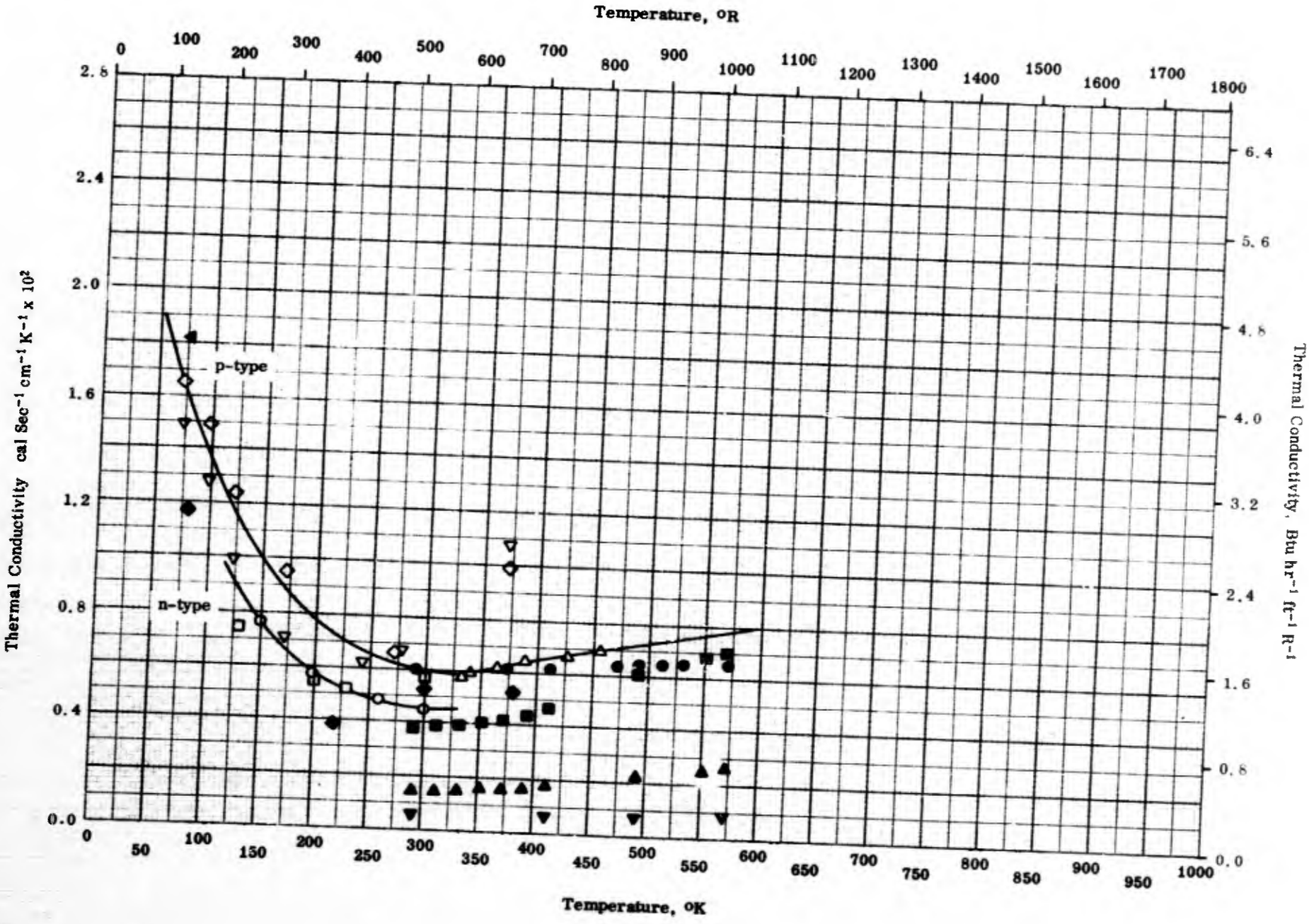


SPECIFIC HEAT -- BISMUTH TELLURIDE

SPECIFIC HEAT — BISMUTH TELLURIDE

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
○	59-16	80-300	3-7	Bi_2Te_3 ; polycrystalline.	
□	60-21	373-823	2	Bi_2Te_3.	Zone-refined.

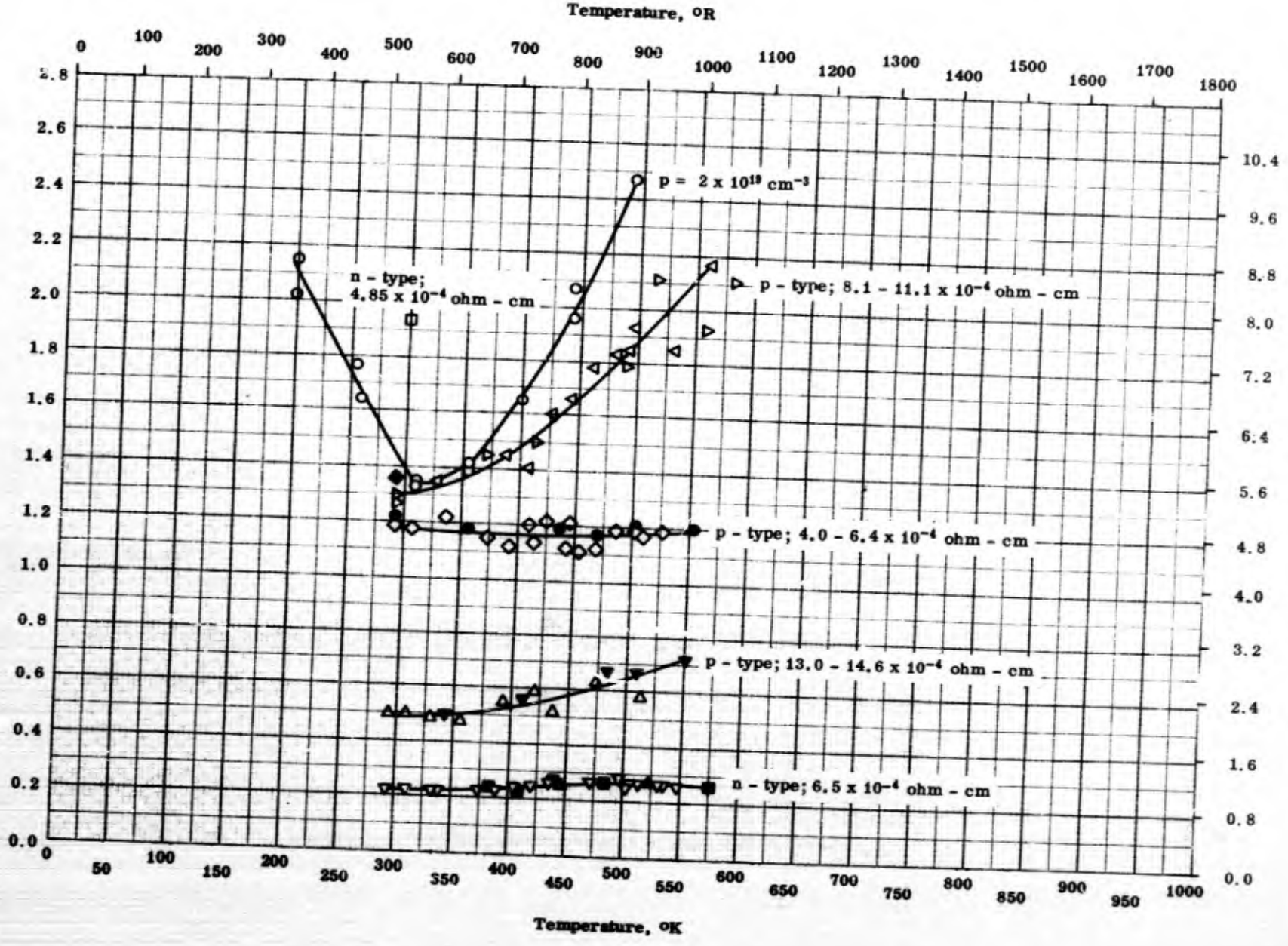


THERMAL CONDUCTIVITY -- BISMUTH TELLURIDE

THERMAL CONDUCTIVITY -- BISMUTH TELLURIDE

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
○	56-1	150-300		Bi_2Te_3; n-type.	Zone-refined; measured parallel to cleavage plane.
□	56-1	130-300		Bi_2Te_3; near intrinsic.	Same as above.
◇	57-4	73-373		Bi_2Te_3; single crystal with 2×10^{19} excess electron holes cm^{-3}.	Measured parallel to cleavage plane.
▽	57-4	73-373		Same as above except with 3×10^{17} excess electron holes cm^{-3}.	Same as above.
△	60-8	333-457		Bi_2Te_3; p-type polycrystal; made from 99.999+ Bi and 99.999+ Te.	Prepared by melting raw materials in vacuum.
●	60-3	293-573	±20	Bi_2Te_3; p-type with electrical resistivity $4.0 - 6.4 \times 10^{-4}$ ohm cm at room temperature.	Measured with heat flow in the direction of crystal planes and in the presence of a 2 Mev electron beam.
■	60-3	293-573	±20	Same as above except electrical resistivity $8.1 - 11.1 \times 10^{-4}$ ohm cm at room temperature.	Same as above except measured across the crystal planes.
▲	60-3	293-573	±20	Same as above except electrical resistivity $13.0 - 14.6 \times 10^{-4}$ ohm cm at room temperature.	Same as above.
▼	60-3	293-573	±20	Bi_2Te_3; n-type with electrical resistivity 6.5×10^{-4} ohm cm at room temperature.	Same as above.
◀	58-4	77		Bi_2Te_3; n-type; doped with nominal 0.40 I; cut from a single crystal sample.	Heat flow perpendicular to the crystal axis and magnetic field parallel to the crystal axis.
◆	60-11	80-380		Bi_2Te_3 with 0.085 CuBr.	



THERMAL DIFFUSIVITY -- BISMUTH TELLURIDE

THERMAL DIFFUSIVITY -- BISMUTH TELLURIDE

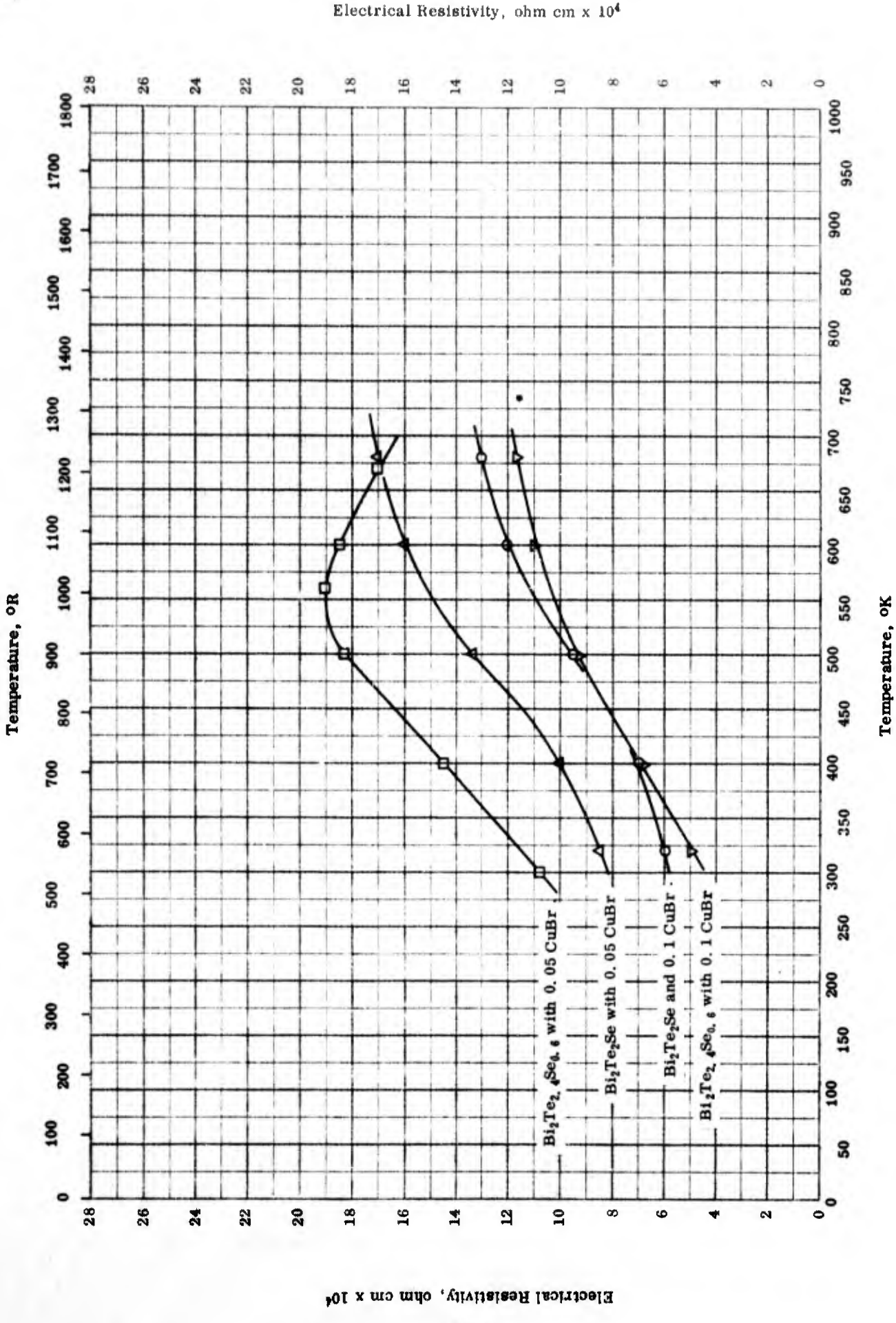
REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
○	59-1	123-493		p-type single crystal with hole concentration. $p = 2 \times 10^{19}$ cm^{-3}.	
□	61-2	300		n-type with electrical resistivity 4.85×10^{-4} ohm cm; sample 0.685 cm dia and 1.42 cm long.	Heat flow parallel to cleavage plane.
△	60-3	293-513	± 10	p-type with electrical resistivity $13.0 - 14.6 \times 10^{-4}$ ohm cm; longitudinally cut with thickness 0.089 cm.	Measured across the crystal planes while being irradiated by 1.95 Mev electron beam; sample surface blackened with camphor black and cooled by forced air-cooling.
▼	60-3	293-551	± 10	Same as above.	The above sample measured under the same condition except cooled by free air-cooling.
◁	60-3	293-561	± 10	p-type with electrical resistivity $8.1 - 11.1 \times 10^{-4}$ ohm cm; longitudinally cut with thickness 0.043 cm.	Measured across the crystal planes under the same condition as the above sample except cooled by forced air-cooling.
▷	60-3	293-583	± 10	Same as above.	The above specimen measured under the same condition except cooled by free air-cooling.
◇	60-3	293-527	± 10	p-type with electrical resistivity $4.0 - 6.4 \times 10^{-4}$ ohm cm; transversely cut with thickness 0.105 cm.	Measured in the direction of the crystal planes under the same condition as the above sample except cooled by forced air-cooling
●	60-3	293-554	± 10	Same as above.	The above specimen measured under same condition except cooled by free air-cooling.

(Continued onto next page)

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
▽	60-3	293-547	± 10	n-type with electrical resistivity 6.5 x 10^{-4} ohm cm; longitudinally cut with thickness 0.064 cm.	Measured across crystal planes under same condition as the above sample except cooled by forced air-cooling.
▲	60-3	293-523	± 10	Same as above.	The above specimen measured under the same condition except cooled by free air-cooling.
■	60-3	383-581	± 10	Same as above.	The above specimen measured under same condition except using hot air heating as impulse heat source.
◆	60-4	293	3.7	Undoped and cut from a single crystal; sample 5.0 cm long with a rectangular cross section of 0.3 x 0.4 cm and with the cleavage planes running parallel to its length.	

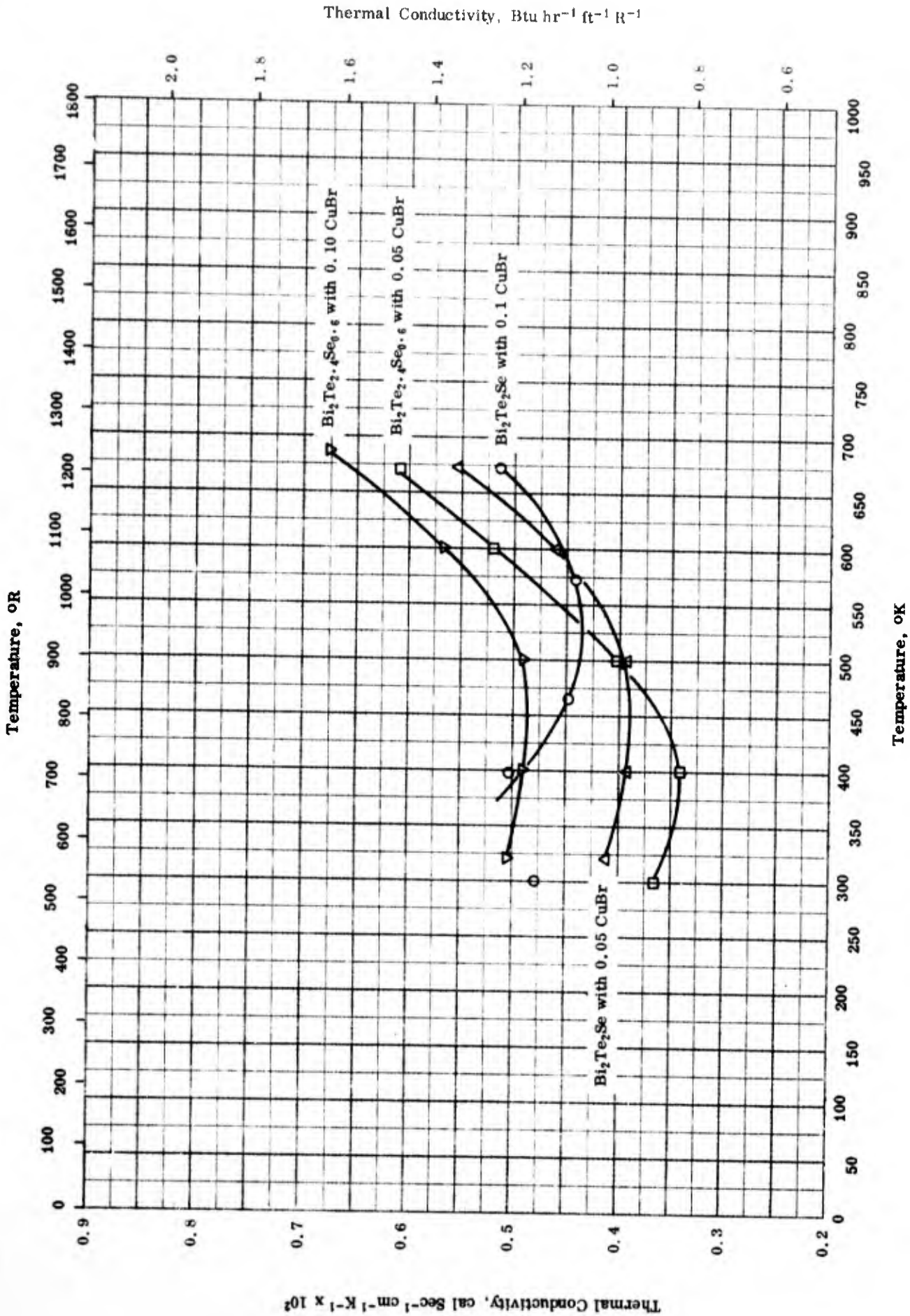


ELECTRICAL RESISTIVITY -- BISMUTH SELENIDE TELLURIDES

ELECTRICAL RESISTIVITY -- BISMUTH SELENIDE TELLURIDES

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
○	60-11	320-680		Bi_2Te_2Se with 0.10 CuBr.	
□	60-11	300-670		$Bi_2Te_{2.4}Se_{0.6}$ with 0.05 CuBr.	
△	60-11	320-680		Bi_2Te_2Se with 0.05 CuBr.	
▽	60-11	320-680		$Bi_2Te_{2.4}Se_{0.6}$ with 0.10 CuBr.	

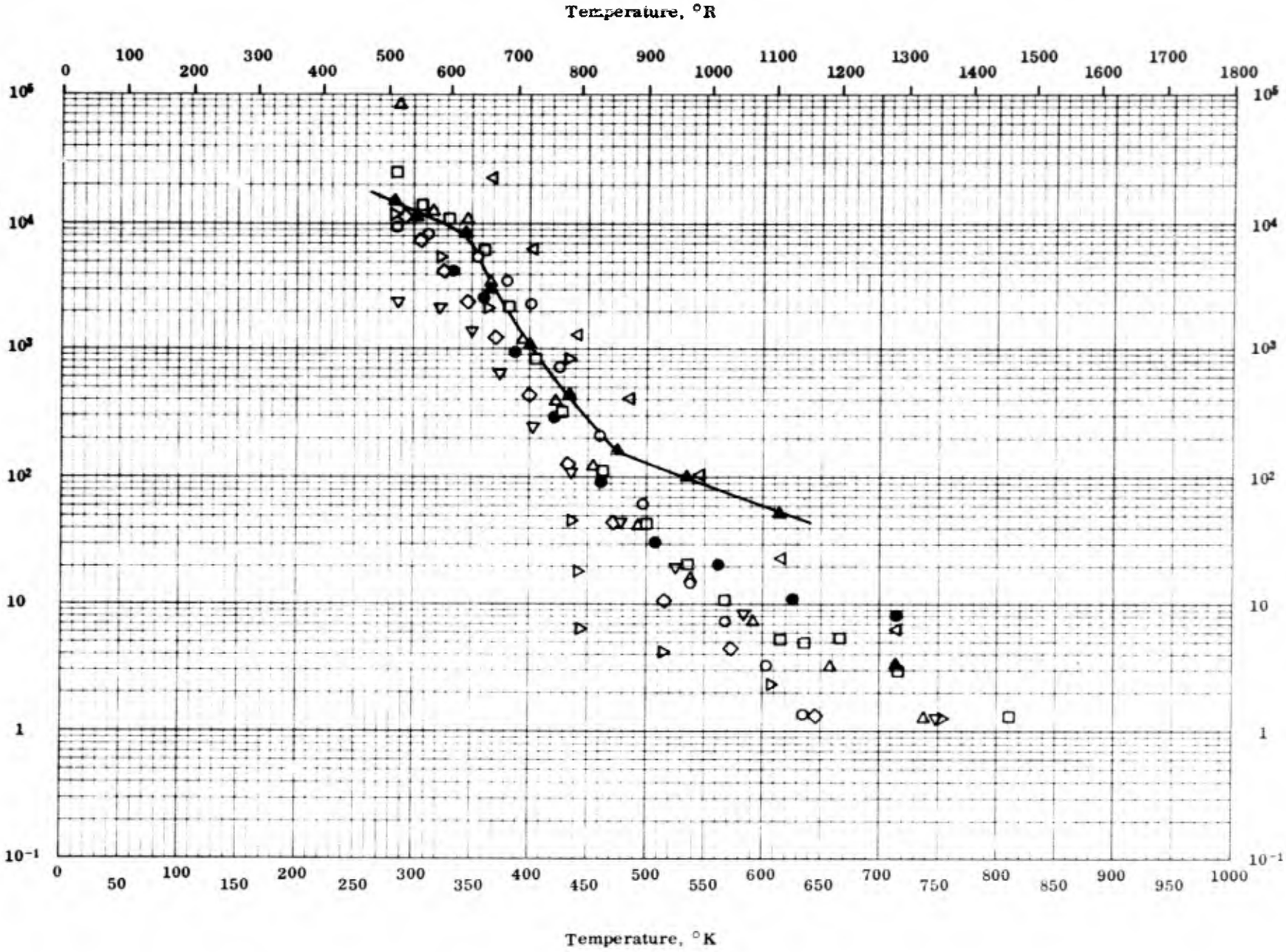


THERMAL CONDUCTIVITY -- BISMUTH SELENIDE TELLURIDE

THERMAL CONDUCTIVITY -- BISMUTH SELENIDE TELLURIDE

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
○	60-11	300-673		Bi_2Te_2Se with 0.1 CuBr.	
□	60-11	300-670		$Bi_2Te_{2.4}Se_{0.6}$ with 0.05 CuBr.	
△	60-11	320-673		Bi_2Te_2Se with 0.05 CuBr.	
▽	60-11	320-685		$Bi_2Te_{2.4}Se_{0.6}$ with 0.10 CuBr.	



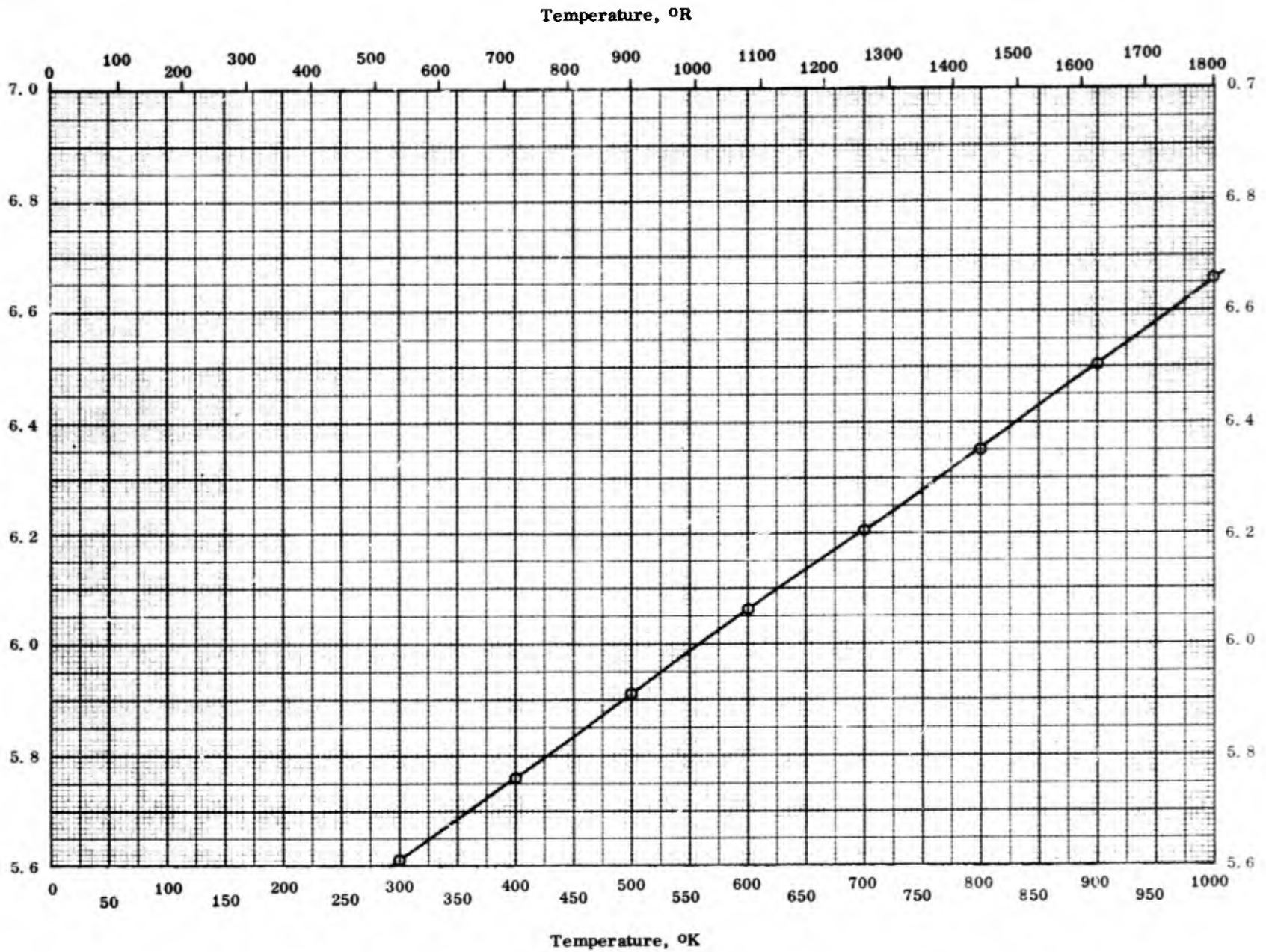
TPRC

ELECTRICAL RESISTIVITY -- CADMIUM TELLURIDE

ELECTRICAL RESISTIVITY -- CADMIUM TELLURIDE

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
○	55-9	287-637		CdTe; 0.2 Au.	Hot pressed at 350 C and 3000 kg cm^{-2} from powder synthesized from chemically pure Te and Cd.
□	55-9	286-813		CdTe; 1.0 Au.	Same as above.
△	55-9	288-741		CdTe; 0.5 Se.	Same as above.
◇	55-9	291-645		CdTe; 0.02 Cu.	Same as above.
▽	55-9	287-752		CdTe; 0.2 Cd.	Same as above.
▷	55-9	284-752		CdTe; 1.0 Te.	Same as above.
◁	55-9	370-715		CdTe; prepared from Te with traces of oxides.	Same as above.
●	55-9	286-715		CdTe; 0.1 Te; single crystal.	Heated together chemically pure Te and Cd at 1070 C for 2-3 hrs; homogenized and formed into single crystal by Bridgman's method.
▲	55-9	284-715		CdTe; prepared from chemically pure Cd and Te; single crystal.	Same as above.

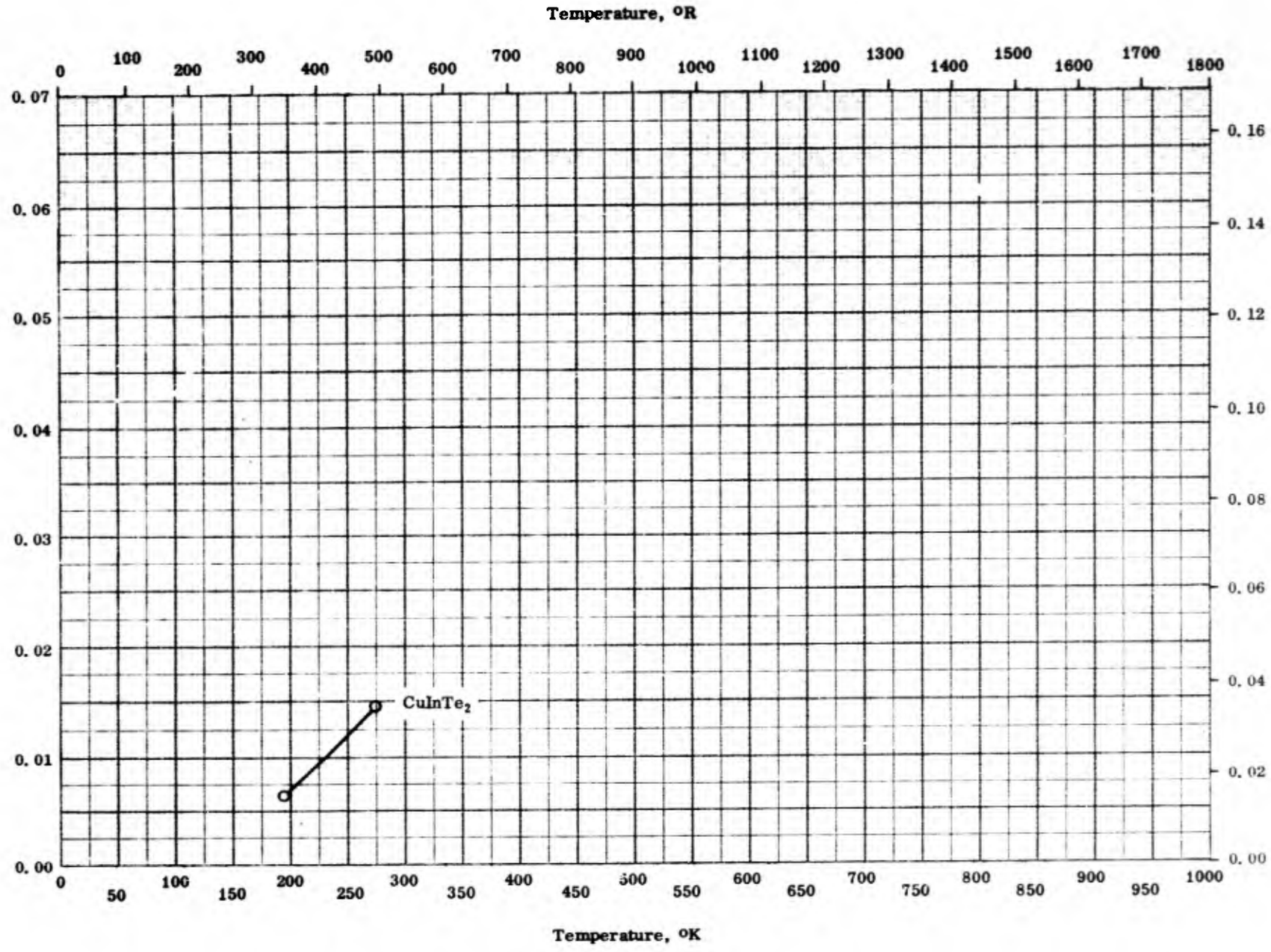


SPECIFIC HEAT -- CADMIUM TELLURIDE

SPECIFIC HEAT — CADMIUM TELLURIDE

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
O	65-2	300-965	4.5	CdTe; traces Sn.	



TPRC

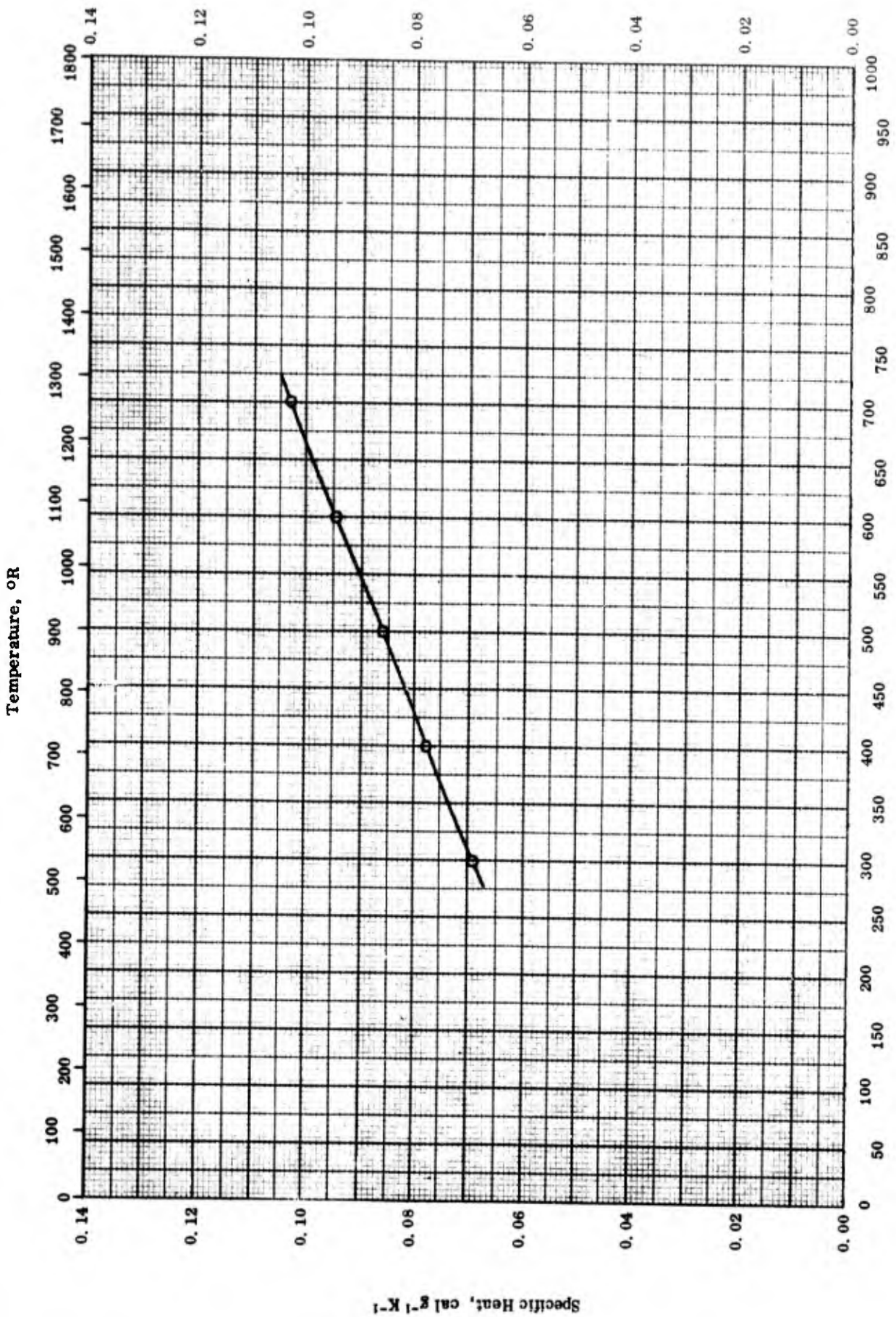
THERMAL CONDUCTIVITY -- COPPER INDIUM TELLURIDE

THERMAL CONDUCTIVITY -- COPPER INDIUM TELLURIDE

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
O	60-7	194-274		Chalcopyrite group.	

TPRC

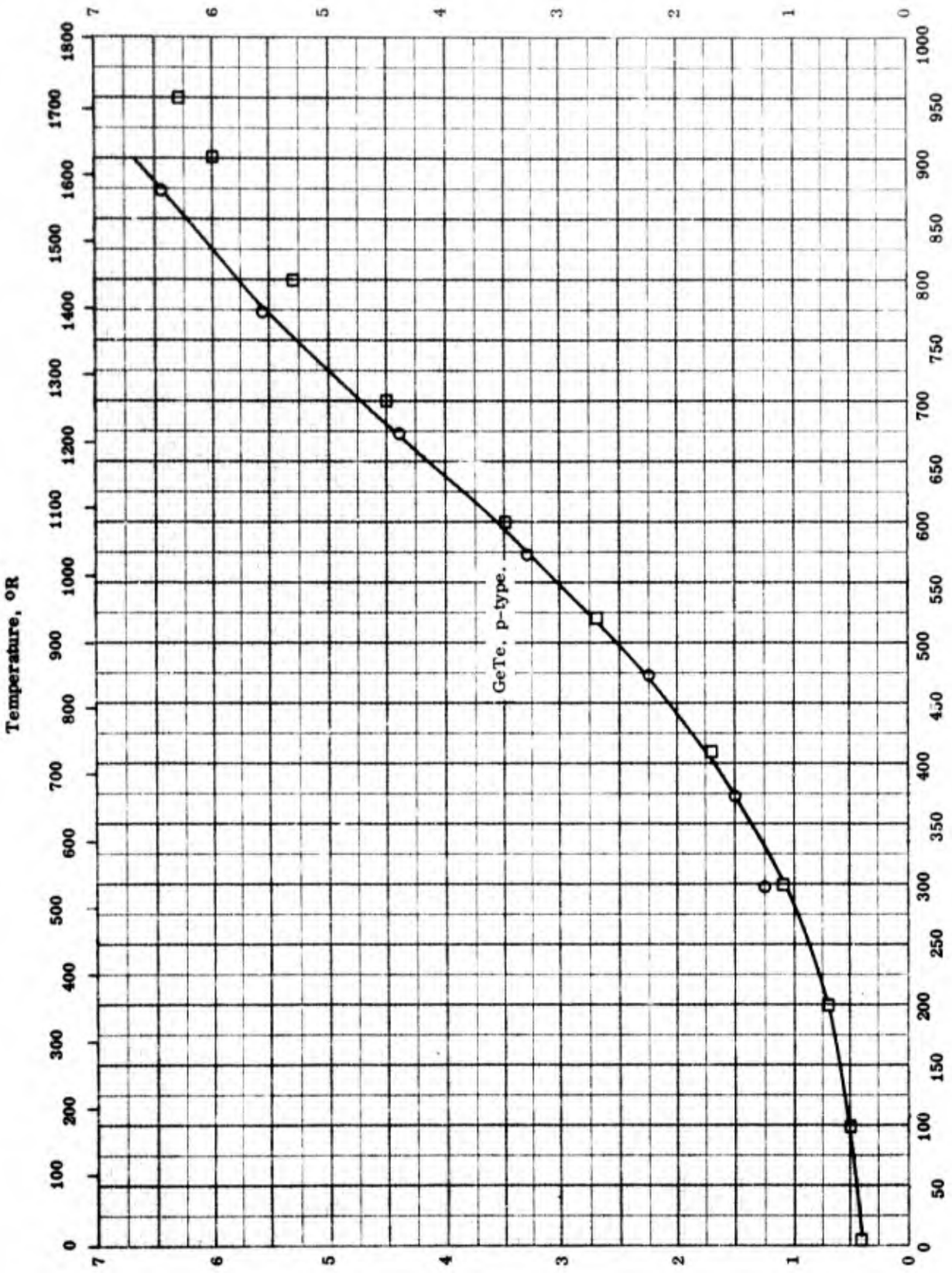


SPECIFIC HEAT -- GALLIUM TELLURIDE

SPECIFIC HEAT -- GALLIUM TELLURIDE

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample specifications	Remarks
O	63-13	300-700		Ga_2Te_3.	



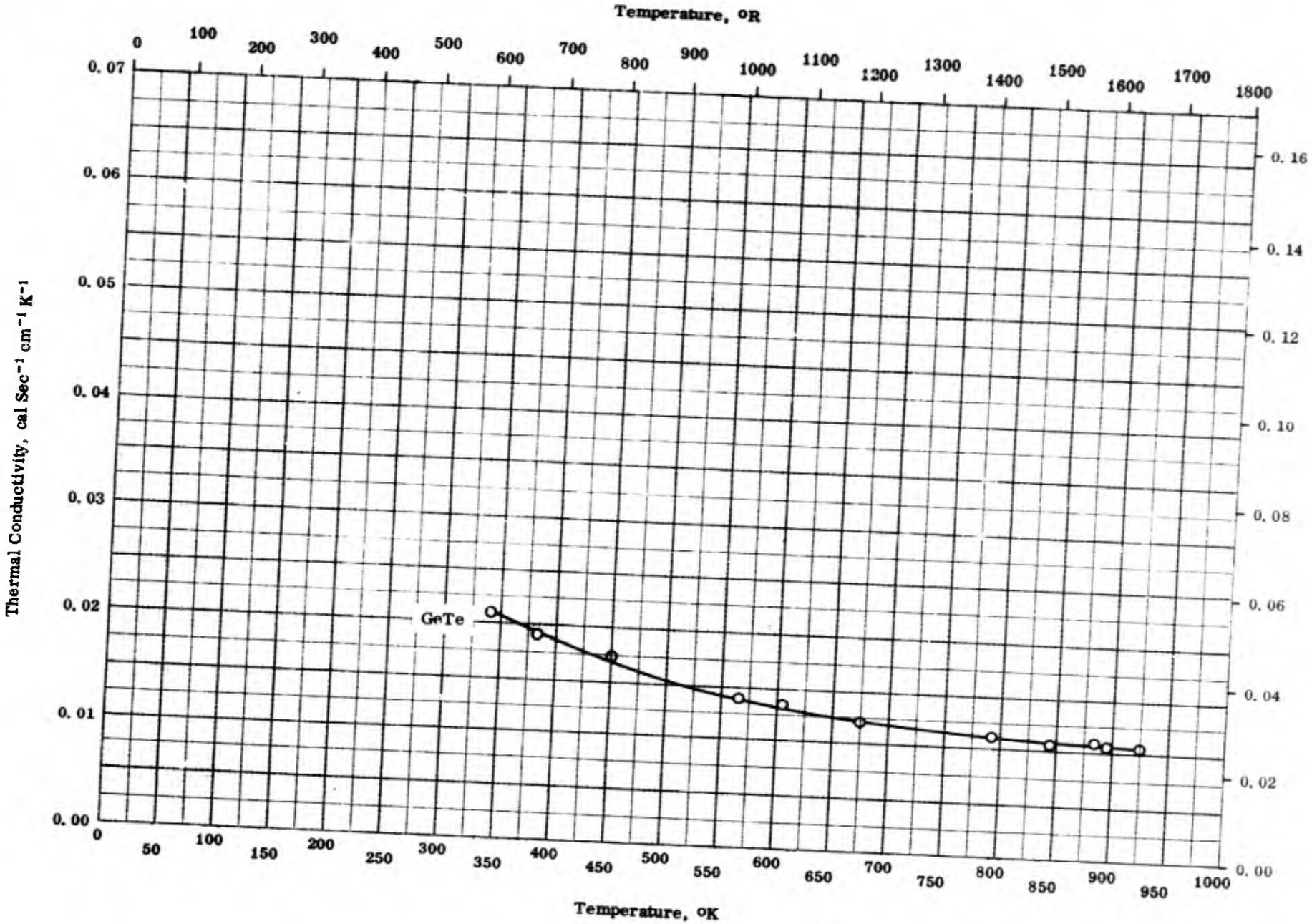
ELECTRICAL RESISTIVITY -- GERMANIUM TELLURIDE

Electrical Resistivity, ohm cm x 10⁴

ELECTRICAL RESISTIVITY -- GERMANIUM TELLURIDE

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
○	61-16	298-873		GeTe, p-type.	
□	61-11	5-950		GeTe.	



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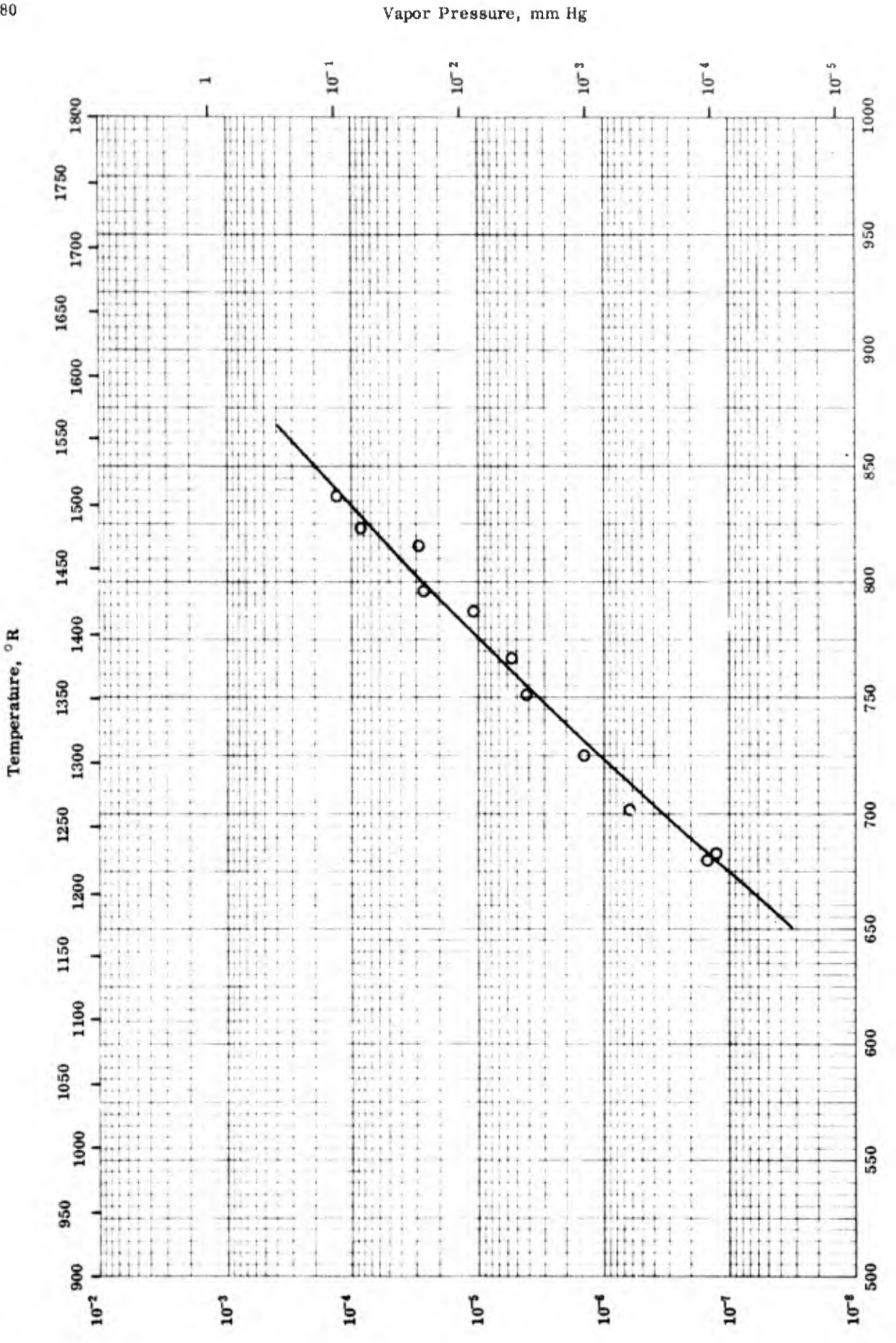
THERMAL CONDUCTIVITY -- GERMANIUM TELLURIDE

THERMAL CONDUCTIVITY -- GERMANIUM TELLURIDE

REFERENCE INFORMATION

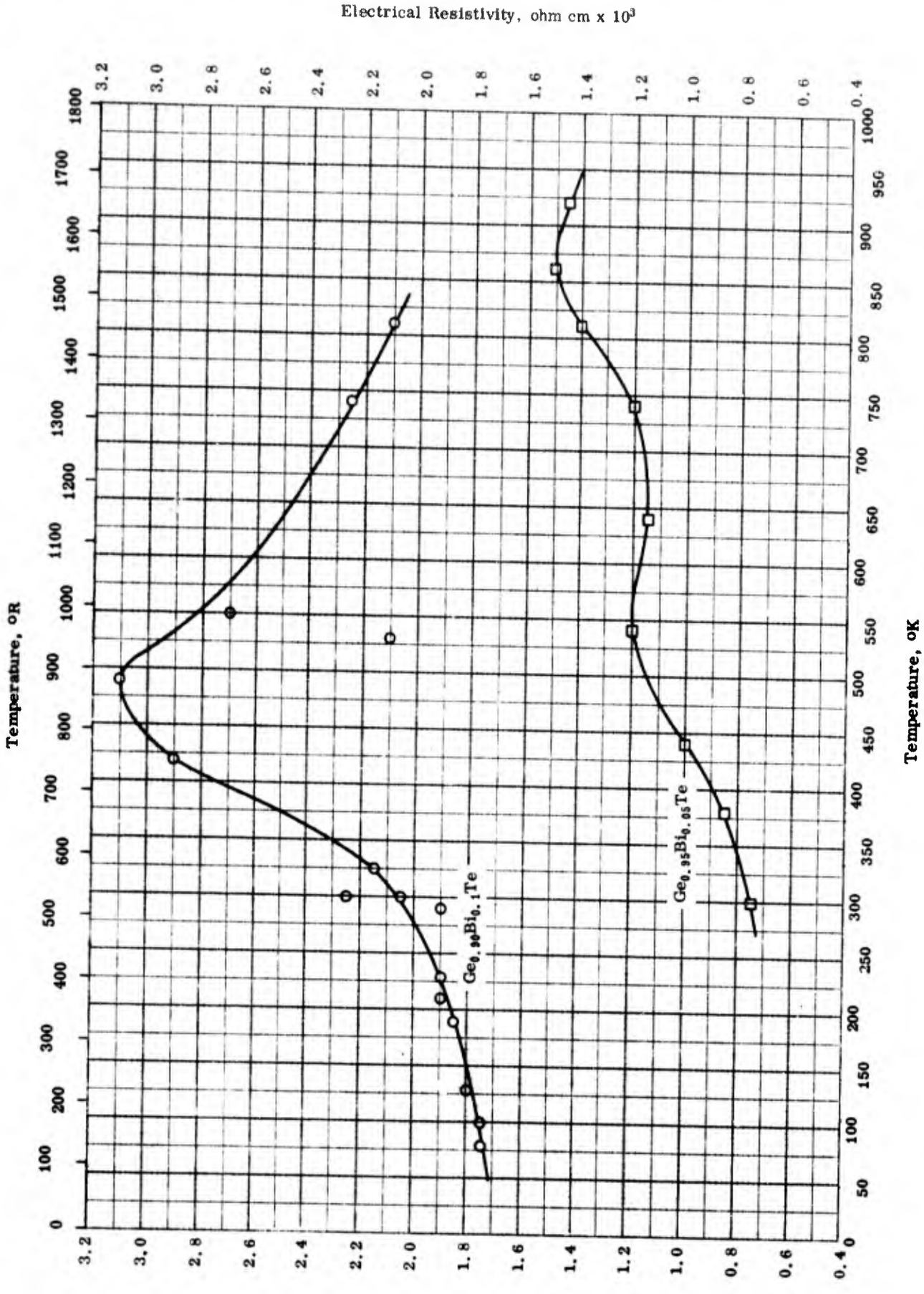
Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
O	60-11	340-925		GeTe.	



VAPOR PRESSURE -- GERMANIUM TELLURIDE

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
O	62-14	680-837		GeTe; 63.75 Te and 36.2 Ge.	Prepared from stoichiometric amount of Ge and Te; crushed and ground to powder.

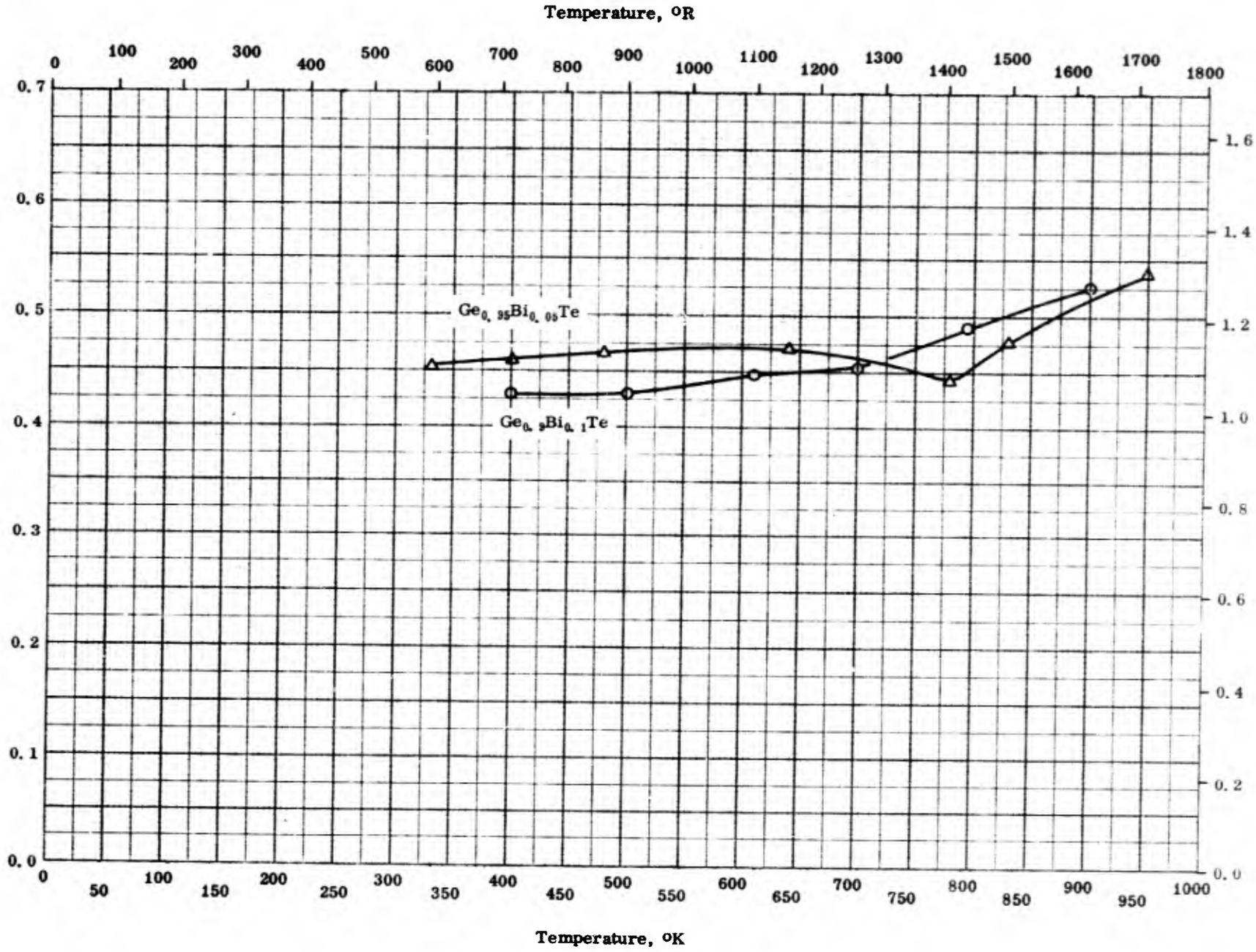


ELECTRICAL RESISTIVITY -- GERMANIUM BISMUTH TELLURIDES

ELECTRICAL RESISTIVITY -- GERMANIUM BISMUTH TELLURIDES

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
○	60-11	80-810		$Ge_{0.90}Bi_{0.1}Te$.	
□	60-11	300-920		$Ge_{0.95}Bi_{0.05}Te$.	



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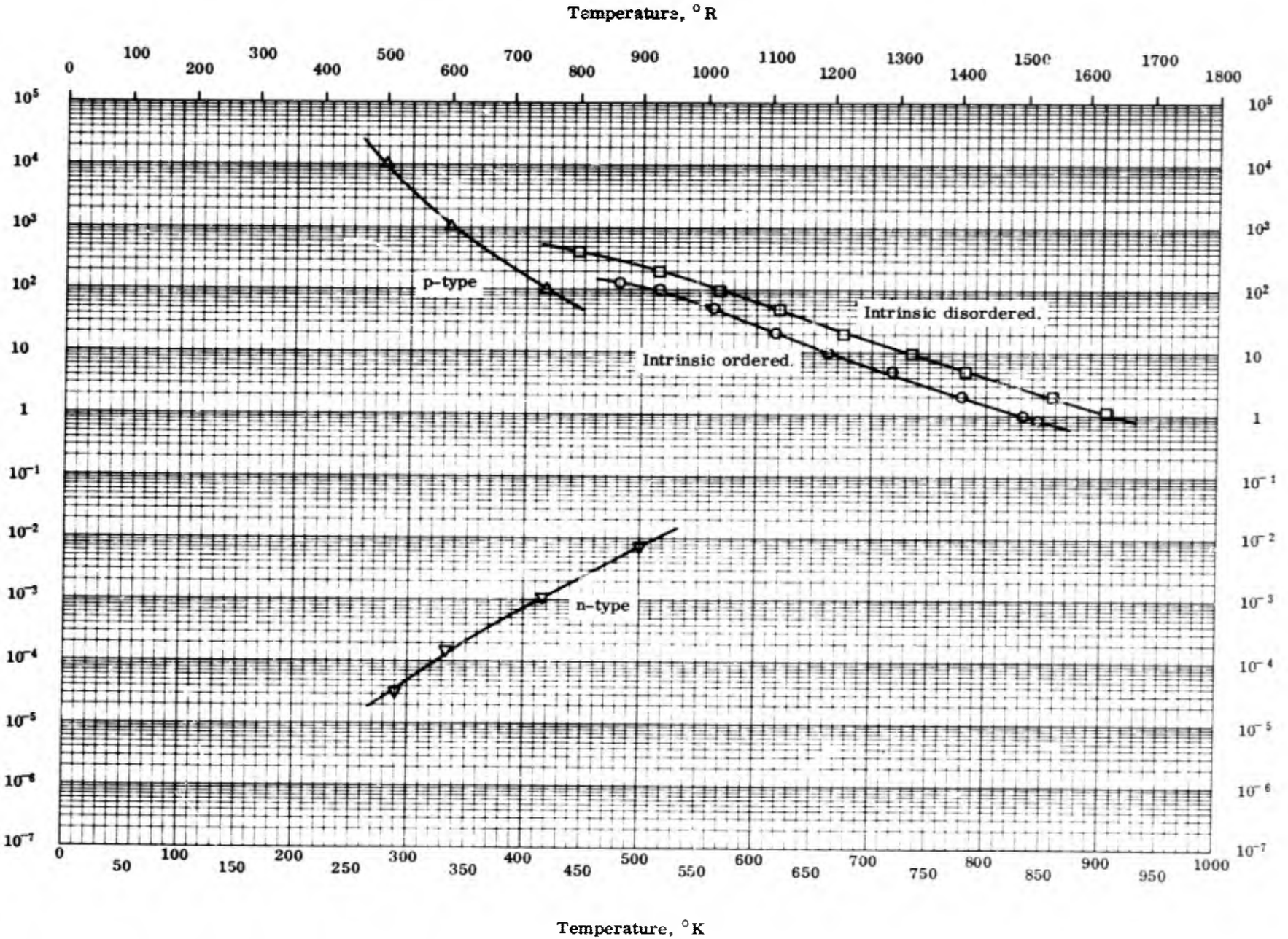
THERMAL CONDUCTIVITY -- GERMANIUM BISMUTH TELLURIDE

THERMAL CONDUCTIVITY -- GERMANIUM BISMUTH TELLURIDE

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
O	60-11	400-900		$Ge_{0.9} Bi_{0.1} Te$.	
Δ	60-11	330-950		$Ge_{0.95} Bi_{0.05} Te$.	

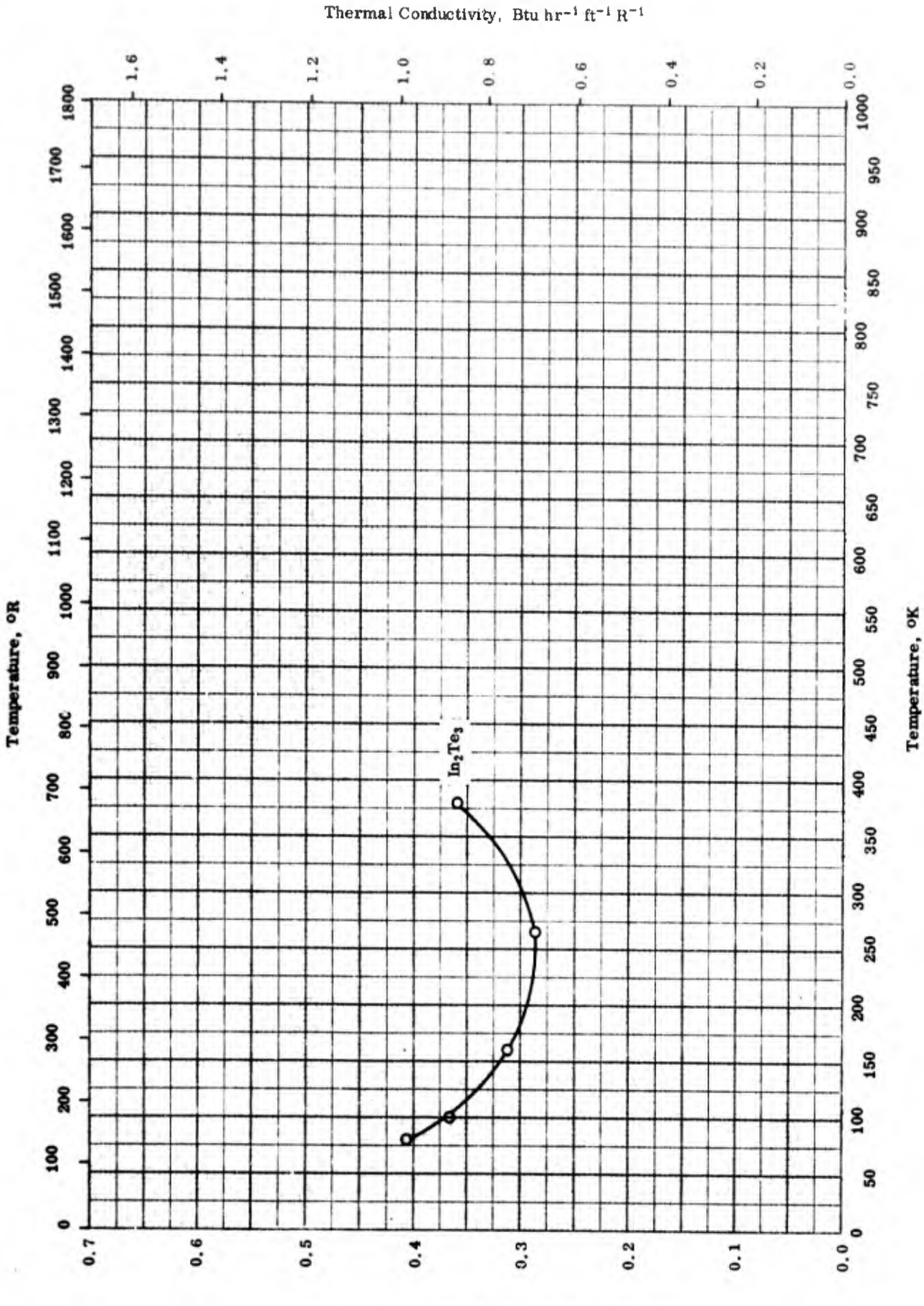


ELECTRICAL RESISTIVITY -- INDIUM TELLURIDE

ELECTRICAL RESISTIVITY -- INDIUM TELLURIDE

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
○	61-18	480-844		In_2Te_3; intrinsic; ordered.	
□	61-18	445-904		In_2Te_3; intrinsic; disordered.	
△	61-19	278-417		In_2Te_3, p-type.	
▽	61-19	290-500		In_2Te_3, n-type.	

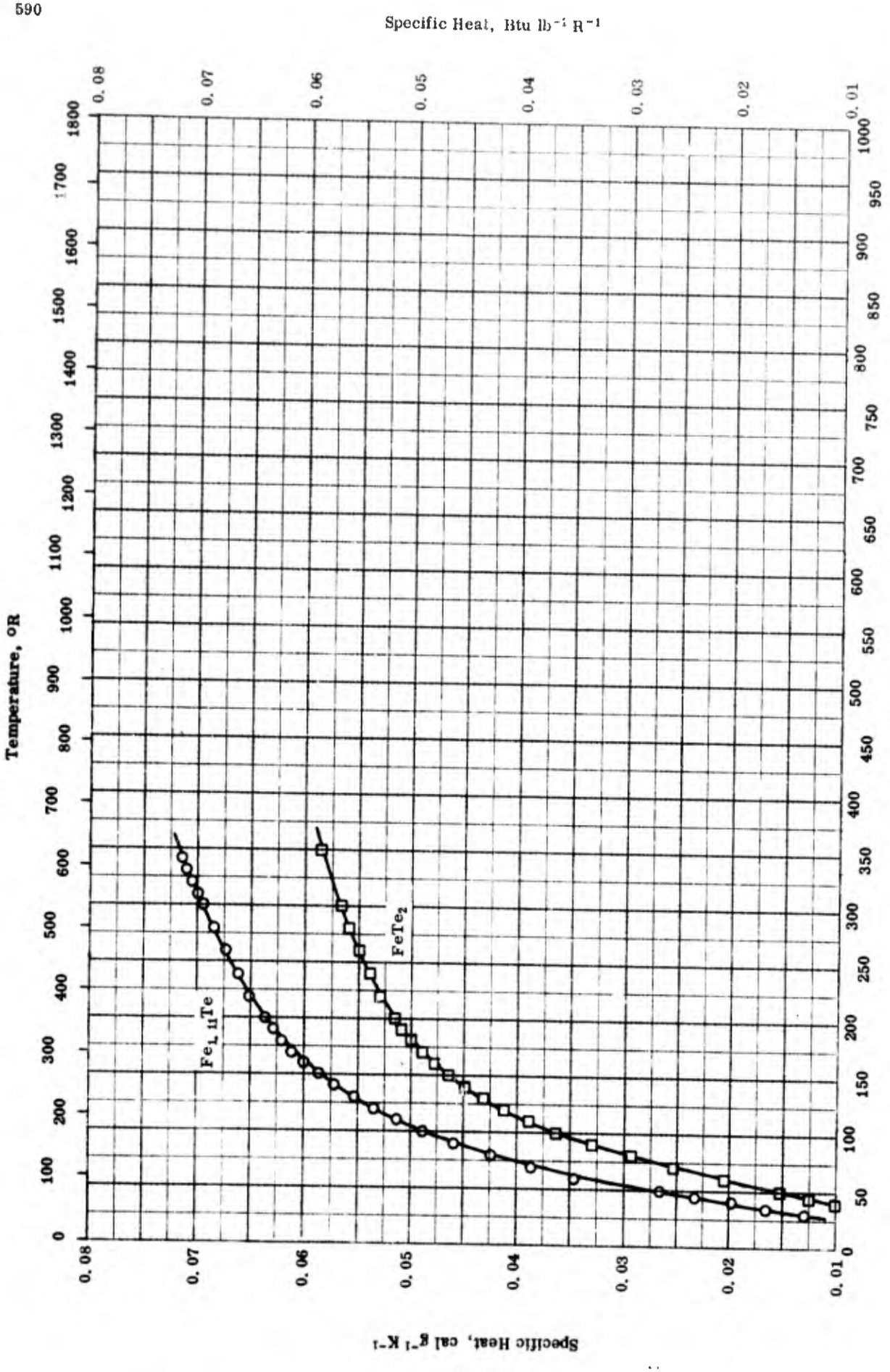


THERMAL CONDUCTIVITY -- INDIUM TELLURIDE

THERMAL CONDUCTIVITY -- INDIUM TELLURIDE

REFERENCE INFORMATION

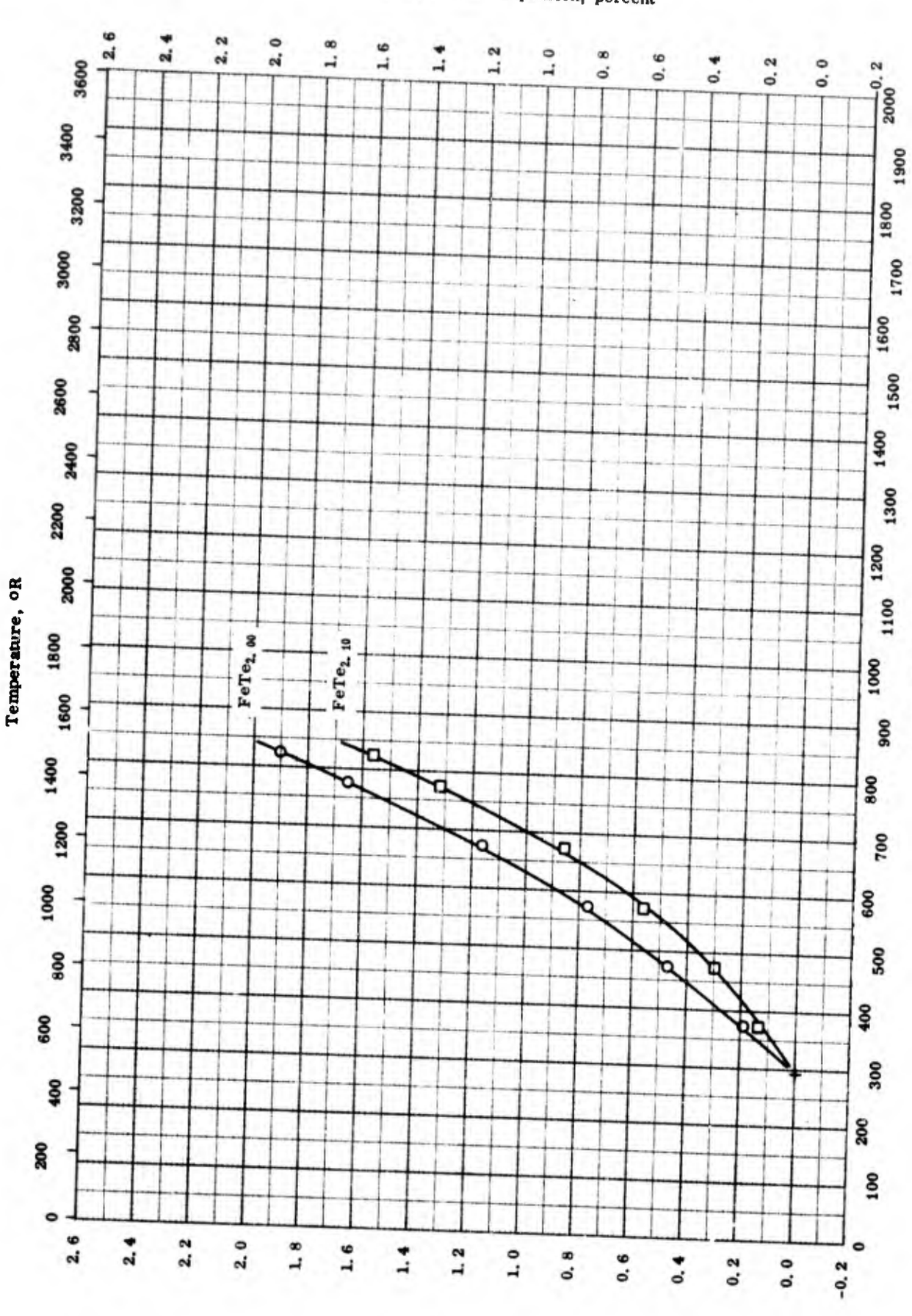
Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
O	60-11	80-380		In_2Te_3.	



SPECIFIC HEAT -- IRON TELLURIDES

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
○	59-17	5-350	0.1-5	$Fe_{1.11}Te$; 0.01 Fe, 0.01 Ni, 0.01 Si, 0.001 Mn, traces Al, Mg and Pb.	Heated 1 week at 700 C and cooled; fragmented; heated 2 weeks at 400 C and cooled to room temperature at rate of 50 C day^{-1}.
□	59-17	5-350	0.1-5	$FeTe_2$; impurities same as above.	Same as above.

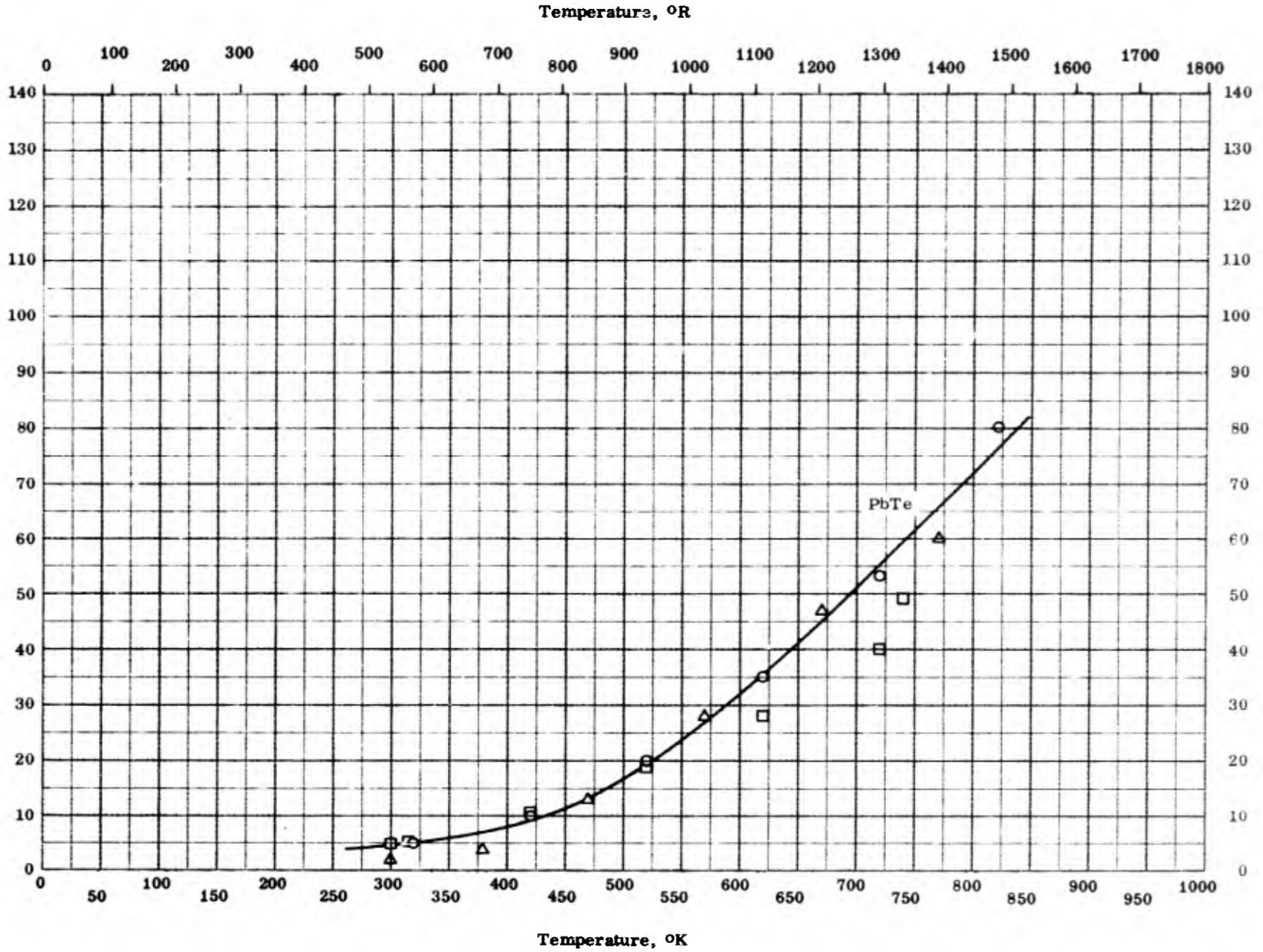


THERMAL LINEAR EXPANSION -- IRON TELLURIDES

THERMAL LINEAR EXPANSION -- IRON TELLURIDES

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
○	57-20	291-823	±15	$FeTe_{2.00}$	
□	57-20	291-823	±15	$FeTe_{2.10}$	

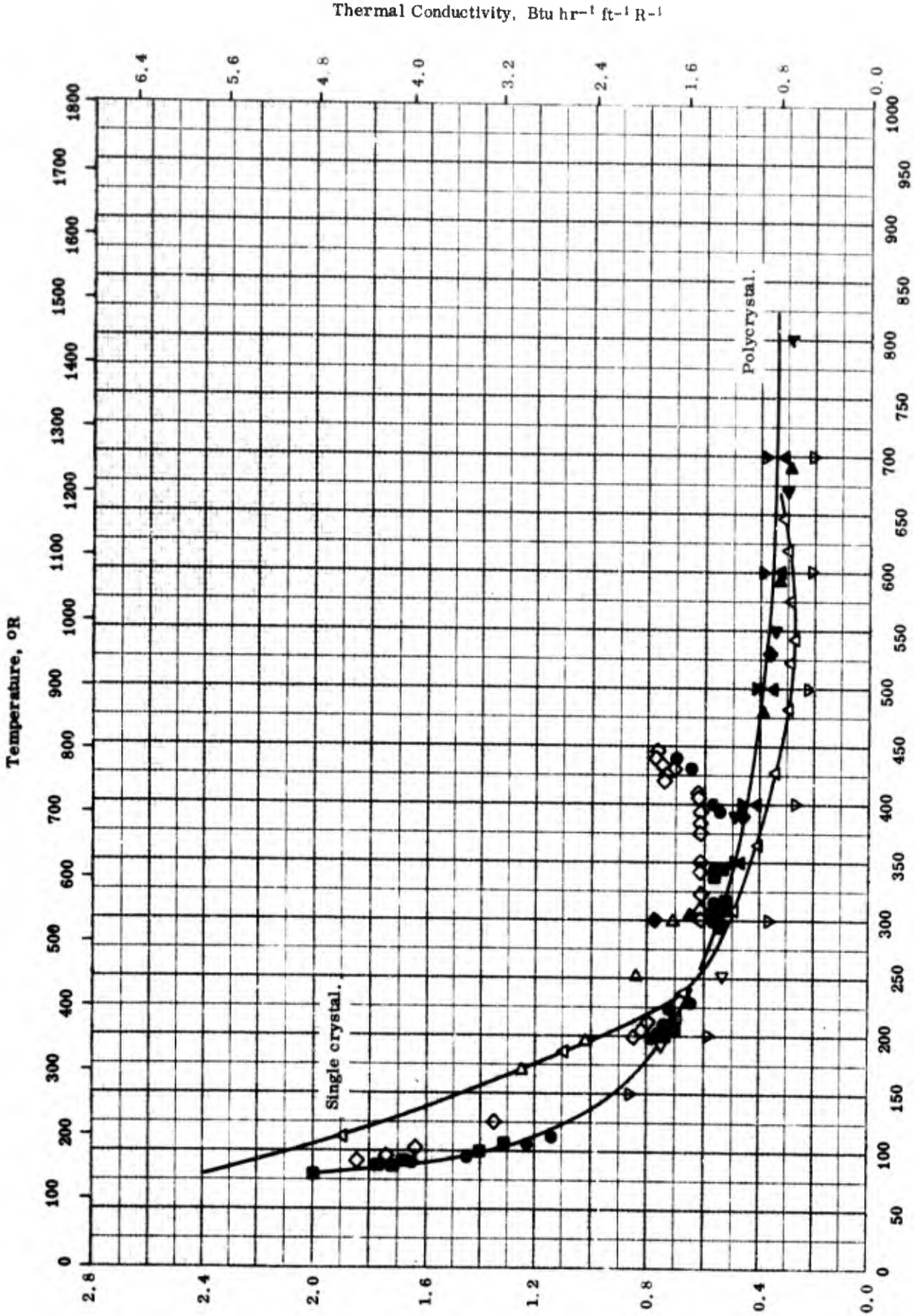


ELECTRICAL RESISTIVITY -- LEAD TELLURIDE

ELECTRICAL RESISTIVITY -- LEAD TELLURIDE

REFERENCE INFORMATION

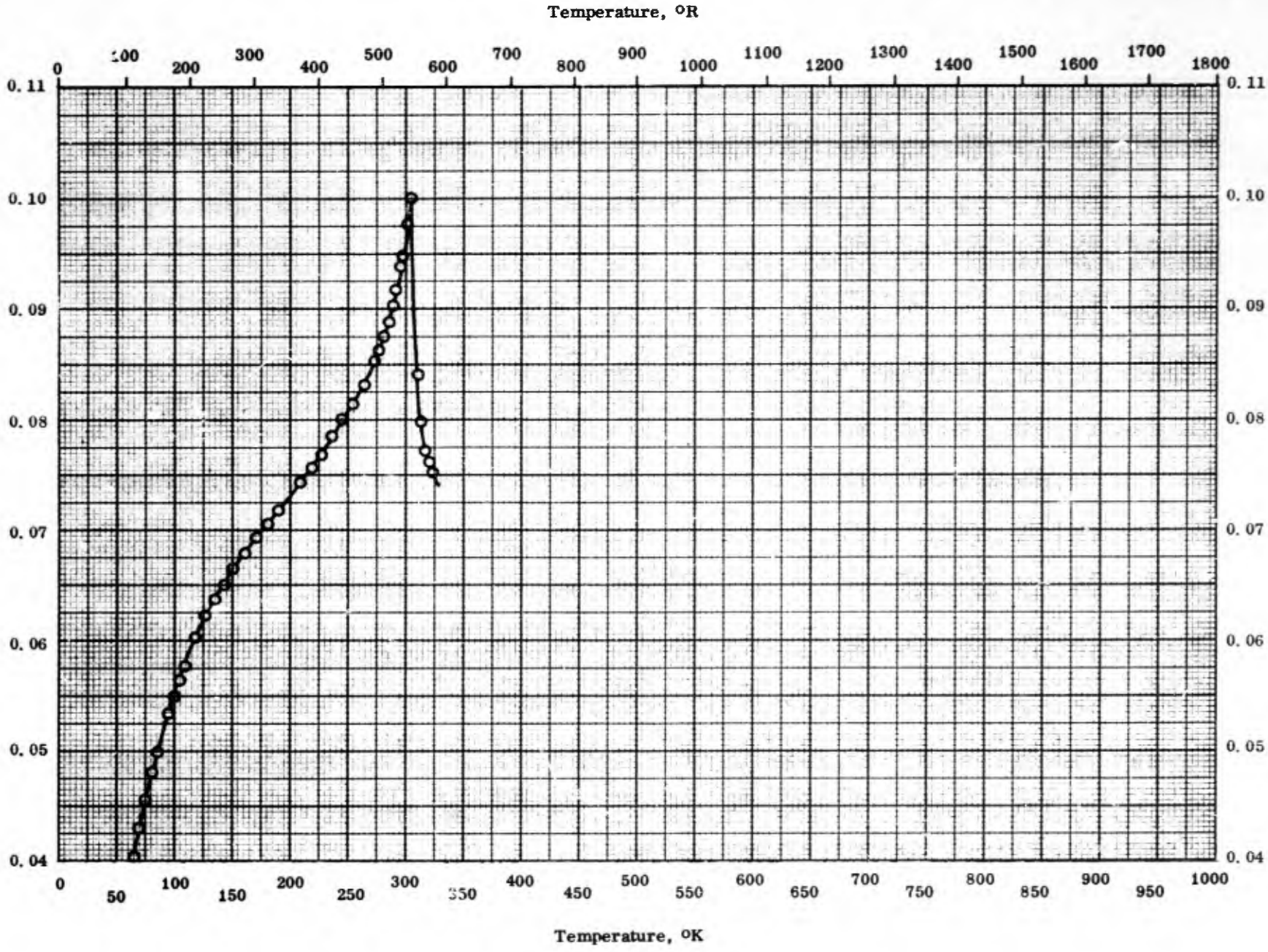
Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
○	60-11	320-820		PbTe with 0.07 Bi.	Sintered.
□	60-11	300-780		PbTe with 0.07 Bi.	Sintered; another sample.
△	60-11	300-770		PbTe with 0.5 excess Pb and 0.2 Bi.	Cast.



THERMAL CONDUCTIVITY -- LEAD TELLURIDE

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
△	59-1	112-647		PbTe; single crystal with hole concentration 2×10^{18} cm^{-3}.	
▽	58-3	150-700		PbTe.	
◁	57-6	193-302		PbTe; polycrystal with room temperature electrical conductivity $\sigma = 60$ ohm^{-1} cm^{-1}.	
▷	57-6	170-300		Same as above except $\sigma = 1740$ $ohm^{-1}cm^{-1}$.	
◇	57-6	92-446		Same as above except $\sigma = 1200$ $ohm^{-1}cm^{-1}$.	
●	57-6	90-440		Same as above except $\sigma = 430$ $ohm^{-1}cm^{-1}$.	
■	57-6	79-344		Same as above except $\sigma = 60$ $ohm^{-1}cm^{-1}$.	
▲	61-6	350-700		PbTe; p-type; density 8.15 g cm^{-3}.	
▼	61-6	350-700		PbTe; n-type; density 8.15 g cm^{-3}.	
◀	60-11	300-800		PbTe with 0.07 Bi.	Sintered.
▶	60-11	305-690		Same as above.	Sintered.
◆	60-11	300-600		PbTe with 0.2 Bi; excess in Pb.	Cast.

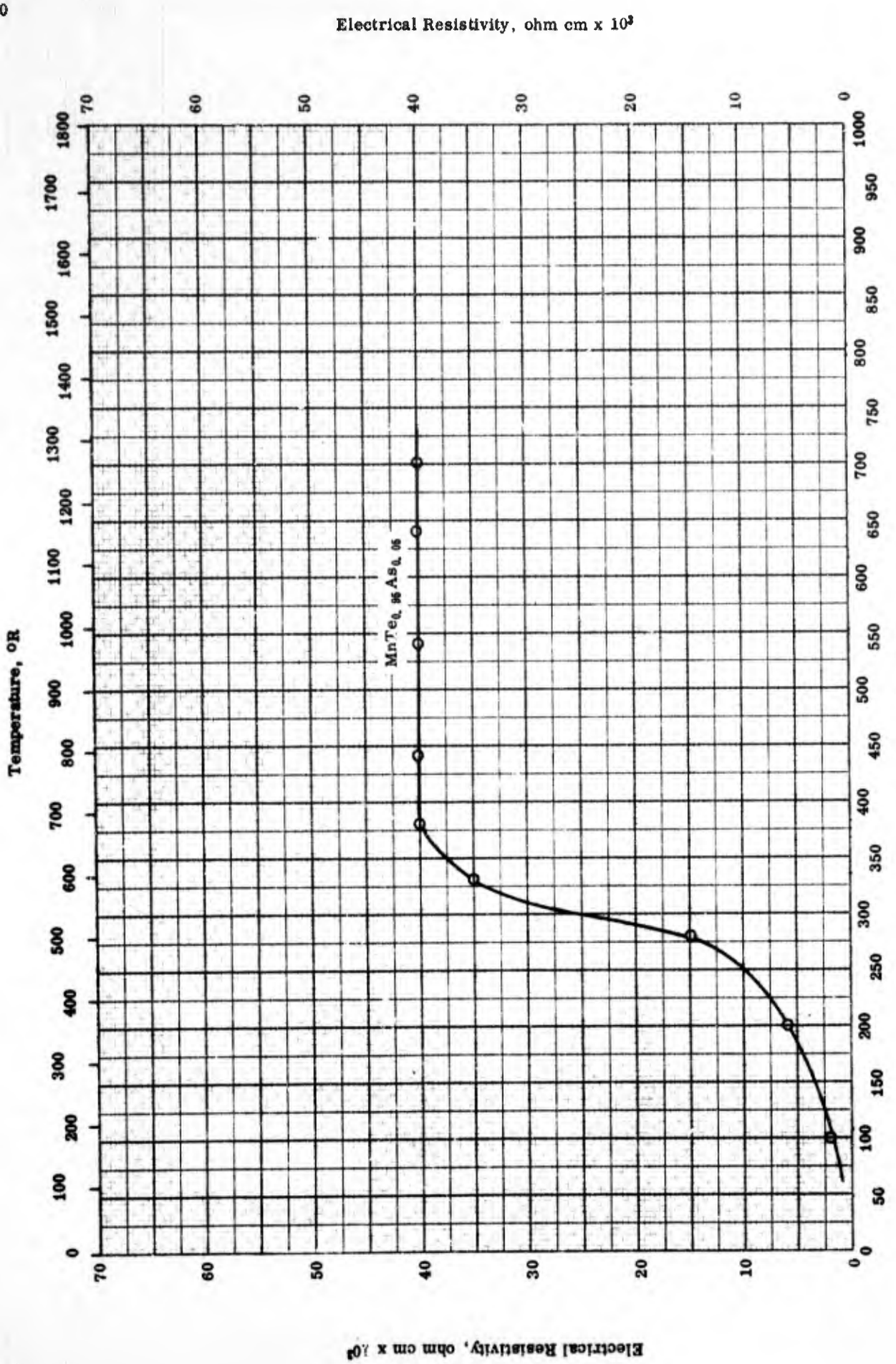


TPRC

SPECIFIC HEAT -- MANGANESE TELLURIDE

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
○	39-1	54-327		99.57 MnTe.	



ELECTRICAL RESISTIVITY -- MANGANESE ARSENIDE TELLURIDE

ELECTRICAL RESISTIVITY -- MANGANESE ARSENIDE TELLURIDE

REFERENCE INFORMATION

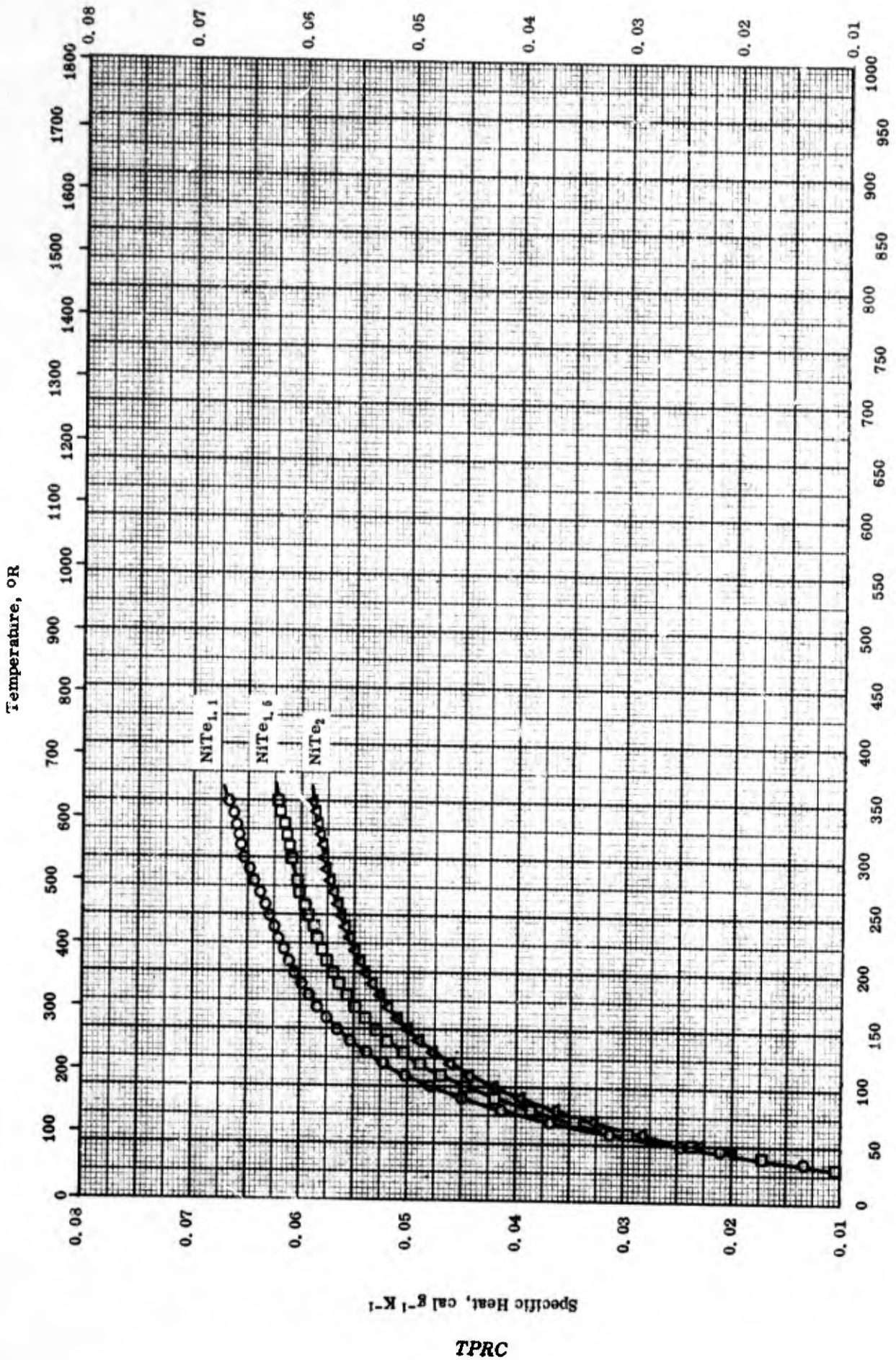
Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
O	60-11	100-700		$MnTe_{0.95}As_{0.05}$.	

THERMAL CONDUCTIVITY -- MANGANESE ARSENIDE TELLURIDE

THERMAL CONDUCTIVITY -- MANGANESE ARSENIDE TELLURIDE

REFERENCE INFORMATION

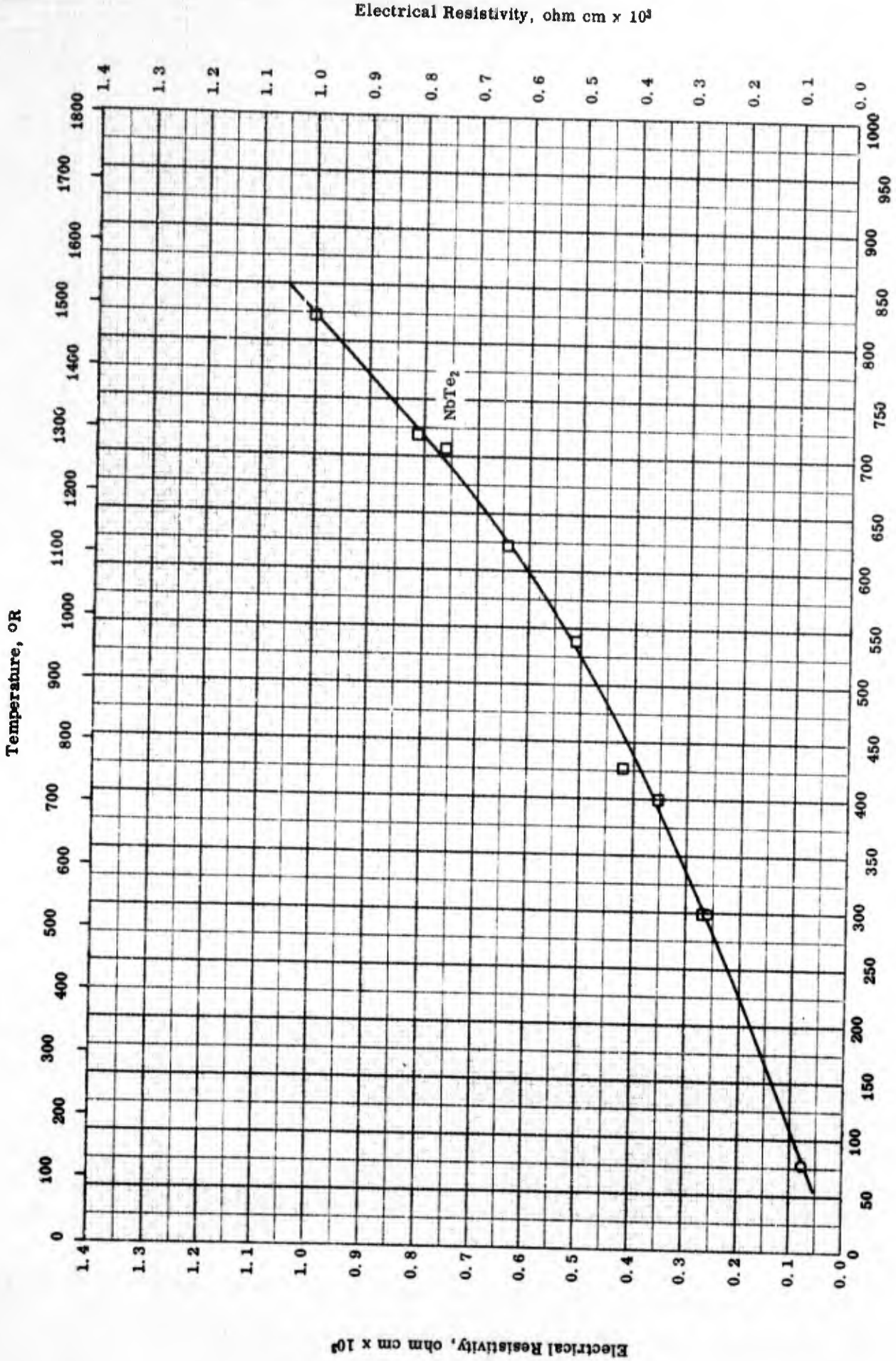
Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
O	60-11	270-800		$MnTe_{0.95}As_{0.05}$	



SPECIFIC HEAT -- NICKEL TELLURIDES

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
○	58-11	5-350	0.1	$NiTe_{1.1}$; 99.99 pure.	Fused 2 hrs at 1000 C and cooled; fragmented; annealed in vacuo 30 days at 500 C and cooled to room temperature over a period of 2 days; additional heating 2 weeks at temperature gradually decreasing from 500 to 300 C.
□	58-11	5-350	0.1	$NiTe_{1.5}$; 99.99 pure.	Same as above.
△	58-11	5-350	0.1	$NiTe_2$; 99.99 pure	Same as above.

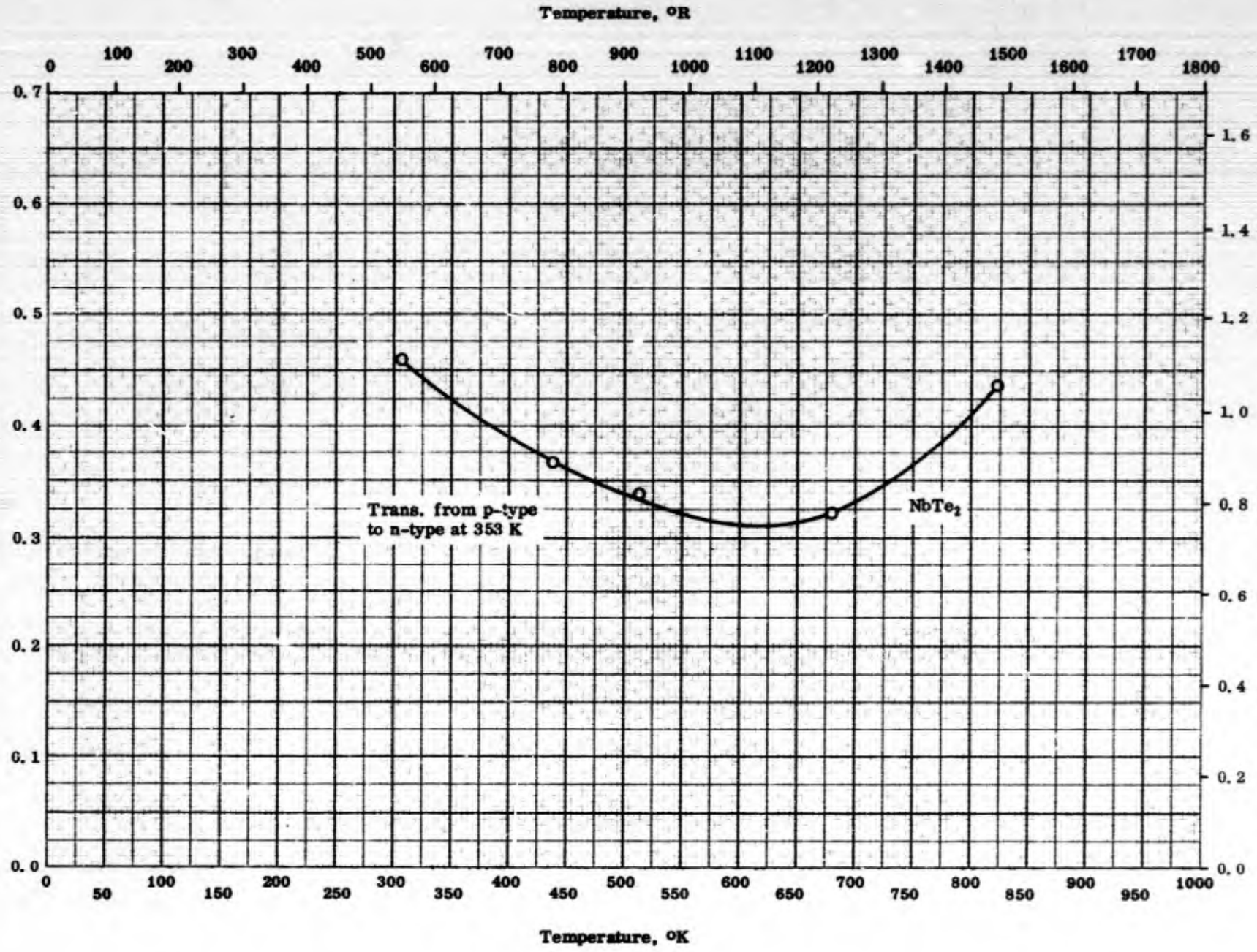


ELECTRICAL RESISTIVITY -- NIOBIUM TELLURIDE

ELECTRICAL RESISTIVITY -- NIOBIUM TELLURIDE

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
○	62-9	77-298		$NbTe_2$, p-type; made from 99.9+ purity raw materials; a homogeneous polycrystal product of grey metallic lustre.	Prepared by mixing powders fired at 600-700 C for 10-15 hrs; again fired at 1000-1200 C for another 10-15 hrs to assure complete reaction.
□	62-9	298-823		Same as above.	Same as above.

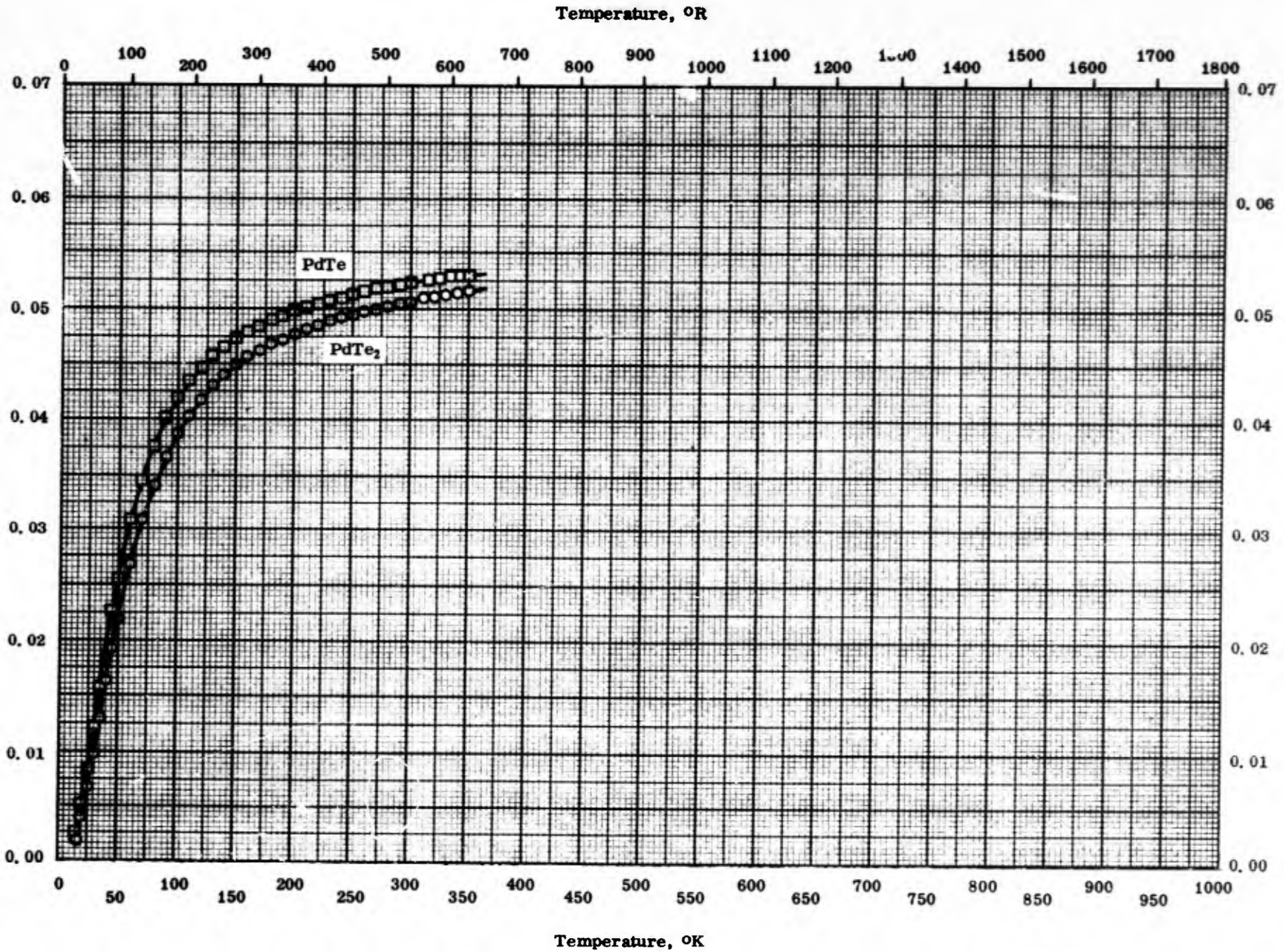


THERMAL CONDUCTIVITY -- NIOBIUM TELLURIDE

THERMAL CONDUCTIVITY -- NIOBIUM TELLURIDE

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
O	62-9	306-823	<±20	99.9+ best c.p. $NbTe_2$; 85 - 88% of theoretical density.	Hot-pressed at 1000 C at 80,000 - 100,000 psi and sintered at 600 - 800 C for 10 - 15 hrs; transition from p-type to n-type at 80 C.

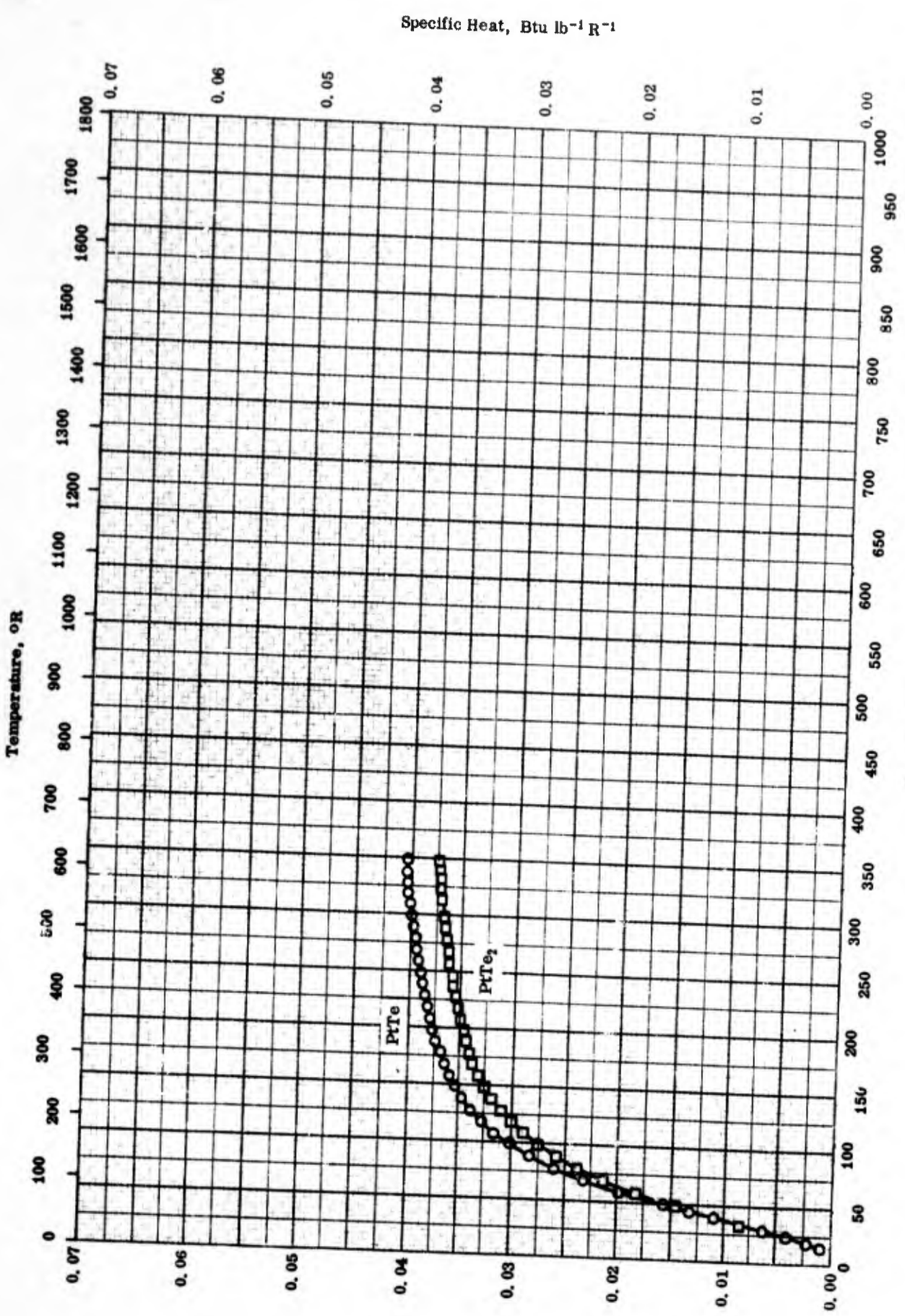


SPECIFIC HEAT -- PALLADIUM TELLURIDES

SPECIFIC HEAT -- PALLADIUM TELLURIDES

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
○	61-22	5-350		$PdTe_2$; prepared from the elements with the following composition: 99.99 Te and Pd with impurities 0.007 Au, 0.006 SiO_2, 0.005 Pt, 0.003 Ag, 0.002 Fe, 0.001 Rh, 0.0002 Pb and 0.006 volatile materials.	Prepared by heating mixture of elements at 800 C; kept molten 2 hrs, cooled, and fragmented; annealed 7 days at 500 C and cooled to room temperature over a period of 2 days.
□	61-21	5-350		PdTe; same as above.	Same as above.



SPECIFIC HEAT -- PLATINUM TELLURIDES

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
○	61-22	5-350	0.1	$PtTe_2$ of high purity; prepared from 99.999 Te and Pt with the following composition: 0.0010 > Fe, 0.0010 > Pb, 0.0007 Pd, 0.0001 Au, and 0.0090 volatile materials.	Prepared by reacting the elements 5 hrs at 100 C; annealed 7 days at 500 C and cooled to room temperature for over 7 days.
□	61-21	5-350	0.1	PtTe; same as above.	Prepared by allowing the elements to react 6 hrs at 1000 C then raising temperature to 1200 C for 1 hr to melt sample, cooled to room temperature overnight; melt broken into fragments; annealed 7 days at 500 C and slowly cooled to room temperature over a period of 7 days.

PROPERTIES OF SILICON TELLURIDE

MOST PROBABLE VALUES

Property	C.G.S. Units	Brit. Eng. Units
Density	3.93	245
Melting Point.	1171	2108

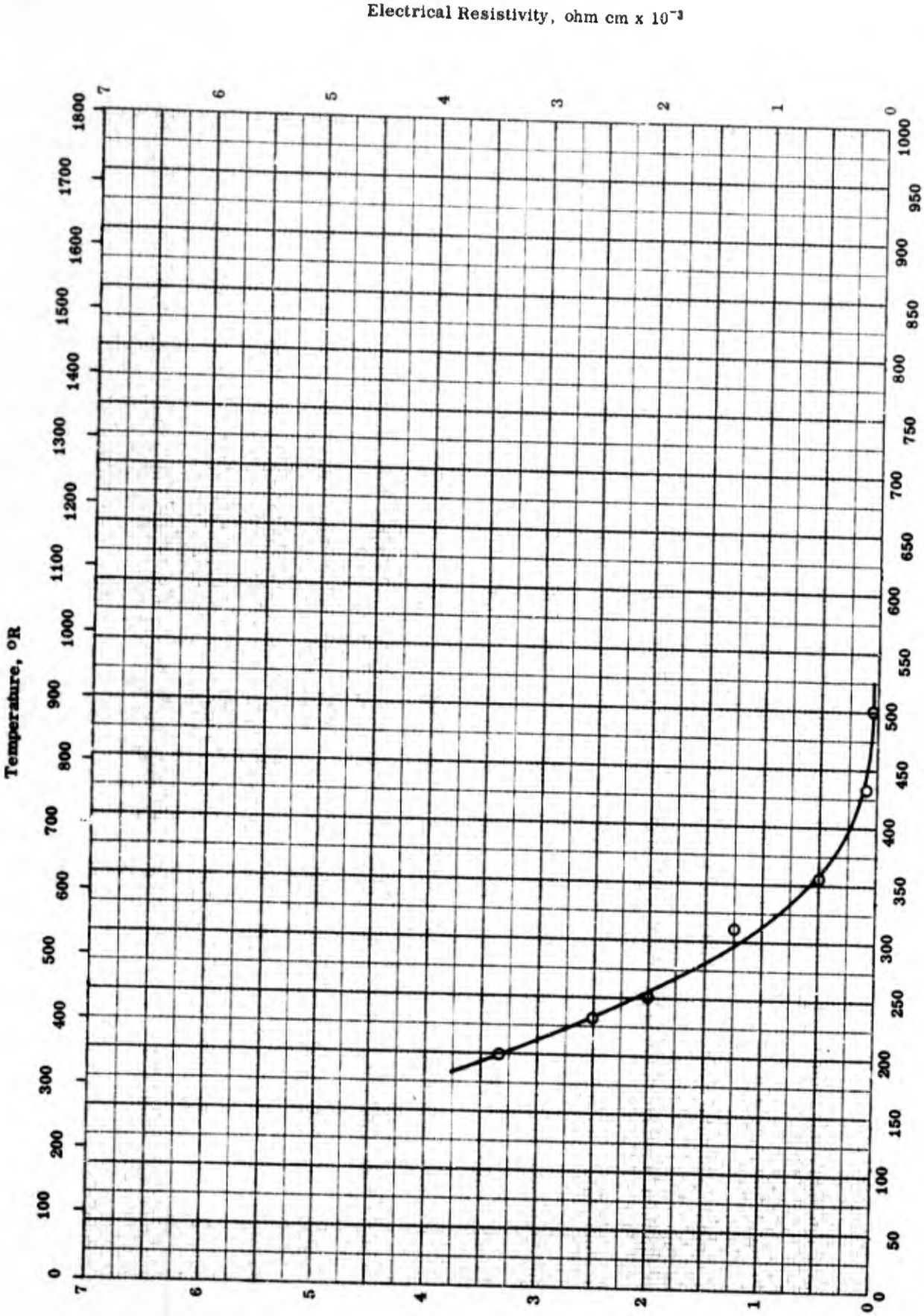
REPORTED VALUES

Density	$g\ cm^{-3}$	$lb\ ft^{-3}$
○ SiTe	3.93	245
Melting Point	K	R
□ SiTe	1171 ± 4	2108 ± 7

PROPERTIES OF SILICON TELLURIDE

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
○	57-2	298		SiTe.	Compounded in vacuum at 1200 C for 4 hrs; measured by pycnometer.
□	57-2	1167-1175		SiTe.	



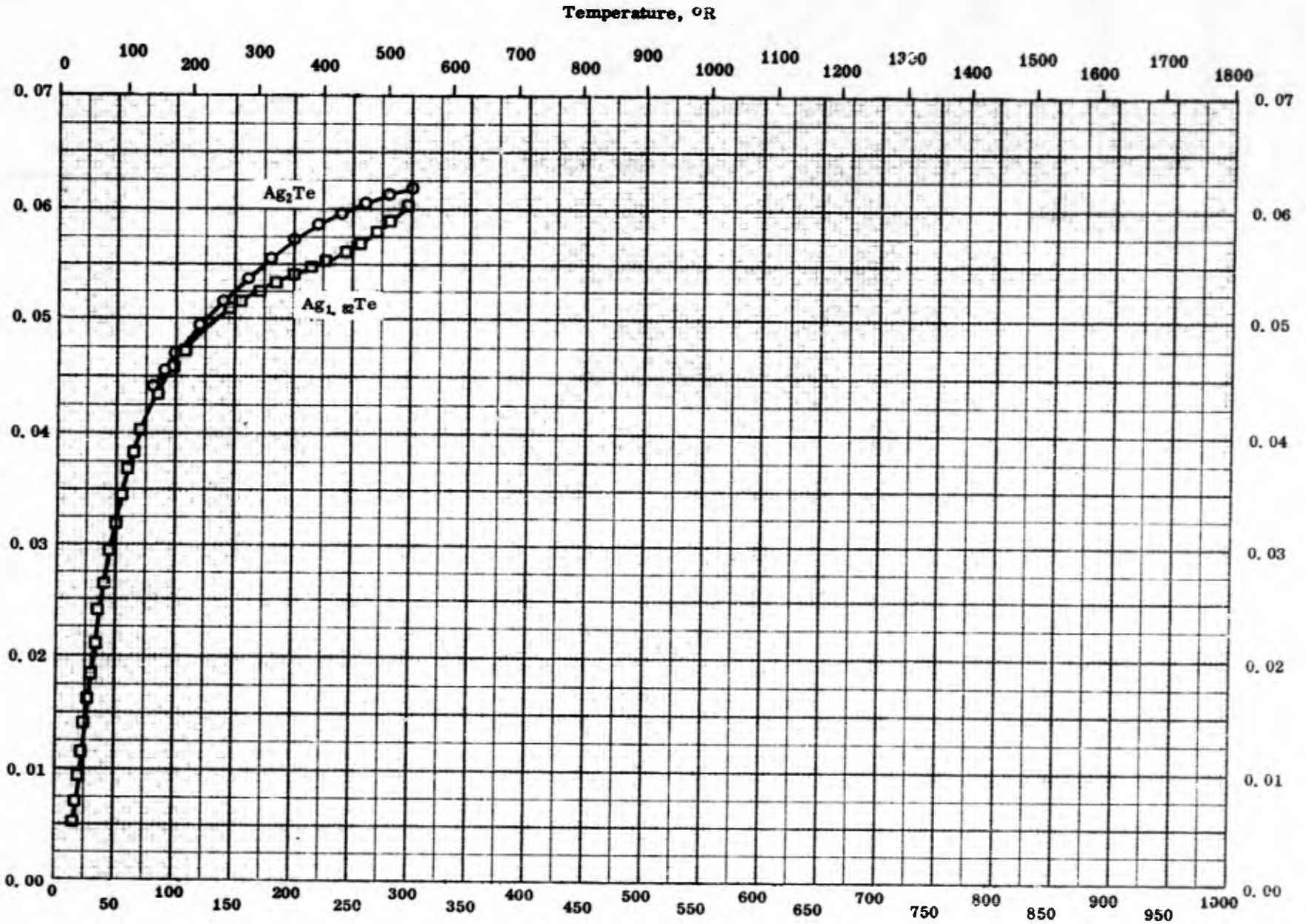
ELECTRICAL RESISTIVITY -- SILICON TELLURIDE

Electrical Resistivity, ohm cm x 10^{-3}

ELECTRICAL RESISTIVITY -- SILICON TELLURIDE

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
O	57-2	200-500		Density 245 lb ft^{-3}.	Compounded in vacuum at 1200 C for 4 hrs.



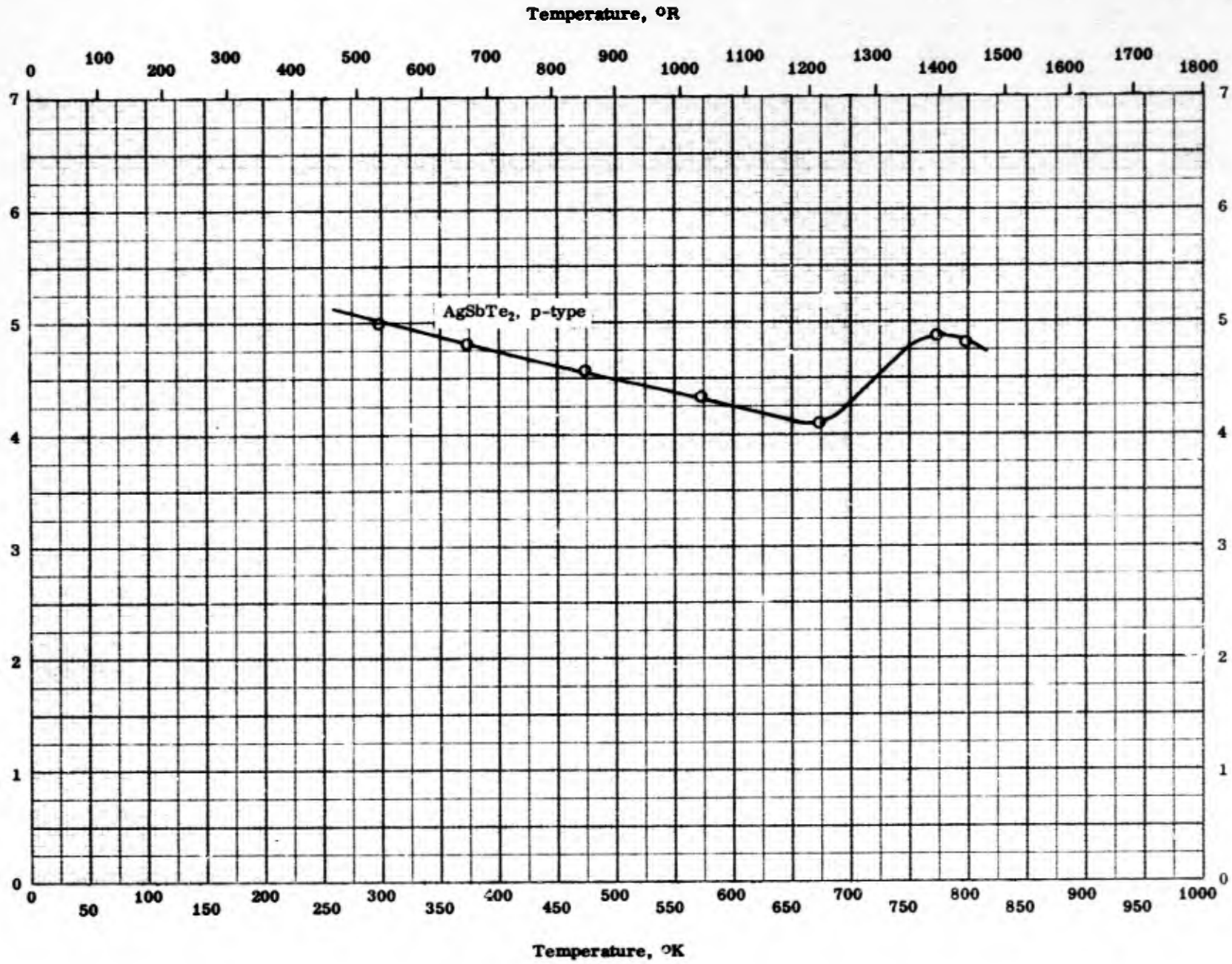
TPRC

SPECIFIC HEAT -- SILVER TELLURIDES

SPECIFIC HEAT — SILVER TELLURIDES

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
○	59-16	80-300	3-7	Ag_2Te; polycrystalline.	
□	62-24	16-296		$Ag_{1.88}Te$; 99.99 pure.	Crushed under agron atmosphere.



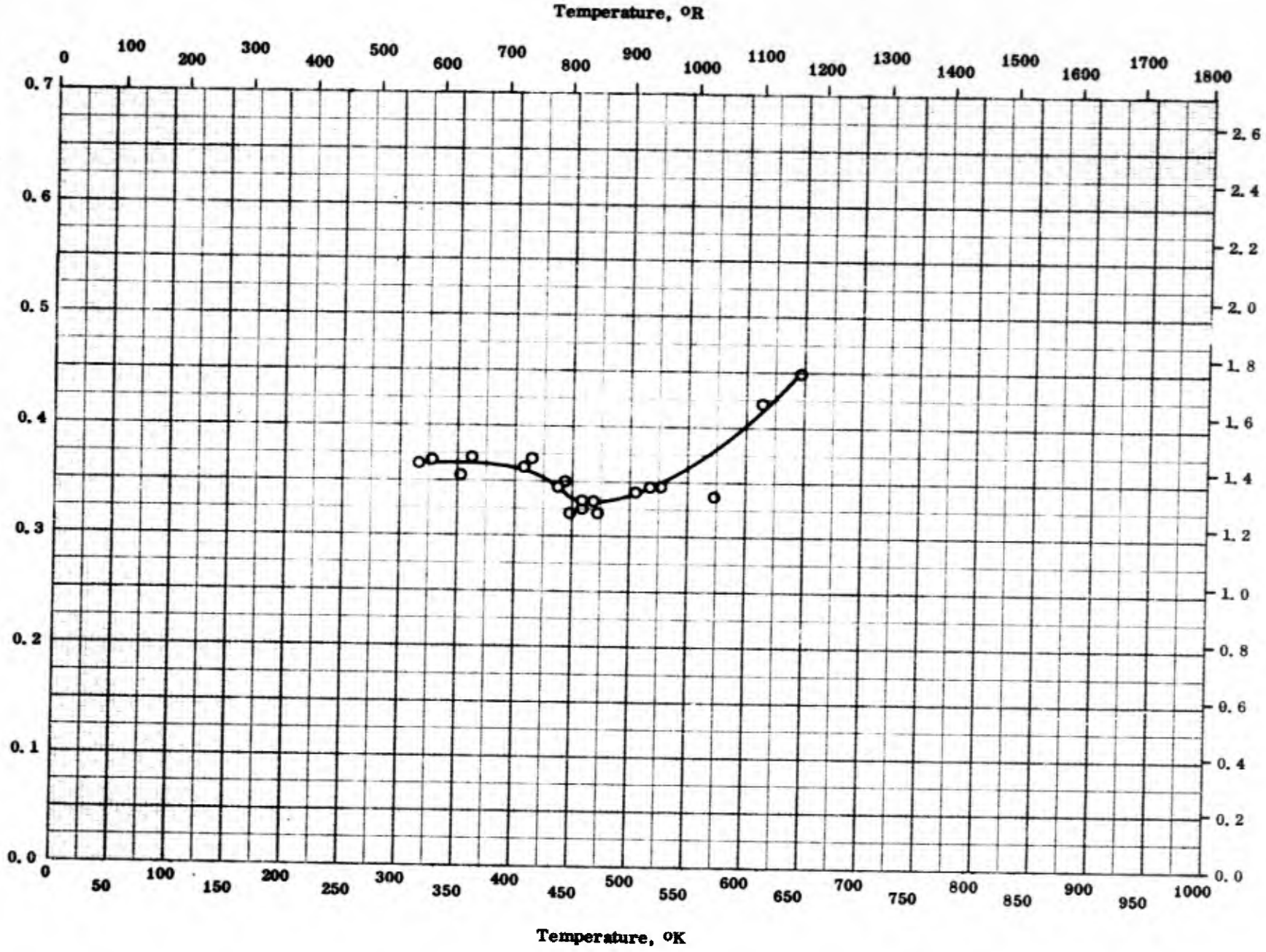
TPRC

ELECTRICAL RESISTIVITY -- SILVER ANTIMONY TELLURIDE

ELECTRICAL RESISTIVITY -- SILVER ANTIMONY TELLURIDE

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
O	61-16	298-798		$AgSbTe_2$; p-type.	Prepared directly from the elements in an evacuated quartz ampoule by heating to 700 C, mixing, and then cooling at about 5 C-min^{-1}.



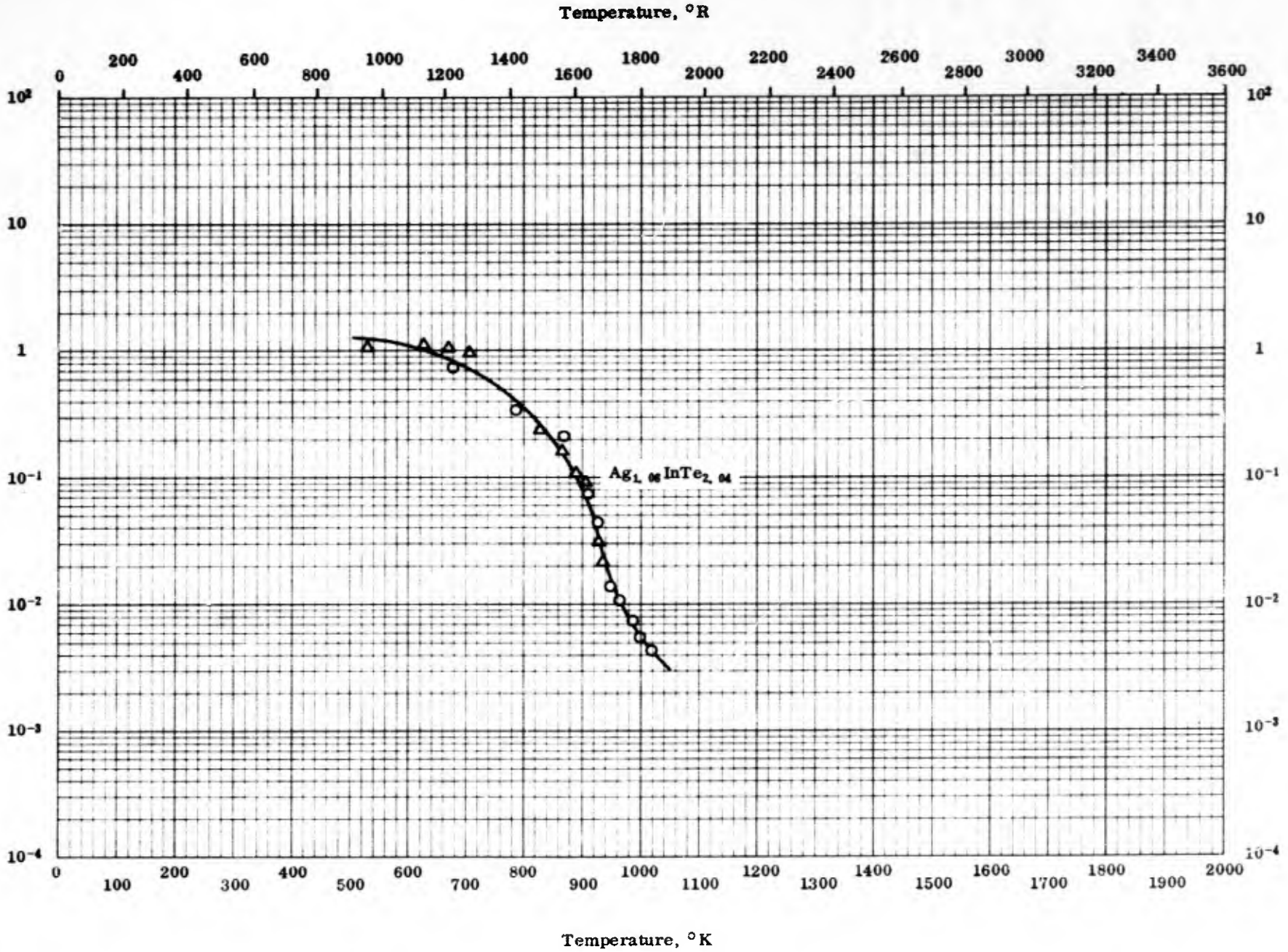
TPRC

THERMAL DIFFUSIVITY -- SILVER ANTIMONY TELLURIDE

THERMAL DIFFUSIVITY -- SILVER ANTIMONY TELLURIDE

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
O	W-46	316-646	2	$AgSb\ Te_2$.	



TPRC

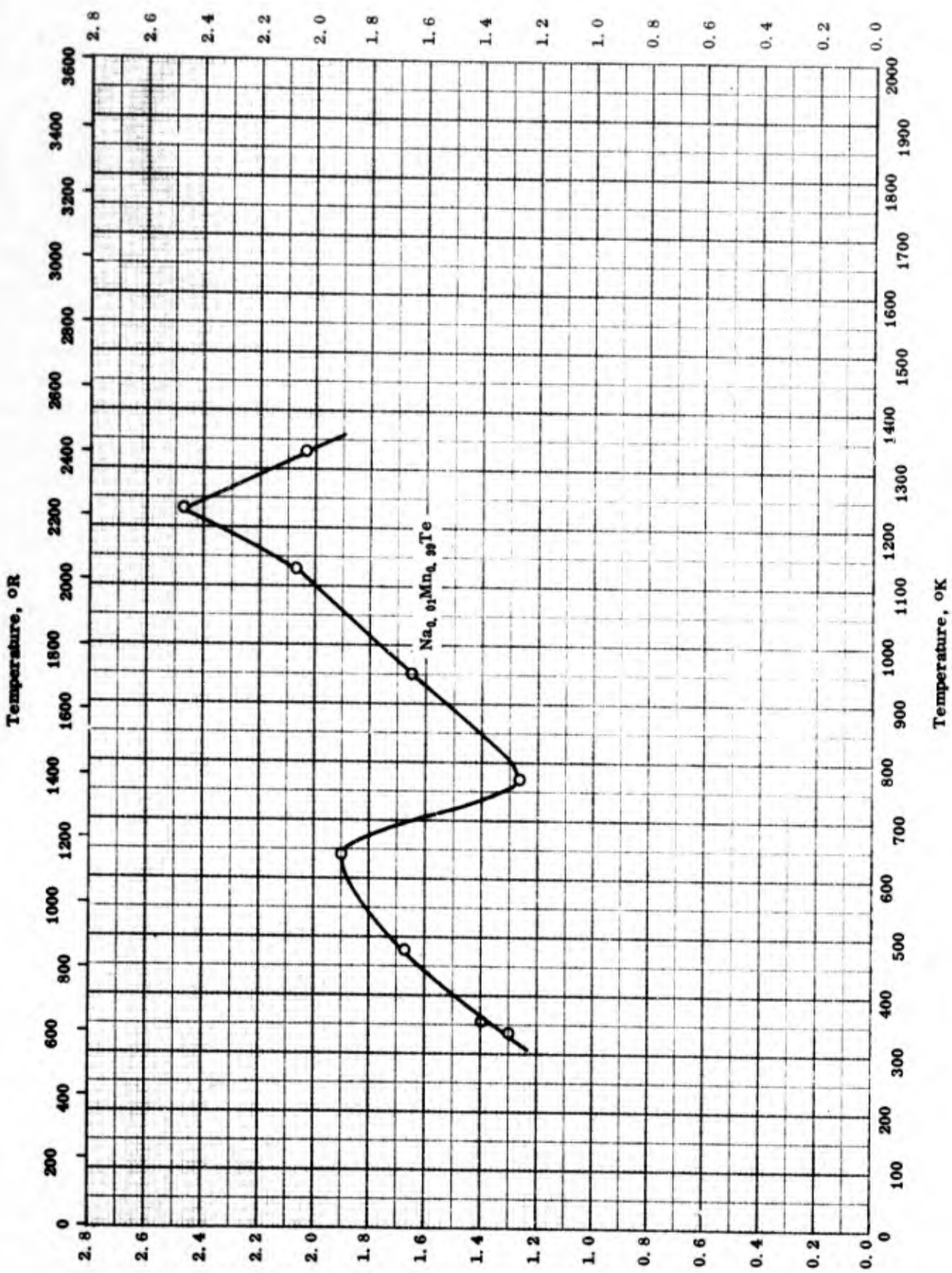
ELECTRICAL RESISTIVITY -- SILVER INDIUM TELLURIDE

ELECTRICAL RESISTIVITY -- SILVER INDIUM TELLURIDE

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
○	59-13	680-1020		Initial $Ag_{1.06}InTe_{2.04}$ and final $Ag_{1.02}InTe_{2.02}$.	Heated in quartz cell under helium; cooling curve.
△	59-13	532-939		Initial $Ag_{1.06}InTe_{2.04}$ and final $Ag_{1.08}In_{1.01}Te_2$.	Same as above.

TPRC

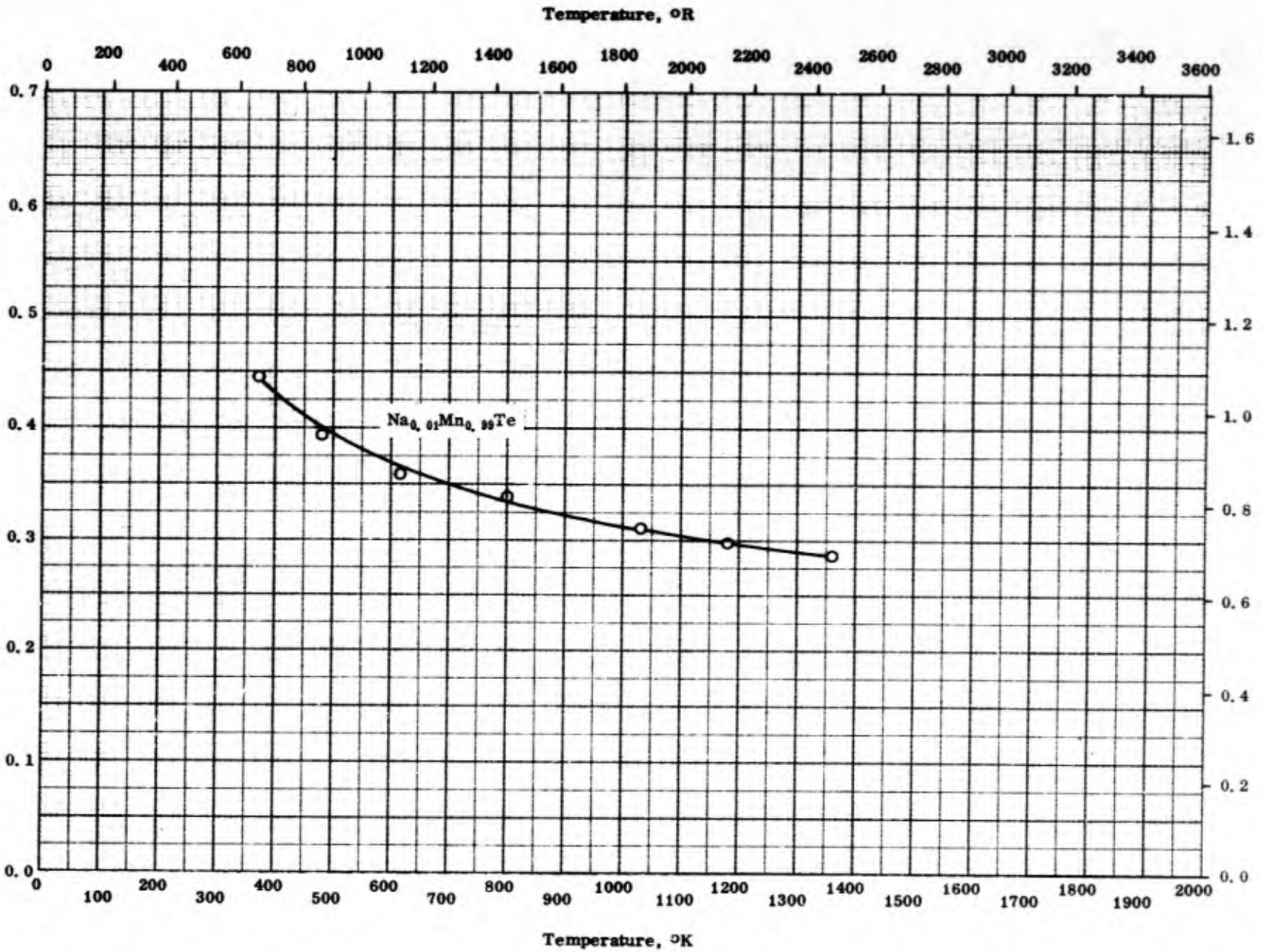


ELECTRICAL RESISTIVITY -- SODIUM MANGANESE TELLURIDE

ELECTRICAL RESISTIVITY -- SODIUM MANGANESE TELLURIDE

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
O	60-11	300-1330		$Na_{0.01}Mn_{0.99}Te$.	



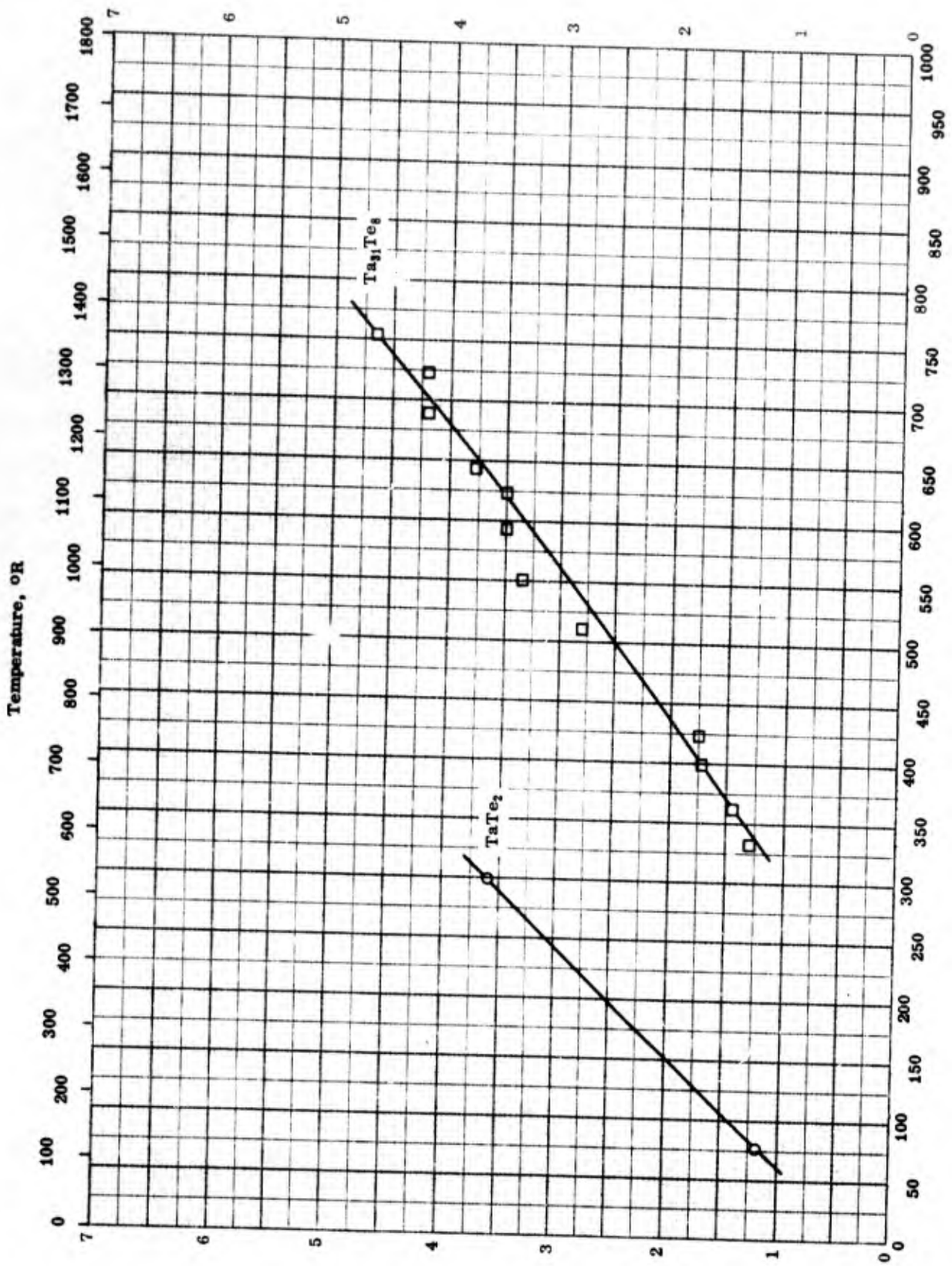
TPRC

THERMAL CONDUCTIVITY -- SODIUM MANGANESE TELLURIDE

THERMAL CONDUCTIVITY -- SODIUM MANGANESE TELLURIDE

REFERENCE INFORMATION

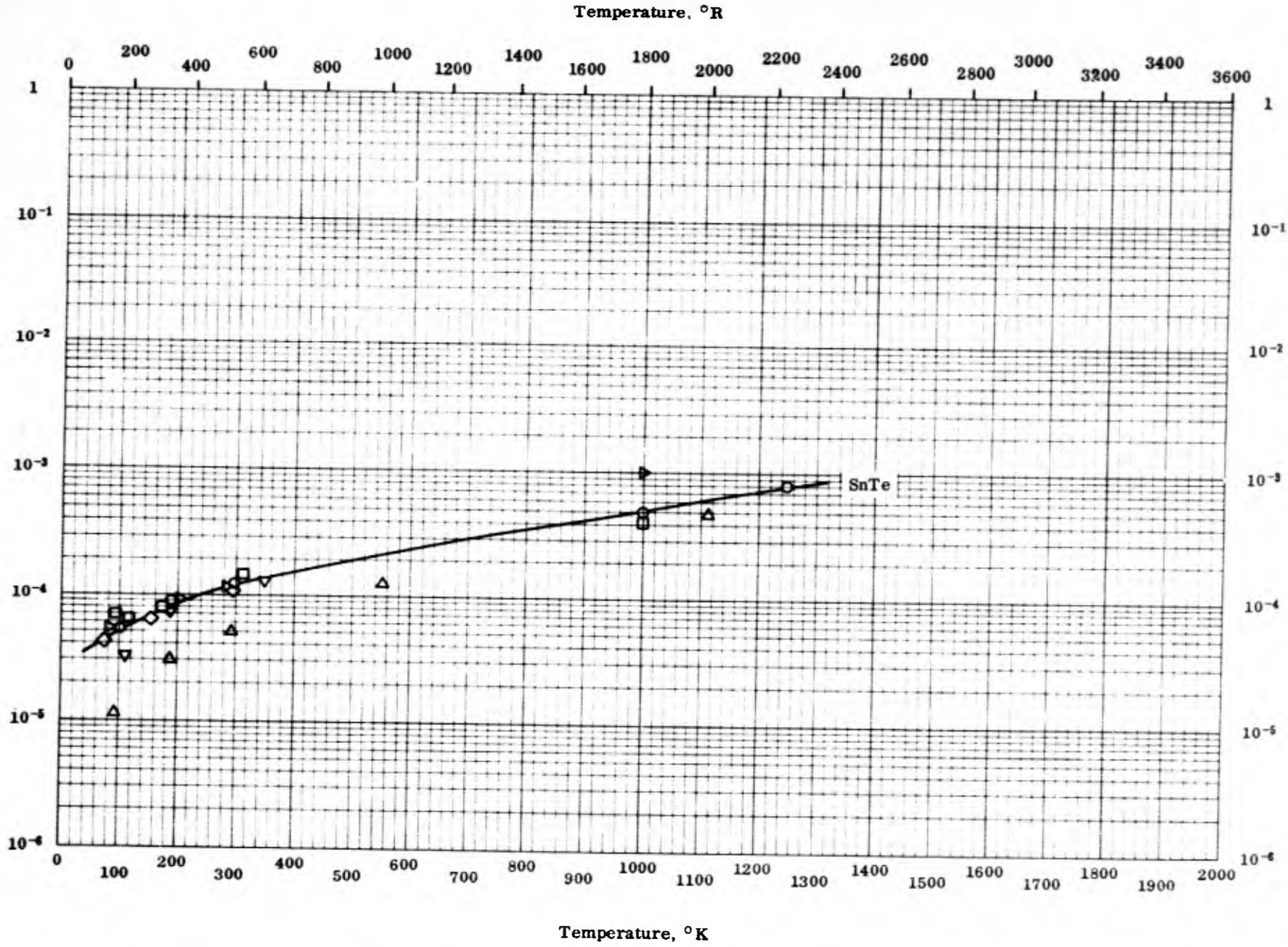
Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
O	60-11	370-1360		$Na_{0.01}Mn_{0.99}Te$.	



ELECTRICAL RESISTIVITY -- TANTALUM TELLURIDES

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
○	62-9	77-298	±20	$TaTe_2$, p-type; prepared from materials of 99.9+ pure; a homogeneous polycrystal product of grey metallic lustre.	Prepared by mixing powders from charges fired at 600-700 C for 10-15 hrs; again fired at 1000-1200 C for another 10-15 hrs to assure complete reaction.
□	61-11	333-753		TaTe; Laves-type phase of nominal composition $Ta_{31}Te_8$.	Powder heated at 1500 F and distilled to remove excess Te; Ta and Te atomic ratio 3.76 to 1.



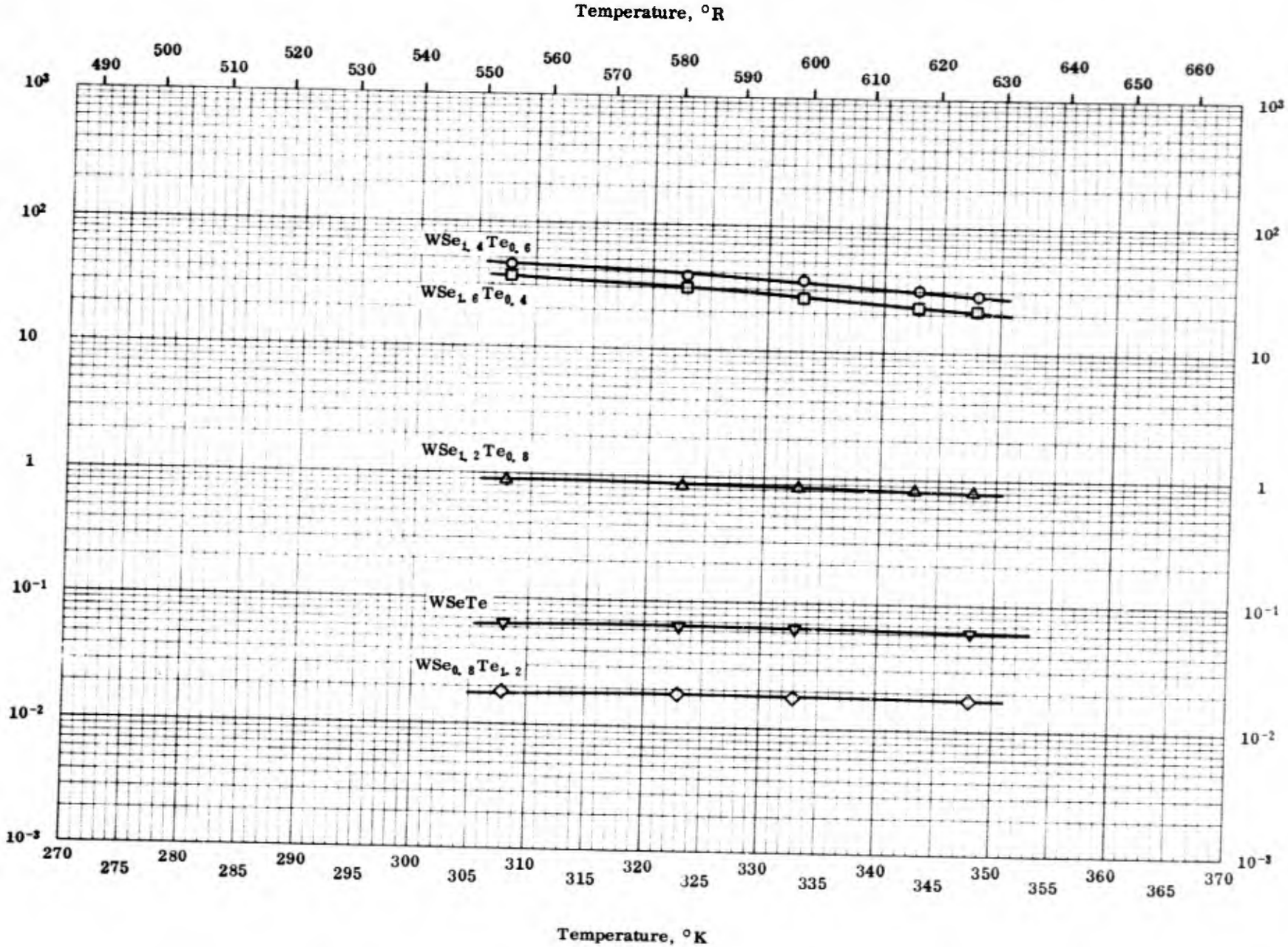
TPRC

ELECTRICAL RESISTIVITY -- TIN TELLURIDE

ELECTRICAL RESISTIVITY -- TIN TELLURIDE

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
○	56-8	98-1250		Polycrystal SnTe; prepared from high purity Sn and 99.998 pure Te.	Heated 15 hrs at 850 C and cooled.
□	56-8	98-1000		Same as above.	Same as above.
△	56-8	98-1111		Same as above.	Same as above.
◇	56-8	98-300		Same as above.	Same as above.
▷	56-8	98-1000		Same as above.	Same preparation as above; zone melted twice.
▽	56-8	111-345		Single crystal SnTe; same as above.	Same preparation as above; zone melted twice.



TPRC

ELECTRICAL RESISTIVITY -- TUNGSTEN SELENIDE TELLURIDES

ELECTRICAL RESISTIVITY -- TUNGSTEN SELENIDE TELLURIDES

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
○	61-17	308-348		$WSe_{1.4}Te_{0.6}$	
□	61-17	308-348		$WSe_{1.6}Te_{0.4}$	
△	61-17	308-348		$WSe_{1.2}Te_{0.8}$	
▽	61-17	308-348		WSeTe	
◇	61-17	308-348		$WSe_{0.8}Te_{1.2}$	

PROPERTIES OF OTHER MISCELLANEOUS METAL TELLURIDES

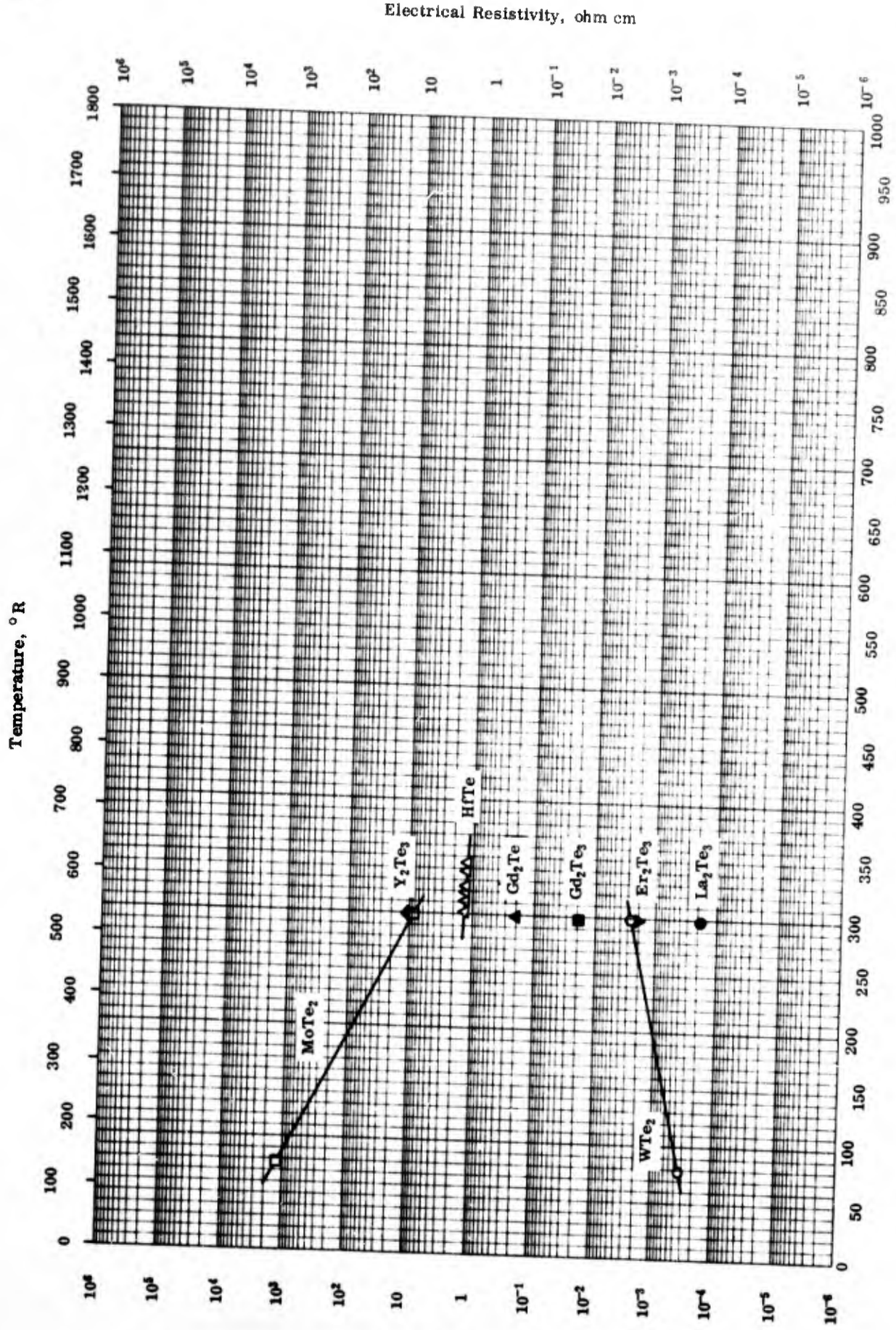
REPORTED VALUES

Density		$g\ cm^{-3}$	$lb\ ft^{-3}$
○	Sc_2Te_3	5.26	328.2
□	Ce_3Te_4	6.80	424.3
	$CeTe_2$	7.00	436.8
Melting Point		K	R
△	BaTe	1793 ± 20	3227 ± 36

PROPERTIES OF OTHER MISCELLANEOUS METAL TELLURIDES

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
○	62-21	298		Sc_2Te_3.	
□	62-21	298		Rare earth metal tellurides.	
△	58-16	1773-1813		BaTe.	



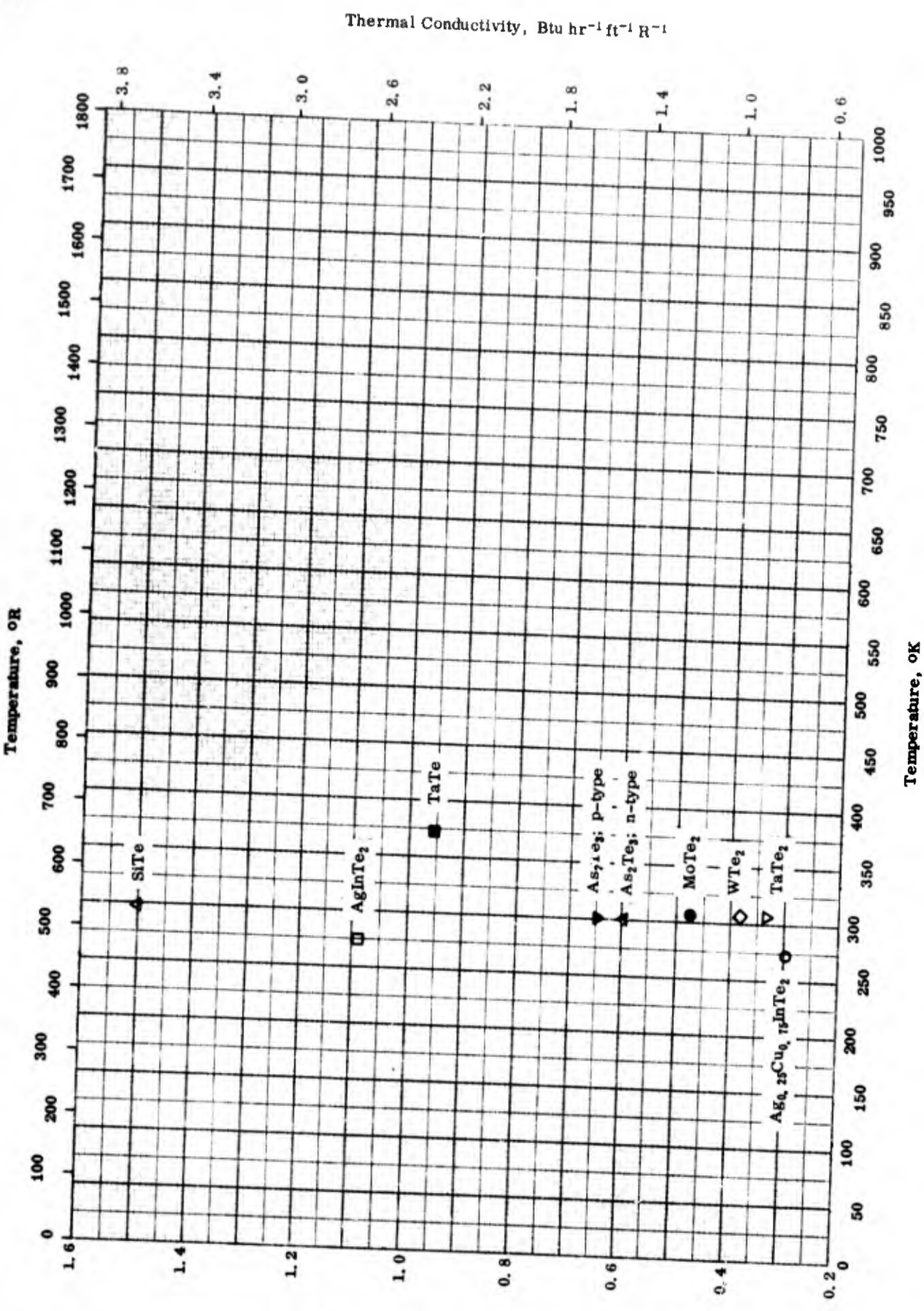
TPRC

ELECTRICAL RESISTIVITY -- MISCELLANEOUS TELLURIDES

ELECTRICAL RESISTIVITY -- MISCELLANEOUS TELLURIDES

REFERENCE INFORMATION

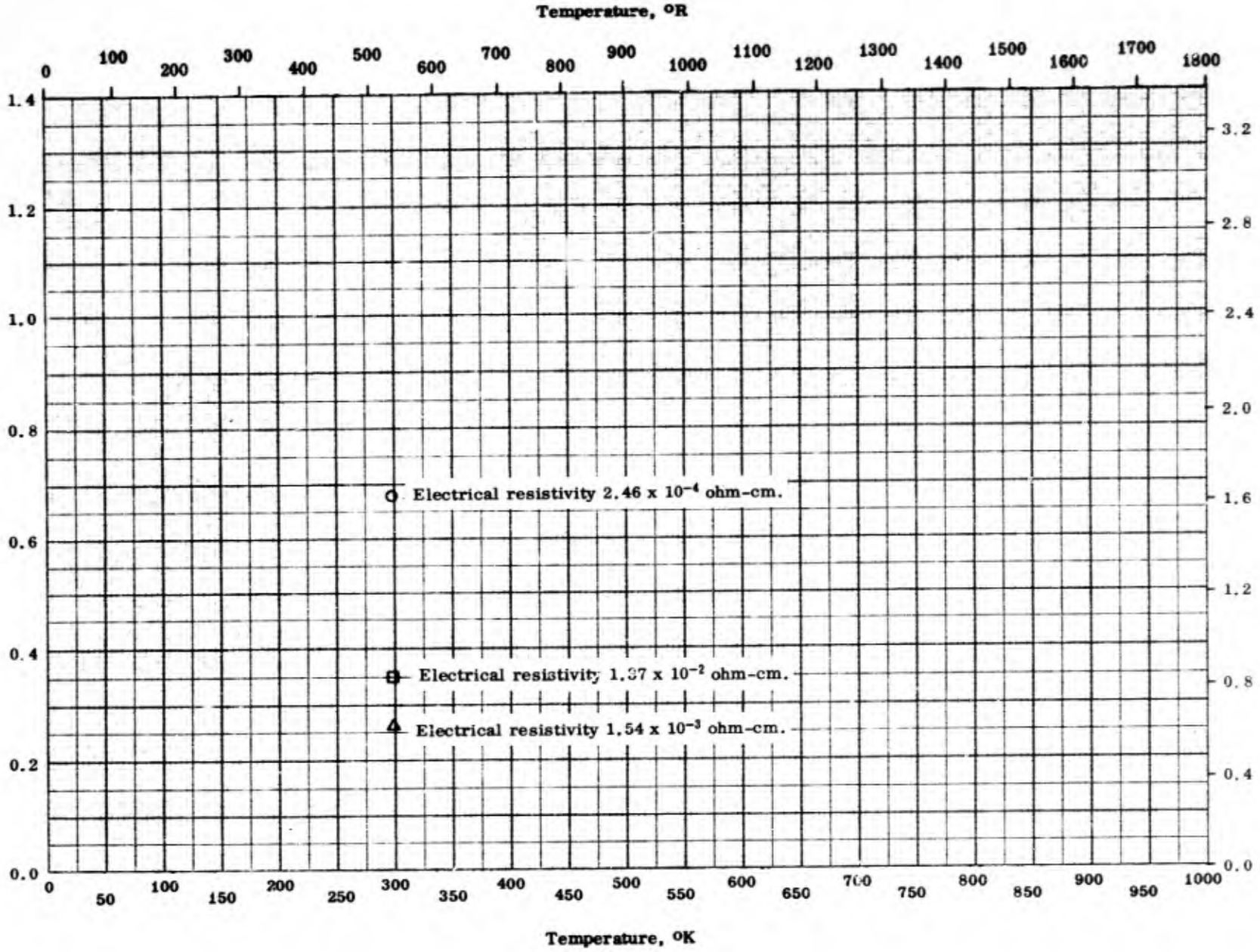
Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
○	62-9	77-298	± 20	WTe_2; n-type; prepared from 99.9* pure elements; a homogeneous polycrystal product of grey metallic lustre.	Made by mixing charges after being fired at 600-700 C for 10-15 hrs; again fired at 1000-1200 C for another 10-15 hrs to assure complete reaction.
□	62-9	77-298	±20	$MoTe_2$; n-type; same as above.	Same as above.
△	61-17	303-345		HfTe; sample appeared to be an agglomerate of loose crystals.	Prepared by reacting at 1200 F for 192 hrs a mixture of Hf and Te in an atomic ratio of 1 to 4 under He.
●	62-21	298		La_2Te_3.	
■	62-21	298		Gd_2Te_3.	
▲	62-21	298		Gd_2Te.	
▼	62-21	298		Er_2Te_3.	
◆	62-21	298		Y_2Te_3.	



THERMAL CONDUCTIVITY -- MISCELLANEOUS TELLURIDES

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
○	60-7	273		$Ag_{0.25}Cu_{0.75}InTe_2$; chalcopyrite group.	
□	60-7	275		$AgInTe_2$; chalcopyrite group.	
△	57-2	298		Silicon Telluride; density 245 lb ft^{-3}.	Compounded in vacuum at 1200 C for 4 hrs.
▽	62-9	306	< ± 20	$TaTe_2$; 99.9+ chemically pure.	Cold-pressed at 80,000-100,000 psi and sintered at 600-800 C for 10 - 15 hrs.
◇	62-9	306	< ± 20	WTe_2; 99.9+ chemically pure.	Same as above.
⊂	62-9	306	< ± 20	$MoTe_2$; 99.9+ chemically pure.	Same as above.
■	61-11	373		TaTe.	
▲	57-5	300		As_2Te_3; n-type with excess in Te; electron concentration 18 x 10^{18} cm^{-3} at measuring temperature; monoclinic structure.	Vertical zone-melted.
▼	57-5	300		As_2Te_3; p-type with excess in As; hole concentration 40 x 10^{18} cm^{-3} at measuring temperature; monoclinic structure.	Same as above.



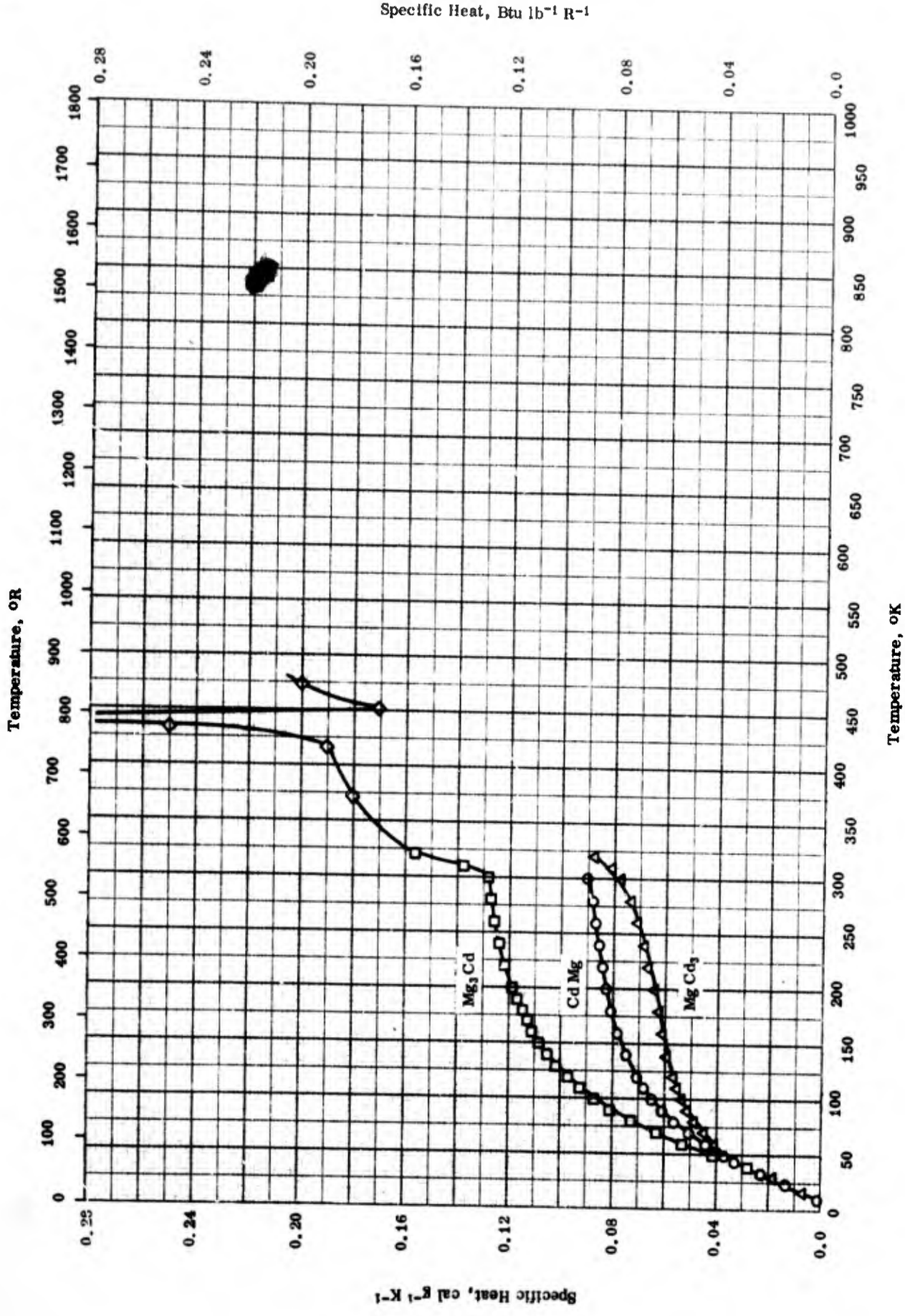
THERMAL CONDUCTIVITY -- BARIUM-LEAD INTERMETALLIC

TPRC

THERMAL CONDUCTIVITY -- BARIUM-LEAD INTERMETALLIC

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
O	61-6	298		Ba_2Pb; seebeck coeff. (25 C) 14.6 $\mu v K^{-1}$, electrical coeff. (25C) 2.46 x 10^{-4} ohm cm, and figure of merit (25 C) 0.305 x 10^{-4} K^{-1}.	Synthesized.
□	61-6	298		Ba_2Pb; seebeck coeff. (25 C) 133.5 $\mu v K^{-1}$, electrical coeff. (25 C) 1.37 x 10^{-2} ohm cm, and figure of merit (25 C) 0.893 x 10^{-4} K^{-1}.	Synthesized.
Δ	61-6	298		Ba_2Pb; seebeck coeff. (25 C) 37.7 $\mu v K^{-1}$, electrical coeff. (25 C) 1.54 x 10^{-3} ohm cm, and figure of merit (25 C) 0.83 x 10^{-4} K^{-1}.	Synthesized.

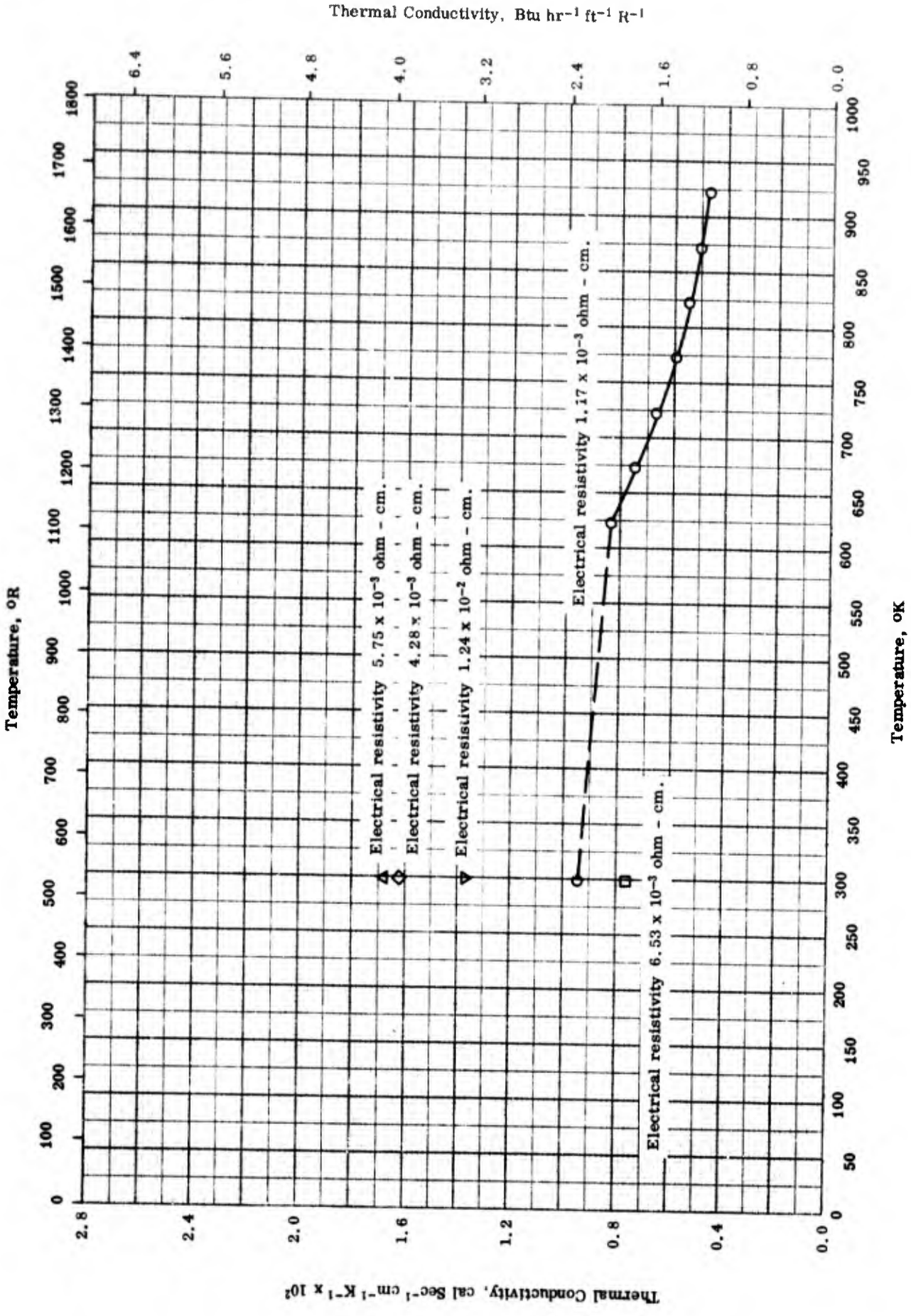


SPECIFIC HEAT -- CADMIUM - MAGNESIUM INTERMETALLICS

SPECIFIC HEAT -- CADMIUM-MAGNESIUM INTERMETALLICS

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
○	54-10	12-300	< 5	MgCd; 79.7 Cd and 20.3 Mg.	Placed in furnace under 1/2 atm. purified helium 10 days at 325 C, then furnace temperature lowered to 225 C, held there for 2 days and gradually reduced to room temperature.
□	54-10	12-320	≤2.8	Mg_3Cd; 60.64 Cd and 39.36 Mg.	Annealed 47 days at 345-350 C; machined; strain relieved 2 days at 300 C.
△	54-10	12-320	≤2.8	$MgCd_3$; 93.26 Cd and 6.74 Mg.	Annealed 30 days at 290-300 C at 295 C for 11 days, and then held at 150 C, 25 C below order-disorder transition point for 18 days.
◇	56-13	373-473		Not given.	

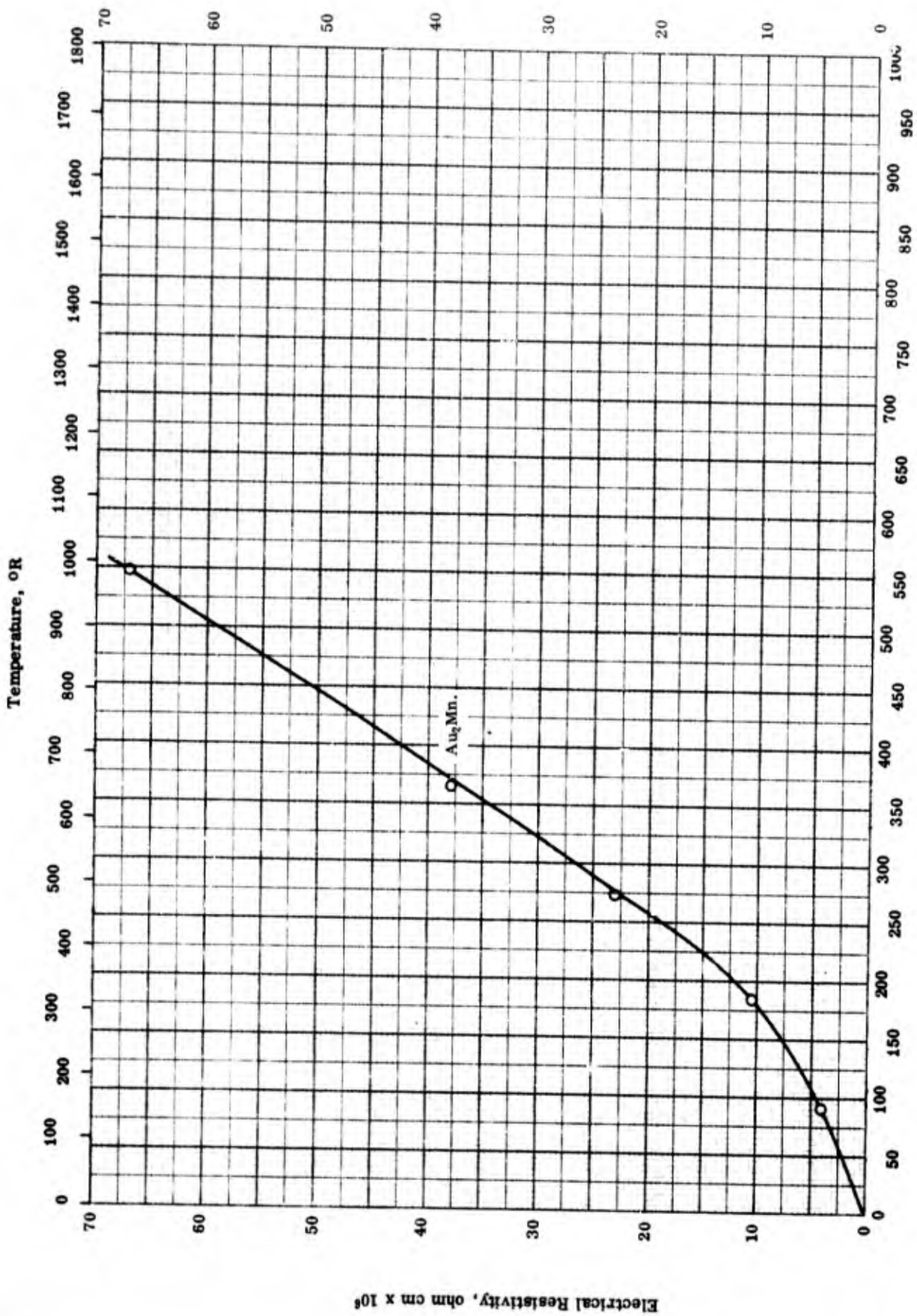


THERMAL CONDUCTIVITY -- CALCIUM-LEAD INTERMETALLIC

THERMAL CONDUCTIVITY -- CALCIUM-LEAD INTERMETALLIC

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
○	61-6	298-923		Ca_2Pb; seebeck coeff. (25 C) 177.5 $\mu v K^{-1}$, electrical resistivity (25 C) 1.17×10^{-3} ohm cm, and figure of merit (25 C) $0.68 \times 10^{-3} K^{-1}$.	Synthesized.
△	61-6	298		Ca_2Pb; seebeck coeff. (25 C) 102.3 $\mu v K^{-1}$, electrical resistivity (25 C) 5.75×10^{-3} ohm cm, and figure of merit (25 C) $0.258 \times 10^{-4} K^{-1}$.	Synthesized.
▽	61-6	298		Ca_2Pb; seebeck coeff. (25 C) 228.5 $\mu v K^{-1}$, electrical resistivity (25 C) 1.24×10^{-2} ohm cm, and figure of merit (25 C) $0.718 \times 10^{-4} K^{-1}$.	Synthesized.
□	61-6	298		Ca_2Pb; seebeck coeff. (25 C) 109.6 $\mu v K^{-1}$, electrical resistivity (25 C) 6.53×10^{-3} ohm cm, and figure of merit (25 C) $0.575 \times 10^{-4} K^{-1}$.	Synthesized.
◇	61-6	298		Ca_2Pb; seebeck coeff. (25 C) 84.8 $\mu v K^{-1}$, electrical resistivity (25 C) 4.28×10^{-3} ohm cm, figure of merit (25 C) $0.248 \times 10^{-4} K^{-1}$.	Synthesized.



ELECTRICAL RESISTIVITY -- GOLD - MANGANESE INTERMETALLICS

ELECTRICAL RESISTIVITY -- GOLD - MANGANESE INTERMETALLICS

REFERENCE INFORMATION

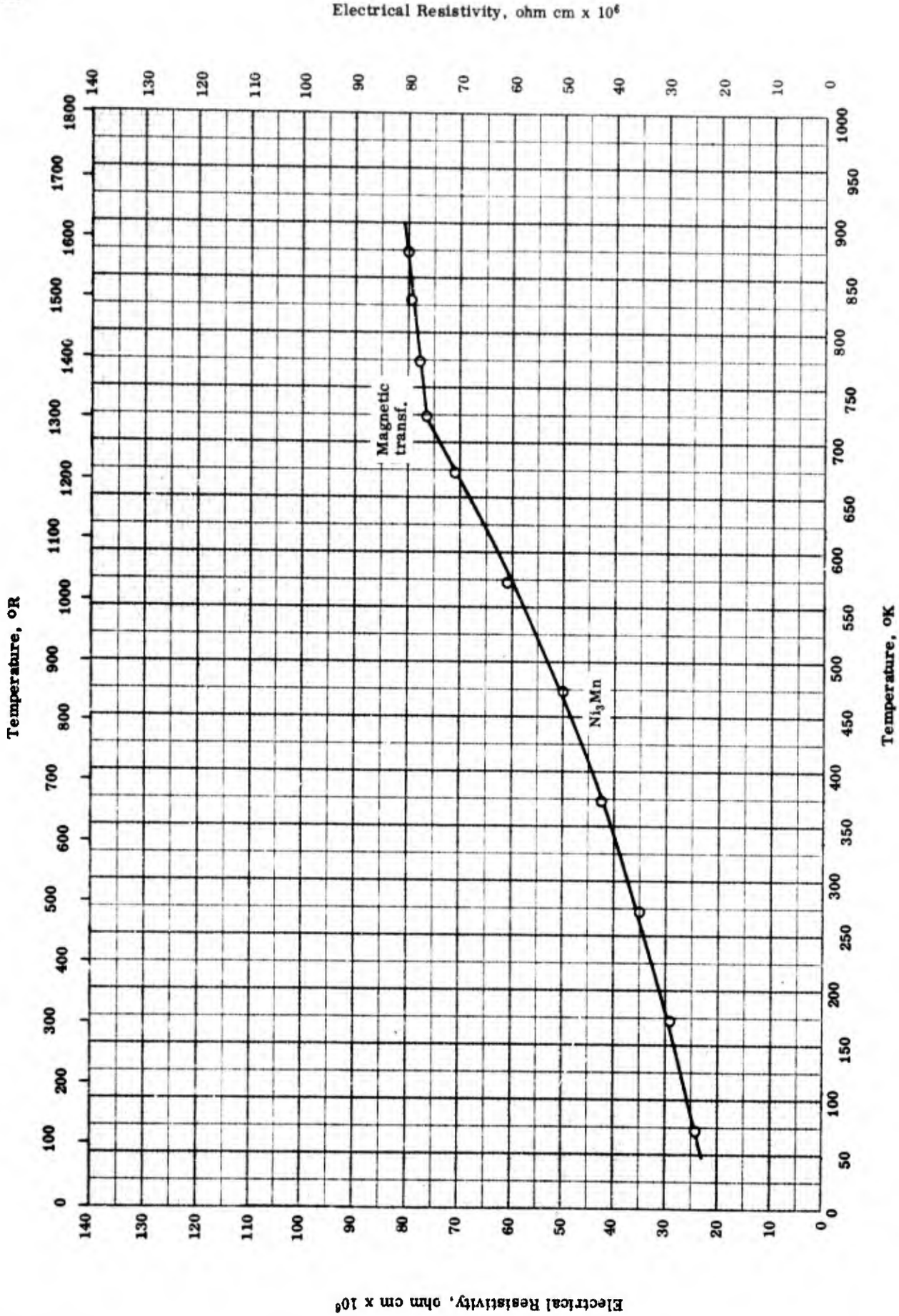
Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
O	57-14	92-549		Au_2Mn; spectroscopically pure.	Melted in induction furnace 90 hrs at 690 C; water quenched.

ELECTRICAL RESISTIVITY -- MAGNESIUM - LEAD INTERMETALLIC

ELECTRICAL RESISTIVITY -- MAGNESIUM - LEAD INTERMETALLIC

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
○	48-1	303-453		Mg_2Pb; density 330 lb ft^{-3}.	
□	55-10	282-795		Mg_2Pb; prepared from 99.98 Mg and 99.998 Pb.	Prepared by melting and chilling from raw materials.
△	55-10	126-758		Two samples prepared from 99.98 Mg and 99.998 Pb: (a) Mg_2Pb + 0.6 Pb. (b) Mg_2Pb + 1.0 Pb.	Both samples give identical curves; same preparation as above.

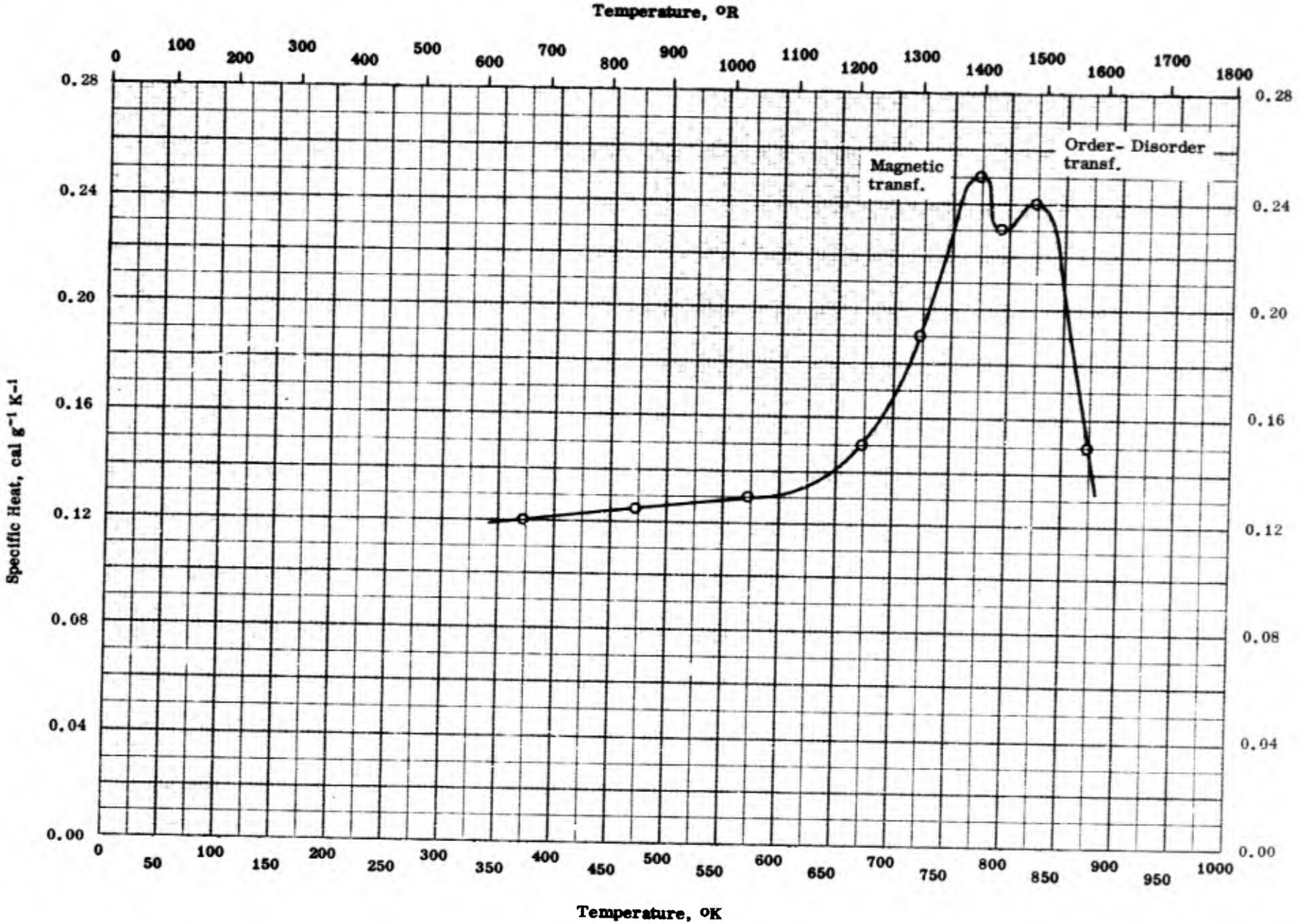


ELECTRICAL RESISTIVITY -- NICKEL - MANGANESE INTERMETALLICS

Electrical Resistivity, ohm cm x 10⁶

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
O	40-2	73-873		Ni_3Mn; 75.6 Ni and 24.4 Mn; prepared from 99.99 pure Hilger Manganese and 99.92 pure Mond Nickel.	Relative data; used datum of $r_{25C} = 36.0 \times 10^{-6}$ ohm cm from ref. 49-3.

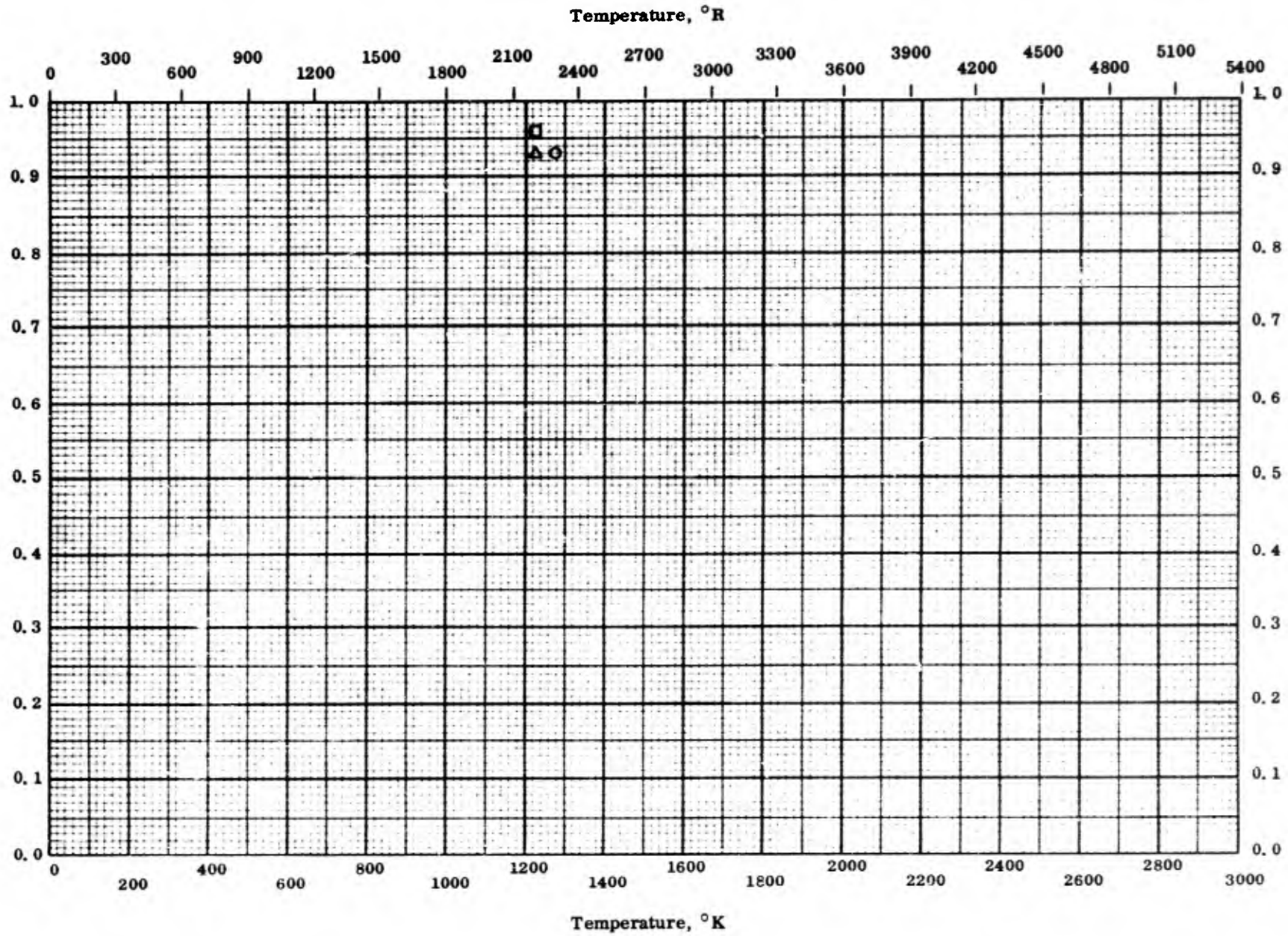


SPECIFIC HEAT -- NICKEL–MANGANESE INTERMETALLICS

SPECIFIC HEAT -- NICKEL-MANGANESE INTERMETALLICS

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
O	40-2	373-873		Ni_3Mn; 75.6 Ni and 24.4 Mn.	Annealed.



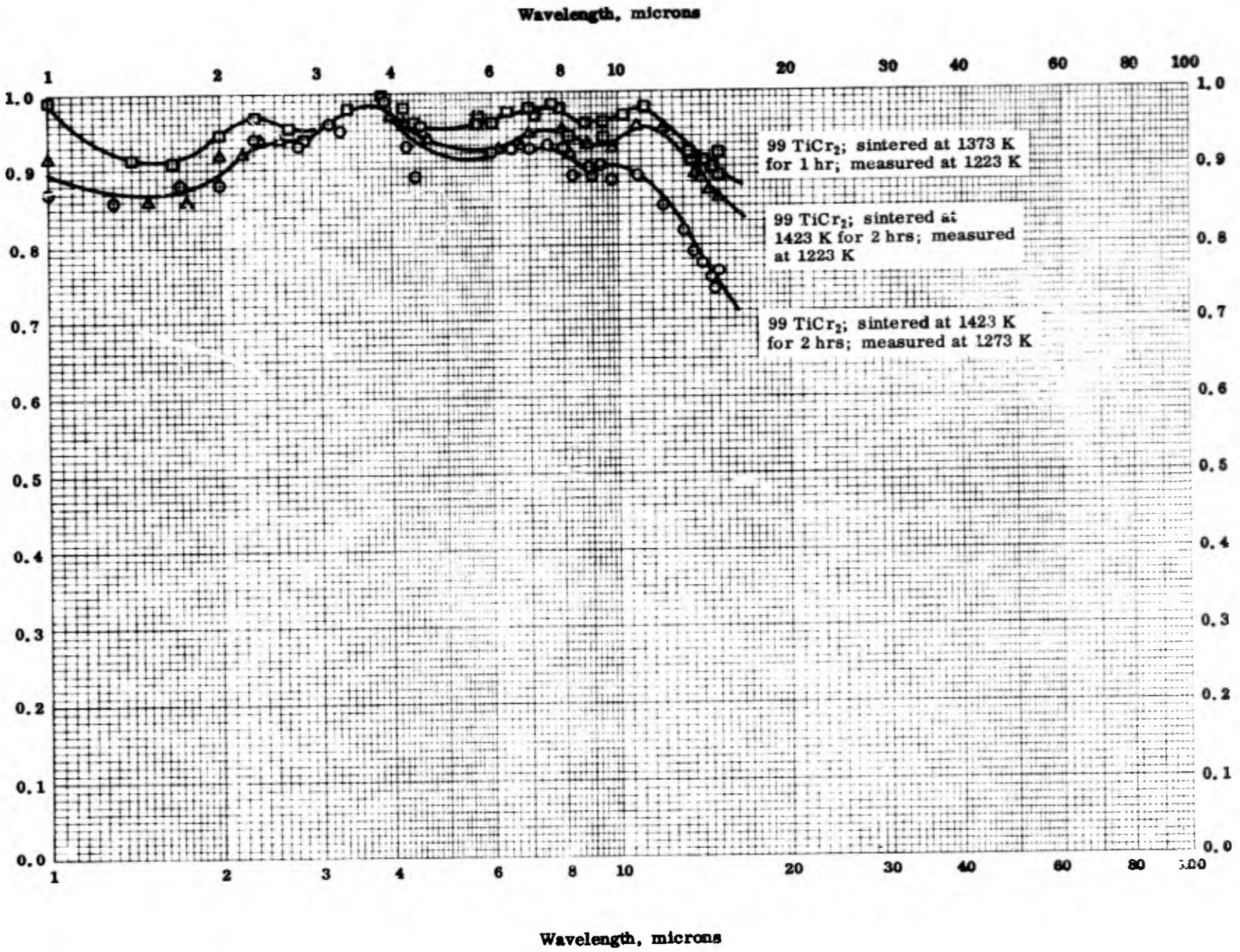
TPRC

NORMAL TOTAL EMITTANCE -- TITANIUM - CHROMIUM INTERMETALLICS

NORMAL TOTAL EMITTANCE -- TITANIUM - CHROMIUM INTERMETALLICS

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
○	63-16	1273	±8	99 $TiCr_2$ and 1 Cr_2O_3; 0.063 in. thickness plate; density 3.36 g cm^{-3}.	Sintered at 1423 K for 2 hrs; measured in argon; calculated from spectral data.
□	63-16	1223	±8	99 pure $TiCr_2$; 0.048 in. thickness plate; density 3.36 g cm^{-3}.	Same as above except sintered at 1373 K for 1 hr.
△	63-16	1223	±8	99 pure $TiCr_2$; 0.057 in. thickness plate; density 3.36 g cm^{-3}.	Same as above except sintered at 1423 K for 2 hrs.

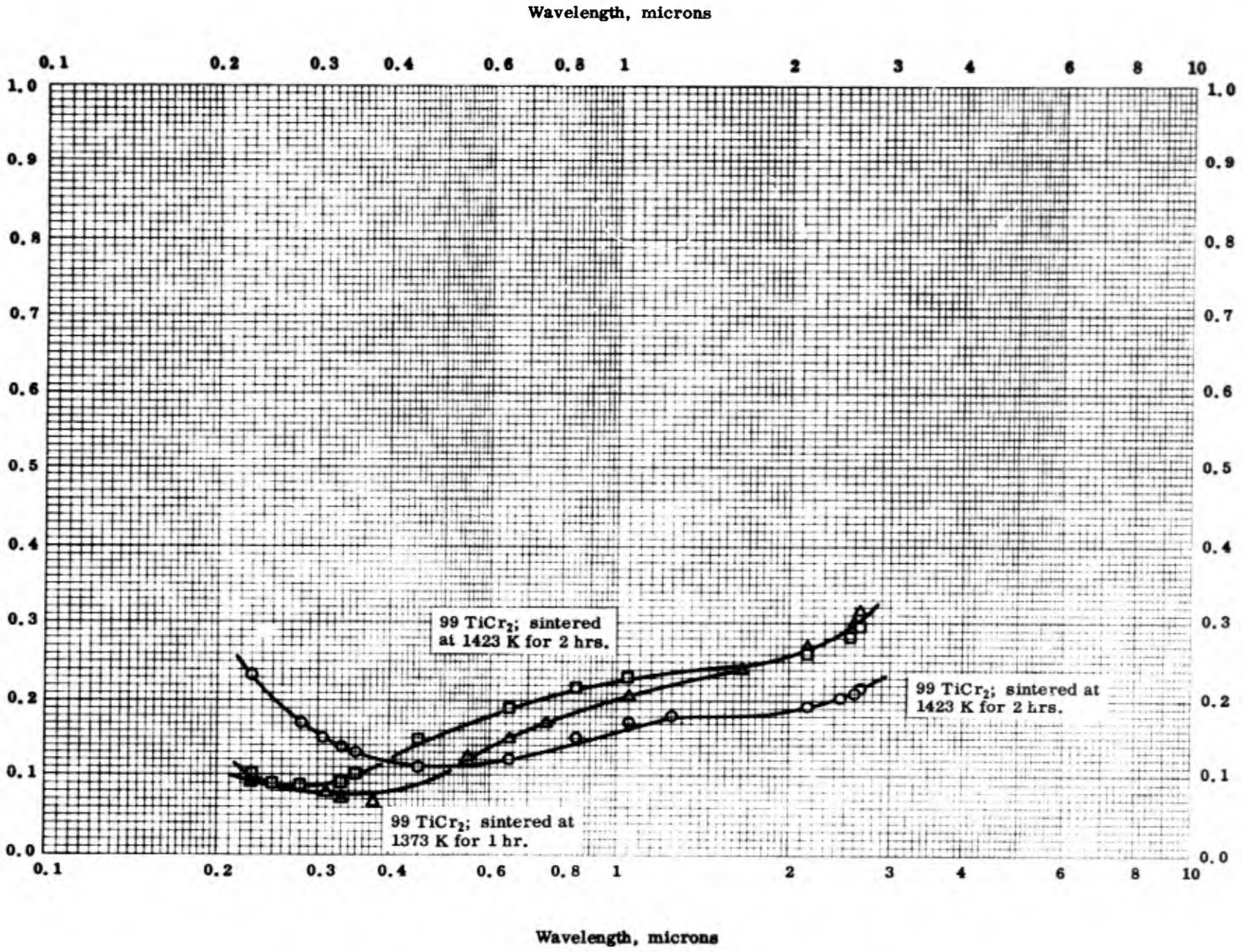


NORMAL SPECTRAL EMITTANCE -- TITANIUM - CHROMIUM INTERMETALLICS

NORMAL SPECTRAL EMITTANCE -- TITANIUM - CHROMIUM INTERMETALLICS

REFERENCE INFORMATION

Symbol	Ref.	Temp. °K	Wavelength Range μ	Rept. Error%	Sample Specifications	Remarks
○	63-16	1273	1-15		99 $TiCr_2$ and 1 Cr_2O_3; 0.063 in. thickness plate; density 3.36 g cm^{-3}.	Sintered at 1423 K for 2 hrs; measured in argon; data taken from a curve.
□	63-16	1223	1-15		99 pure $TiCr_2$; 0.048 in. thickness plate; density 3.36 g cm^{-3}.	Same as above except sintered at 1373 K for 1 hr.
△	63-16	1223	1-15		99 pure $TiCr_2$; 0.057 in. thickness plate; density 3.36 g cm^{-3}.	Same as above except sintered at 1423 K for 2 hrs.



NORMAL SPECTRAL REFLECTANCE -- TITANIUM - CHROMIUM INTERMETALLICS

NORMAL SPECTRAL REFLECTANCE -- TITANIUM - CHROMIUM INTERMETALLICS

REFERENCE INFORMATION

Symbol	Ref.	Temp. °K	Wavelength Range μ	Rept. Error%	Sample Specifications	Remarks
○	63-16	298	0.23-2.65	5	99 $TiCr_2$ and 1 Cr_2O_3; 0.063 in. thickness plate; density 3.36 g cm^{-3}.	Sintered at 1423 K for 2 hrs; data taken from a curve; normal incidence, hemispherical viewing; MgO as reference standard.
□	63-16	298	0.23-2.65	5	99 pure $TiCr_2$; 0.048 in. thickness plate; density 3.36 g cm^{-3}.	Same as above except sintered at 1373 K for 1 hr.
△	63-16	298	0.23-2.65	5	99 pure $TiCr_2$; 0.057 in. thickness plate; density 3.36 g cm^{-3}.	Same as above except sintered at 1423 K for 2 hrs.

PROPERTIES OF OTHER INTERMETALLICS OF CERIUM

REPORTED VALUES

Density		g cm^{-3}	lb ft^{-3}
□	CeAg	7.65 ± 0.03	478 ± 2
△	CeAg	7.62	475.5
	CeBi	8.44	526.7
	CeCd	7.26	453.0
	$CeCd_2$	7.876	491.5
	$CeCd_3$	8.394	523.8
	$CeCd_{11}$	8.472	528.7
	$CeCo_2$	9.338	582.7
	$CeCo_5$	8.54	532.9
	$CeGa_2$	6.62	413.1
	CeHg	9.88	616.5
	$CeIn_3$	7.738	482.9
	CeMg	4.57	285.2
	Ce_2Ni_7	8.55	533.5
	$CeNi_2$	9.15	571.0
	$CeNi_3$	8.48	529.2
	$CeNi_5$	8.72	544.1
	$CeOs_2$	15.79	985.3
	$CePb_3$	10.8	673.9
	$CePt_2$	15.26	952.2

Melting Point		K	R
O	CeAg	1128	2031
	$CeAg_2$	1140	2053
	$CeAg_3$	1263	2274
	Ce_2Au	930	1675
	CeAu	1623	2922
	$CeAu_2$	1403	2526
	$CeAu_3$	1423	2562

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PROPERTIES OF OTHER INTERMETALLICS OF CERIUM (Continued)

REPORTED VALUES

Melting Point (continued)	K	R
$CeCu$	708	1419
$CeCu_2$	1098	1968
$CeCu_4$	1053	1896
$CeCu_6$	1213	2184
Ce_4Mg	905	1630
$CeMg$	1011	1820
$CeMg_3$	1053	1896
$CeMg_9$	895	1612
Ce_2Pb	1663	2994
$CePb_3$	1443	2598
Ce_2Tl	1218	2193
$CeTl$	1508	2715
$CeTl_3$	1358	2436

PROPERTIES OF OTHER INTERMETALLICS OF CERIUM

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
△	62-21	298		Intermetallic of cerium.	
□	43-2	298		CeAg.	Prepared from commerically pure alloys in CO_2 and heated above its melting point for 2 hrs; auth. estimates his value to be 2.5% low.
○	43-1	708-1663		Prepared from 98 pure Ce containing 0.14 Fe, 0.14 Mg, and 0.02 Si.	

PROPERTIES OF OTHER INTERMETALLICS OF GADOLINIUM

REPORTED VALUES

Density	g cm^{-3}	lb ft^{-3}
○ GdAg	8.98	560.4
GdCo	8.94	557.9
Gd_3Co	8.52	531.6
$GdCo_2$	9.36	584.1
$GdCo_3$	9.00	561.6
$GdCo_4$	8.38	522.9
$GdCo_5$	8.80	549.1
Gd_2Co_3	9.60	599.0
GdCu	8.512	531.1
$GdCu_4$	8.77	547.2
$GdCu_5$	8.77	547.2
$GdGa_2$	7.72	481.7
Gd_3Ni	8.18	510.4
Gd_3Ni_2	8.56	534.1
GdNi	8.62	537.9
$GdNi_2$	9.44	589.1
$GdNi_3$	9.18	572.8
$GdNi_4$	9.00	561.6
$GdNi_5$	9.05	564.7
Gd_2Ni_7	9.14	570.3
Gd_2Ni_{17}	8.90	555.4
Gd_2Os_3	16.49	1029.0
$Gd_{0.83}Y_{0.17}Co_5$	8.64	539.1
$Gd_{0.61}Y_{0.39}Co_5$	8.46	527.9

PROPERTIES OF OTHER INTERMETALLICS OF GADOLINIUM

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
O	62-21	298		Intermetallics of Gd.	

PROPERTIES OF OTHER INTERMETALLICS OF LANTHANUM

REPORTED VALUES

Density		g cm^{-3}	lb ft^{-3}
□	LaAg	7.60	474.2
	$LaAg_2$	8.25	514.8
	$LaAg_3$	8.62	537.9
	La_2Au	8.43	526.0
	LaAu	10.53	657.1
	$LaAu_3$	14.51	905.4
	LaBi	8.11	506.1
	LaCd	7.00	436.8
	$LaCd_2$	7.825	488.3
	$LaCd_{11}$	8.409	524.7
	LaCu	6.74	420.6
	$LaCu_2$	7.08	441.8
	$LaCu_5$	7.95	496.1
	$LaGa_2$	6.47	403.7
	LaHg	9.84	614.0
	$LaHg_2$	12.45	776.9
	$LaHg_3$	11.41	712.0
	$LaIn_3$	7.57	472.4
	LaMg	4.32	269.6
	$LaNi_5$	8.28	516.7
	$LaOs_2$	14.89	929.1
	$LaPb_3$	10.50	655.2
	$LaTl_3$	11.25	702.0
	LaZn	6.714	419.0
	$LaZn_5$	7.16	446.8
	$LaZn_{11}$	7.27	453.6

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PROPERTIES OF OTHER INTERMETALLICS OF LANTHANUM (Continued)

REPORTED VALUES

Density (continued)		g cm^{-3}	lb ft^{-3}
○	LaAg	7.42 ± 0.03	463 ± 2
	$LaAg_2$	8.25 ± 0.01	515 ± 1
	$LaAg_3$	8.02 ± 0.03	501 ± 2
	LaAu	10.31 ± 0.02	644 ± 1
	La_3Au	8.43 ± 0.03	526 ± 2
	LaCu	6.74 ± 0.03	421 ± 2
	$LaCu_2$	7.08 ± 0.07	442 ± 4

Melting Point		K	R
◇	LaAg	1159	2087
	$LaAg_2$	1137	2047
	$LaAg_3$	1228	2211
	La_2Au	938	1689
	LaAu	1633	2940
	$LaAu_2$	1487	2677
	$LaAu_3$	1477	2659
	LaCu	824	1484
	$LaCu_2$	1107	1993
	$LaCu_4$	1058	1905
	$LaCu_6$	1198	2157
	La_4Mg	947	1705
	La_2Mg	1016	1829
	$LaMg_3$	1039	1871
	$LaMg_9$	935	1684
	La_2Pb	1591	2864
	LaPb	1519	2735
	$LaPb_3$	1363	2454

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PROPERTIES OF OTHER INTERMETALLICS OF LANTHANUM (Continued)

REPORTED VALUES

Melting Point (continued)	K	R
La_2Tl	1188	2139
$LaTl$	1455	2620
$LaTl_3$	1369	2465

PROPERTIES OF OTHER INTERMETALLICS OF LANTHANUM

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
□	62-21	296		Intermetallic series of La.	
○	43-2	298		Same as above; prepared from 97.5 pure La and commercially purest alloys.	LaO layer removed in CO_2, homogenized 2 hrs above melting point; authors conclude their values low by 2.5%.
◇	43-1	824-1633		Same as above; prepared from 98 pure La containing 1.02 Mg, 0.55 Fe, and 0.05 Si.	Author considers subcooling and also possible sample contamination by crucible or O_2.

PROPERTIES OF OTHER INTERMETALLICS OF PLUTONIUM

REPORTED VALUES

Density		g cm^{-3}	lb ft^{-3}
●	$PuOs_2$	19.2	1199
▲	$PuMn_2$	12.0	749

Melting Point		K	R
○	PuNi	1098	1977
□	$PuNi_2$	1273	2292
△	$PuNi_5$	1713	3084
▽	$PuPb_3$	1118	2013
◇	$PuOs_2$	1723	3192
■	$PuMn_2$	1323	2382

PROPERTIES OF OTHER INTERMETALLICS OF PLUTONIUM

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
○	55-26	1273		PuNi.	M. P. by break in time-temperature curve.
□	55-26	1713		$PuNi_2$.	Same as above.
△	55-26	1098		$PuNi_5$.	Same as above.
▽	55-26	1118		$PuPb_3$.	Same as above.
◇	55-26	1723		$PuOs_2$.	Same as above.
■	55-26	1323		$PuMn_2$.	Same as above.
●	55-26	298		$PuOs_2$.	Computed by x-ray measurements of lattice.
▲	55-26	298		$PuMn_2$.	Same as above.

PROPERTIES OF OTHER INTERMETALLICS OF PRASEODYMIUM

REPORTED VALUES

Density		g cm^{-3}	lb ft^{-3}
□	PrAg	7 90	493.0
	PrBi	8.616	537.6
	PrCd	7.485	467.1
	$PrCd_2$	7.978	497.8
	$PrCd_3$	8.506	530.8
	$PrCd_{11}$	8.512	531.1
	$PrCo_2$	9.32	581.6
	$PrCo_5$	8.34	520.4
	$PrGa_2$	6.51	406.2
	PrHg	9.88	616.5
	Pr_3In	7.45	464.9
	$PrIn_3$	8.02	500.5
	PrMg	4.65	290.2
	$PrMg_3$	3.52	219.6
	$PrNi_5$	8.51	531.0
	$PrOs_2$	15.39	960.3
	$PrPb_3$	10.98	685.1

Melting Point		K	R
○	PrAg	2162	1201
	$PrAg_2$	2072	1151
	$PrAg_3$	2211	1228
	Pr_2Au	1770	983
	PrAu	2922	1623
	$PrAu_2$	2670	1483
	$PrAu_3$	2652	1473
	PrCu	1505	836
	$PrCu_2$	2006	1114
	$PrCu_4$	1975	1097
	$PrCu_6$	2224	1235

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PROPERTIES OF OTHER INTERMETALLICS OF PRASEODYMIUM (Continued)

REPORTED VALUES

Melting Point (Continued)	K	R
Pr_4Mg	1846	1025
PrMg	1873	1040
$PrMg_3$	1846	1025
$PrMg_9$	1608	893
Pr_2Pb	2854	1485
PrPb	2627	1458
$PrPb_3$	2494	1385
Pr_2Tl	2391	1328
PrTl	2562	1423
$PrTl_3$	2400	1333

PROPERTIES OF OTHER INTERMETALLICS OF PRASEODYMIUM

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
□	62-21	298		Intermetallic series.	
○	43-1	836-1682		Intermetallic series from 99 estimated purity Pr.	

PROPERTIES OF OTHER INTERMETALLICS OF URANIUM

REPORTED VALUES

Density		g cm^{-3}	lb ft^{-3}
○	UBi_2	11.38	712.9
□	U_3Bi_4	12.59	780.6
△	UBi	13.6	849
▽	UBi_2	12.35*	771.0*
▼	U_3Bi_4	12.59	786.0
◇	U_4Bi_5	11.52 ± 0.2	719.2 ± 12
◆	$U_6Co_{1.09}$; 4.3 Co	17.7	1105
◑	UCo 19.8 Co	15.37	959.5
◁	UPb_3	13.24	827
▷	UPb_3	12.98	810
▶	UPb; 46.5 Pb	13.7	855
⊖	U_6Mn; 3.7 Mn	17.8	1110
⊖	UMn_2; 31.6 Mn	12.57	784.7
◨	Same as above	12.57	784.7
◧	$U_6Mn_{1.09}$; 4.0 Mn	17.8	1110
⊟	U_6Mn; 3.7 Mn	17.8	1110
⊟	UMn_2; 31.6 Mn	12.5	780
◪	Same as above	12.66	790.3
◪	U_6Ni; 3.9 Ni	17.6	1099

Melting Point		K	R
●	UBi_2	1283	2310
■	U_3Bi_4	1423	2562
▲	UBi	1684 ± 25	3057 ± 45
◀	UPb_3	1493	2688
◐	UPb; 46.5 Pb	1280	2796
◪	U_6Mn; 3.7 Mn	999	1798
◪	UMn_2; 31.6 Mn	1393	2507
◆	U_2Tl	1163	2094

*Most probable value for this compound.

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
●	57-30	2310		UBi_2; made from 99.99 Bi and U.	Dissolved in nitric acid via the hydride; M. P. from break in time-temperature curve.
○	57-30	298		Same as above.	Dissolved in nitric acid via the hydride.
□	57-30	298		U_3Bi_4; same as above.	Same as above.
■	57-30	1423		Same as above.	Same as above; M. P. from break in time-temperature curve.
▲	57-30	1673-1723		UBi_2; same as above.	Same as above.
△	57-30	298		Same as above.	Dissolved in nitric acid via hydride.
◇	49-7	298		U_4Bi_5; prepared from 99.9+ U and 99.8 Bi.	Mixed, degassed 20 min. up to 1130 C and 40 min. up to 1500 C; density computed from x-ray measurements of lattice.
▽	52-23 also 53-18	298		UBi_2.	Density computed from x-ray measurements of lattice.
▼	52-23 also 53-18	298		U_3Bi_4.	Same as above.

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PROPERTIES OF OTHER INTERMETALLICS OF URANIUM (continued)

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
◆	48-2 also 50-7	298		$U_6Co_{1.09}$; 95.7 U and 4.3 Co; single crystal.	Density computed from x-ray measurements of lattice.
●	48-2 also 50-7	298		UCo; 80.2 U and 19.8 Co; single crystal.	Same as above.
△	54-24	298		UPb_3; 72.3 Pb and 27.7 U.	
◀	54-24	1553		Same as above.	
▽	52-22	298		Same as above.	
▶	56-23	298		UPb; 53.5 U and 46.5 Pb.	Layers of U and Pb outgassed at 100 C, heated in H_2 atm at 250 C to convert U into UH_3 powder, then evacuated to decompose UH_3 into U powder, and mixture heated 16 hrs at 1220 C; density computed from x-ray measurement.
●	56-23	1553		Same as above.	Same as above except M. P. from break in time-temperature curve.
⊖	49-14	298		U_6Mn; 96.3 U and 3.7 Mn; prepared from 99.9+ U and 99.95 Mn.	Inductively melted in BeO crucible in A atm.; computed from x-ray measurement.
⊠	49-14	999		Same as above.	Same as above; M. P. method not given.
●	49-14	298		UMn_2; 68.4 U and 31.6 Mn; prepared from 99.9+ U and 99.95 Mn.	Same as above; density from x-ray measurement.

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PROPERTIES OF OTHER INTERMETALLICS OF URANIUM (continued)

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
◇	49-14	1393		Same as above.	Same as above; M. P. method not given.
▯	50-7	298		UMn_2; 68.4 U and 31.6 Mn; single crystal.	Density from x-ray measurement of lattice.
▯	50-7	298		$U_6Mn_{1.09}$; 96 U and 4 Mn; single crystal.	Same as above.
▭	48-2	298		U_6Mn; 96.3 U and 3.7 Mn.	Same as above.
▭	50-8	298		UMn_2; 68.4 U, 31.6 Mn, and Fe, Si, C, Cu, Al, and Cr as impurities; prepared by melting 99.5 U and 99.98 electrolytic Mn.	
▭	50-8	298		Same as above.	Density computed from x-ray measurements.
▭	48-2 also 50-7	258		U_6Ni; 96.1 U and 3.9 Ni.	Density computed from x-ray measurements of lattice.
◆	56-29	1163		U_2Ti.	Decomposes.

PROPERTIES OF OTHER INTERMETALLICS OF RARE EARTH METALS

REPORTED VALUES

Density		g cm^{-3}	lb ft^{-3}
O	$DyCo_2$	9.98	622.8
	$DyCo_5$	9.05	564.7
	$DyGa_2$	8.07	503.6
	$DyNi_5$	9.29	579.7
	ErAg	9.96	621.5
	$ErCo_5$	9.27	578.4
	$ErGa_2$	8.35	521.0
	$ErMn_2$	10.40	649.0
	$ErNi_5$	9.44	589.1
	$HoGa_2$	8.21	512.3
	$HoCo_2$	10.20	636.5
	$HoCo_5$	9.34	582.8
	$HoMn_2$	8.65	539.8
	$HoMn_5$	7.63	476.1
	$HoNi_2$	10.40	649.0
	$HoNi_5$	9.32	581.6
	$LuOs_2$	17.81	1111.3
	NdAg	8.14	507.9
	NdBi	8.849	552.2
	NdCd	7.699	480.4
	$NdCd_2$	8.129	507.3
	$NdCd_3$	8.631	538.5
	$NdCd_{11}$	8.566	534.5
	$NdCo_5$	8.38	522.9
	$NdCu_5$	8.27	516.0
	$NdGa_2$	6.98	435.6
	NdHg	10.23	638.4
	$NdNi_5$	8.61	537.3
	$NdOs_2$	15.64	975.9
	$NdPb_3$	11.13	694.8

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PROPERTIES OF OTHER INTERMETALLICS OF RARE EARTH METALS (Continued)

REPORTED VALUES

Density (continued)	g cm^{-3}	lb ft^{-3}
SmBi	9.267	578.3
SmCd	8.135	507.6
$SmCd_2$	8.422	525.5
$SmCd_{11}$	8.612	537.4
$SmGa_2$	7.39	461.1
SmHg	11.1	692.6
$SmIn_3$	8.319	519.1
$SmPb_3$	11.34	707.6
$SmCo_2$	9.31	580.9
$SmCo_5$	9.05	564.7
$SmNi_2$	9.45	589.7
$SmNi_5$	8.82	550.4
$TbGa_2$	7.89	492.3
$TbCo_5$	9.20	574.1
YAg	6.90	430.6
YCu_5	7.62	475.5
YGa_2	6.07	378.8
YNi_5	7.75	483.6
YOs_2	14.54	907.3
YCo_5	7.58	473.0
YCo_2	7.31	456.1
YMn_2	5.829	363.7
YMn_5	6.41	400.0
YRh	7.45	464.9

PROPERTIES OF OTHER INTERMETALLICS OF RARE EARTH METALS

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
○	62-21	298		Intermetallics of Dy, Er, Ho, Lu, Nd, Sm, Tb, and Y.	

PROPERTIES OF MISCELLANEOUS METAL INTERMETALLICS

REPORTED VALUES

Density	g cm^{-3}	lb ft^{-3}
◀ $ThMn_{12}$	8.12	507
▶ Th_6Mn_{23}	9.02 ± 0.05	563 ± 3
Melting Point	**K**	**R**
○ Al_3V	1630	2940
◧ $SbZr_2$; hexagonal	2161	3890
⊟ BiCe	1795	3230
⊟ $BiCe_3$	1672	3010
⊟ Bi_3Ce_4	1907	3430
⊟ Cr_2Nb	≈1933	≈3480
◪ Cr_3Ta_2; hexagonal	2211	3980
◪ Cr_2Zr; hexagonal	1972	3550
◩ Cr_2Zr; f.c.c.	2133	3840
◪ CoCr; tetragonal; sigma phase	1745	3140
⊟ CoMo	1833	3300
⊟ CoMo; 62 atomic % Mo	1906	3430
◆ Co_5Nb_2	1772	3190
⊟ $CoTi_2$	1900	3420
⊟ CoTi	1723	3100
⊟ CoW	1906	3430
◆ Co_4Zr	>1772	>3190
⊟ Au_2Ti	1756	3160
◆ Au_3Zr	1833	3300
● $HfCr_2$	1753	3156
■ $HfCo_2$	1843	3318
◇ $HfMn_2$	1858	3344

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PROPERTIES OF MISCELLANEOUS METAL INTERMETALLICS (Continued)

REPORTED VALUES

Melting Point (continued)	K	R
□ $HfMo_2$	2573	4622
▲ $HfNi_2$	2063	3714
△ HfV_2	1773	3192
◆ Fe_5Nb_3	1922	3460
◪ Fe_2Zr; f.c.c.	1895	3411
◪ Fe_3Zr; cubic	1806	3251
◆ MnPd	1795	3230
◪ Mo_2Zr; cubic	2156	3880
▬ Ni_3Ta; hexagonal	1822	3280
◪ Ni_4Zr	1911	3440
◪ Ni_3Zr	1983	3570
◆ NiZr	1747	3145
▼ $NbCr_2$	1983	3570
◆ $NbCo_2$	1843	3318
▽ $NbMn_2$	1753	3156
◆ α-Ru_2W_3	>1922	>3460
◁ $TaCr_2$	2288	4119
▷ $TaCo_2$	1883	3390
◆ Sn_3Zr_5	≈2256	≈4061
○ $SnZr_2$	2222	4000
● Ti_3Au	1665	2998
$TiAu$	1763	3174
$TiAu_2$	1728	3111
● WCo_2	2023	3642
▬ W_2Zr	2443	4397

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PROPERTIES OF MISCELLANEOUS METAL INTERMETALLICS (Continued)

REPORTED VALUES

Melting Point (continued)	K	R
⊖ VMn_2	1543	2958
⊖ V_2Zr; hexagonal	2011	3620
◨ $ZrCo_2$	1833	3300
⊖ ZrV_2	1773	3192

PROPERTIES OF MISCELLANEOUS METAL INTERMETALLICS

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
○	54-23	1633		Al_3V; 38.6 V; prepared from 99.9 Al and c.p. VO_5.	Observation of first liquid drop; temperature by optical pyrometer sighting on black body cavity.
△	53-17	1773		HfV_2 from Ca-reduced V and high purity Hf plate containing 2-7 Zr.	Arc-melted.
▲	53-17	2063		$HfNi_2$ from rolled electrolytic Ni and AEC Hf with 2-7 Zr.	Arc-melted.
□	53-17	2573		$HfMo_2$ from high purity Mo sheet and powder; same Hf as above.	Arc-melted.
◇	53-17	1858		$HfMn_2$ from electrolytic Mn and same Hf as above.	Arc-melted.
●	53-17	1753		$HfCr_2$ from electrolytic Cr and same Hf as above.	Arc-melted.
■	53-17	1843		$HfCo_2$; Ca-reduced Co containing 0.15 Ni, 0.15 Fe, and 0.5>Ca.	Arc-melted.
▽	53-17	1753		High purity Nb powder and electrolytic Mn.	Arc-melted.
▼	53-17	1983		Same as above except electrolytic Cr.	Arc-melted.
◆	53-17	1843		Same as above; Ca reduced to containing 0.15 Ni, 0.15 Fe, 0.5 >Ca.	Arc-melted.
◂	53-17	2288		$TaCr_2$ from high purity Ta sheets and electrolytic Cr.	Arc-melted.
▷	53-17	1883		Same as above except Ca-reduced Co with 0.5> Ca, 0.15 Fe, and 0.15 Ni.	Arc-melted.
◐	53-17	2023		WCo_2 from high purity W sheet and powder and Ca-reduced Co with 0.5 >Ca, 0.15 Fe, and 0.15 Ni.	Arc-melted.

(Continued onto next page)

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
●	53-17	1543		VMn_2 from Ca-reduced V and high purity electrolytic Mn.	Arc-melted.
▶	51-7	298		$ThMn_{12}$.	Computed from measurements of lattice.
◀	51-7	298		Th_6Mn_{23}.	Same as above.
●	56-27	1665-1763		Series of Ti-Au intermetallics.	M. P. by observation of flow during preparation.
⊖	53-17	1773		ZrV_2 from Ca-reduced V and iodide crystal Zr bar.	Arc-melted.
◧	53-17	1833		$ZrCo_2$ from Ca-reduced Co containing 0.15 Ni, 0.15 Fe, and 0.5 >Ca and iodide crystal Zr bar.	Arc-melted.
■	51-12	2161		$SbZr_2$; hexagonal.	
■	55-33	1672-2443		Series of intermetallics of metals.	
■	56-22	1933		Cr_2Nb.	
■	54-34	2211		Cr_3Ta_2; hexagonal.	
■	53-30	1806-2133			
■	53-13	1972-2156		Cr_2Zr and Mo_2Zr.	
■	55-33 also 54-34	1745		CoCr; tetragonal; sigma phase.	
◆	38-1	1772		Co_2Nb_2.	
◆	54-33	1772		Co_4Zr.	

(Continued onto next page)

PROPERTIES OF MISCELLANEOUS METAL INTERMETALLICS (Continued)

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
◆	54-33 also 55-33	1833		Au_3Zr.	
◆	38-2	1922		Fe_2Nb_3.	
◆	55-39	1795		MnPd.	
◆	56-36	1747		NiZr.	
◆	57-35	1922		α-Ru_2W_3.	
◆	52-27	2256		Sn_3Zr_5.	
●	51-10	2222		$SnZr_2$.	
⊖	53-26	2011		V_2Zr; hexagonal.	

PROPERTIES OF ZIRCONIUM DIBORIDE + MOLYBDENUM DISILICIDE

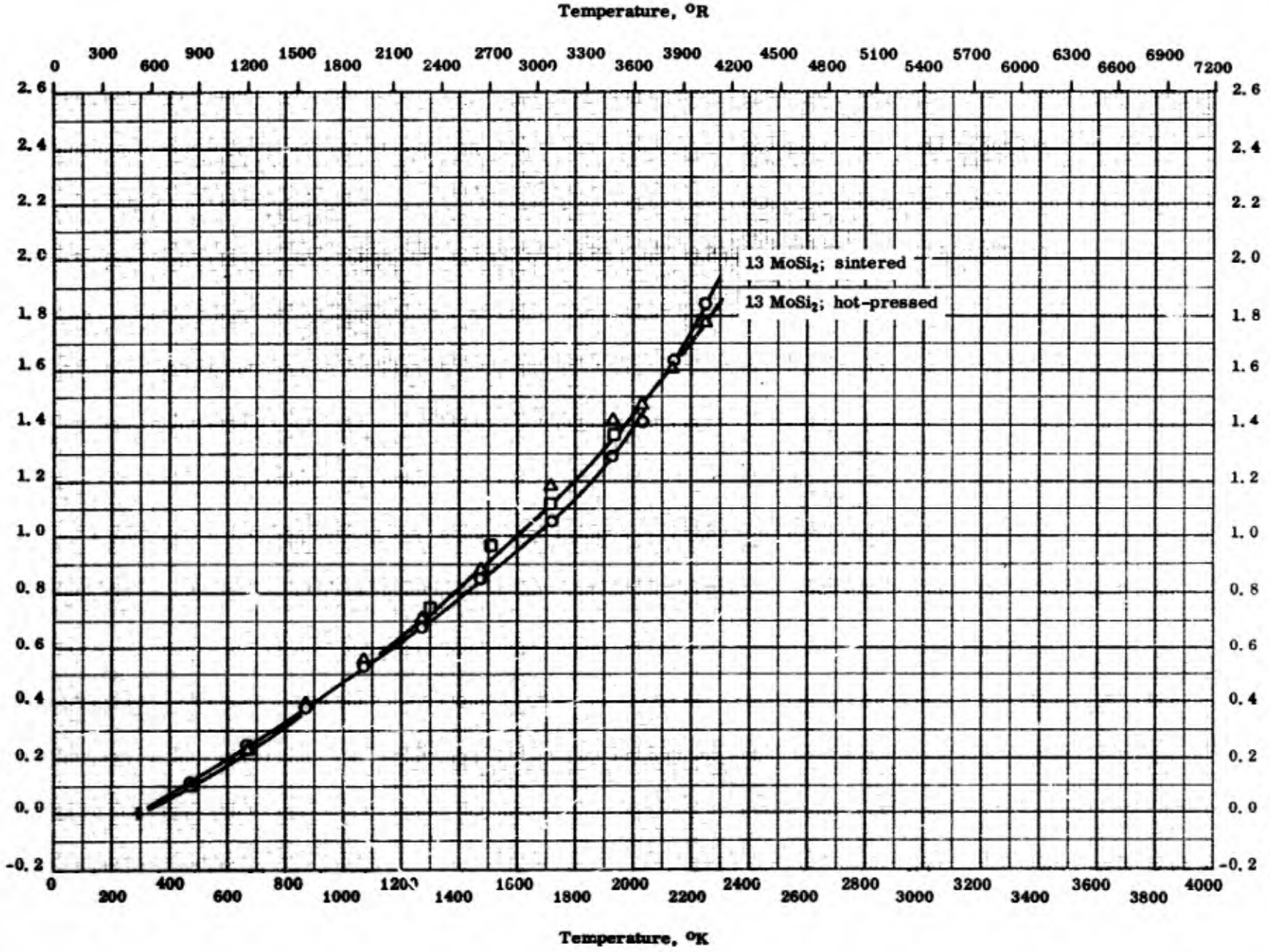
REPORTED VALUES

Melting Point	K	R
○ 50 $MoSi_2$	2978	5180

PROPERTIES OF ZIRCONIUM DIBORIDE + MOLYBDENUM DISILICIDE

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
O	55-28	2878		50 ZrB_2 and 50 $MoSi_2$.	Arc-melted; calibrated optical pyrometer sighting on liquid-solid interface.



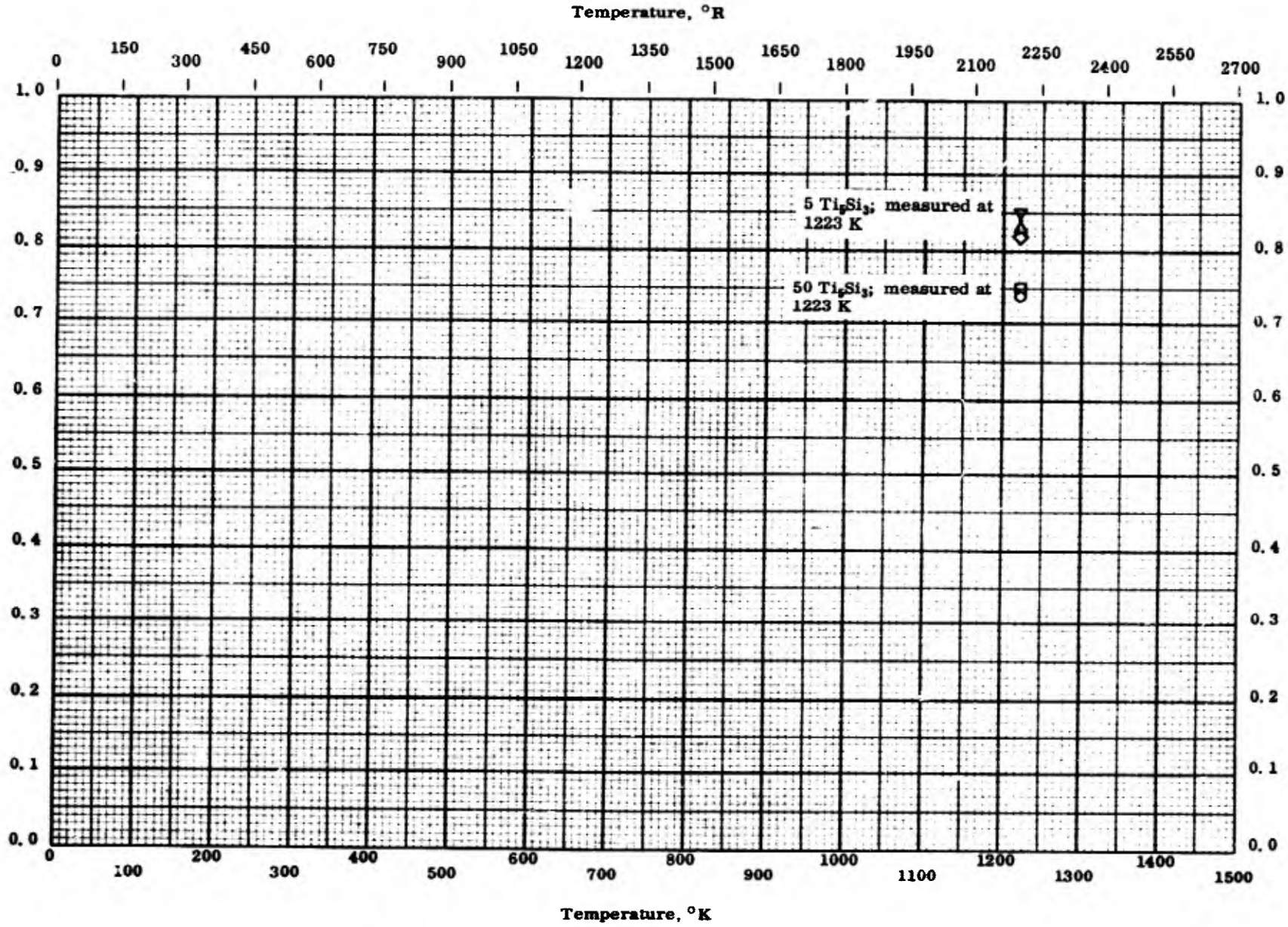
7PRC

THERMAL LINEAR EXPANSION -- ZIRCONIUM DIBORIDE + MOLYBDENUM DISILICIDE

THERMAL LINEAR EXPANSION -- ZIRCONIUM DIBORIDE + MOLYBDENUM DISILICIDE

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
○	62-39	298-2243		86.1 ZrB_2, 12.8 $MoSi_2$ and 1.1 BN; specimen dimension 3 by 1/2 by 1/4 $in.^3$; average density 4.873 $g\,cm^{-3}$.	Sintered; measured in argon; average value of several runs.
△	62-39	298-2243		86.1 ZrB_2, 12.8 $MoSi_2$ and 1.1 BN; specimen dimension 3 by 1/2 by 1/4 $in.^3$; average density 5.48 $g\,cm^{-3}$.	Hot pressed at 1915 C; measured in argon; average value of several runs.
□	62-39	298-1938		86.1 ZrB_2, 12.8 $MoSi_2$ and 1.1 BN; specimen dimension 3 by 1/2 by 1/4 $in.^3$; density not given.	Hot pressed; fabricated by using different lots of ZrB_2; average value of 3 runs.

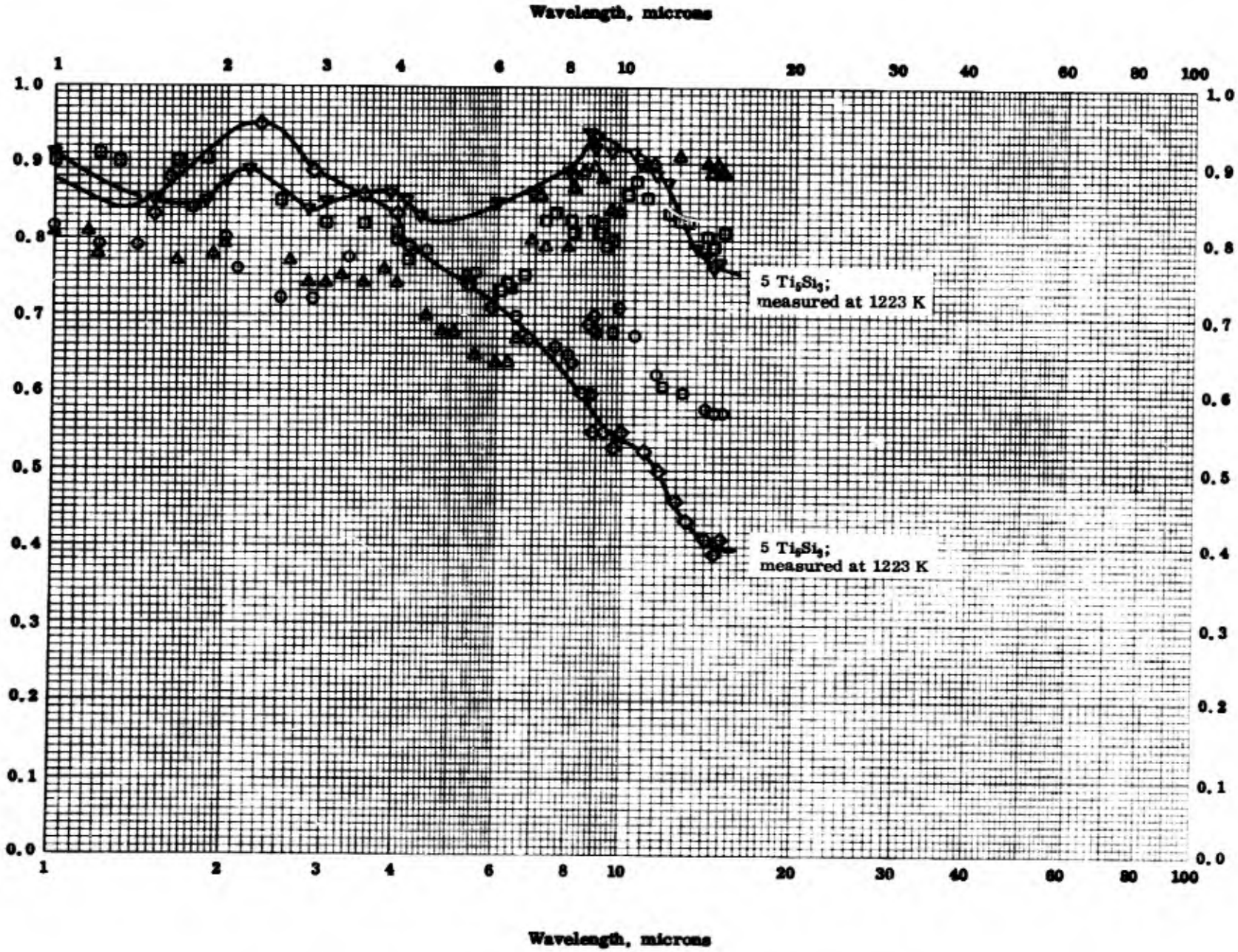


NORMAL TOTAL EMITTANCE -- TITANIUM DISILICIDE + PENTATITANIUM TRISILICIDE

NORMAL TOTAL EMITTANCE -- TITANIUM DISILICIDE + PENTATITANIUM TRISILICIDE

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
○	63-16	1223	± 8	50 $TiSi_2$ and 50 Ti_5Si_3; 0.07 in. thickness plate; density 3.22 g cm^{-3}.	Sintered at 1573 K for 2 hrs; measured in argon; calculated from spectral data.
△	63-16	1223	± 8	75 $TiSi_2$ and 25 Ti_5Si_3; 0.065 in. thickness plate; density 3.44 g cm^{-3}.	Same as above except sintered at 1623 K for 2 hrs.
□	63-16	1223	± 8	90 $TiSi_2$ and 10 Ti_5Si_3; 0.063 in. thickness plate; density 3.49 g cm^{-3}.	Same as above except sintered at 1623 K for 2 hrs.
▽	63-16	1223	± 8	95 $TiSi_2$ and 5 Ti_5Si_3; 0.06 in. thickness plate; density 3.09 g cm^{-3}.	Sintered at 1573 K for 2 hrs; measured in argon; calculated from spectral data.
◇	63-16	1223	± 8	95 $TiSi_2$ and 5 Ti_5Si_3; 0.06 in. thickness plate; density 2.98 g cm^{-3}.	Same as above.

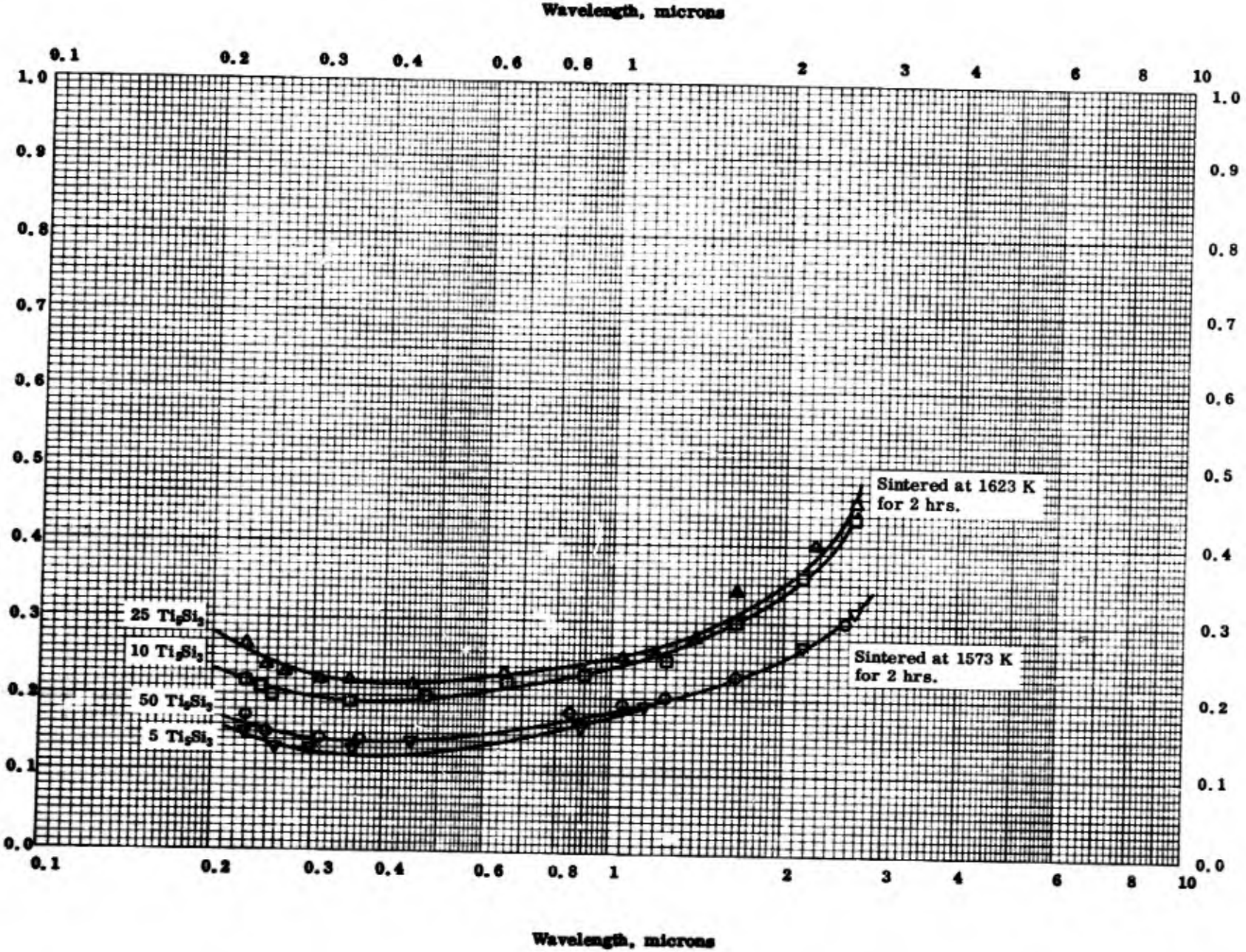


NORMAL SPECTRAL EMITTANCE -- TITANIUM DISILICIDE + PENTATITANIUM TRISILICIDE

NORMAL SPECTRAL EMITTANCE -- TITANIUM DISILICIDE + PENTATITANIUM TRISILICIDE

REFERENCE INFORMATION

Symbol	Ref.	Temp. °K	Wavelength Range, μ	Rept. Error %	Sample Specifications	Remarks
○	63-16	1223	1-15		50 $TiSi_2$ and 50 Ti_5Si_3; 0.07 in. thickness plate; density 3.22 g cm^{-3}.	Sintered at 1573 K for 2 hrs; measured in argon; data taken from a curve.
△	63-16	1223	1-15		75 $TiSi_2$ and 25 Ti_5Si_3; 0.065 in. thickness plate; density 3.44 g cm^{-3}.	Same as above except sintered at 1623 K for 2 hrs.
□	63-16	1223	1-15		90 $TiSi_2$ and 10 Ti_5Si_3; 0.063 in. thickness plate; density 3.49 g cm^{-3}.	Same as above except sintered at 1623 K for 2 hrs.
▽	63-16	1223	1-15		95 $TiSi_2$ and 5 Ti_5Si_3; 0.06 in. thickness plate; density 3.09 g cm^{-3}.	Same as above except sintered at 1573 K for 2 hrs.
◇	63-16	1223	1-15		95 $TiSi_2$ and 5 Ti_5Si_3; 0.06 in. thickness plate; density 2.98 g cm^{-3}.	Same as above.

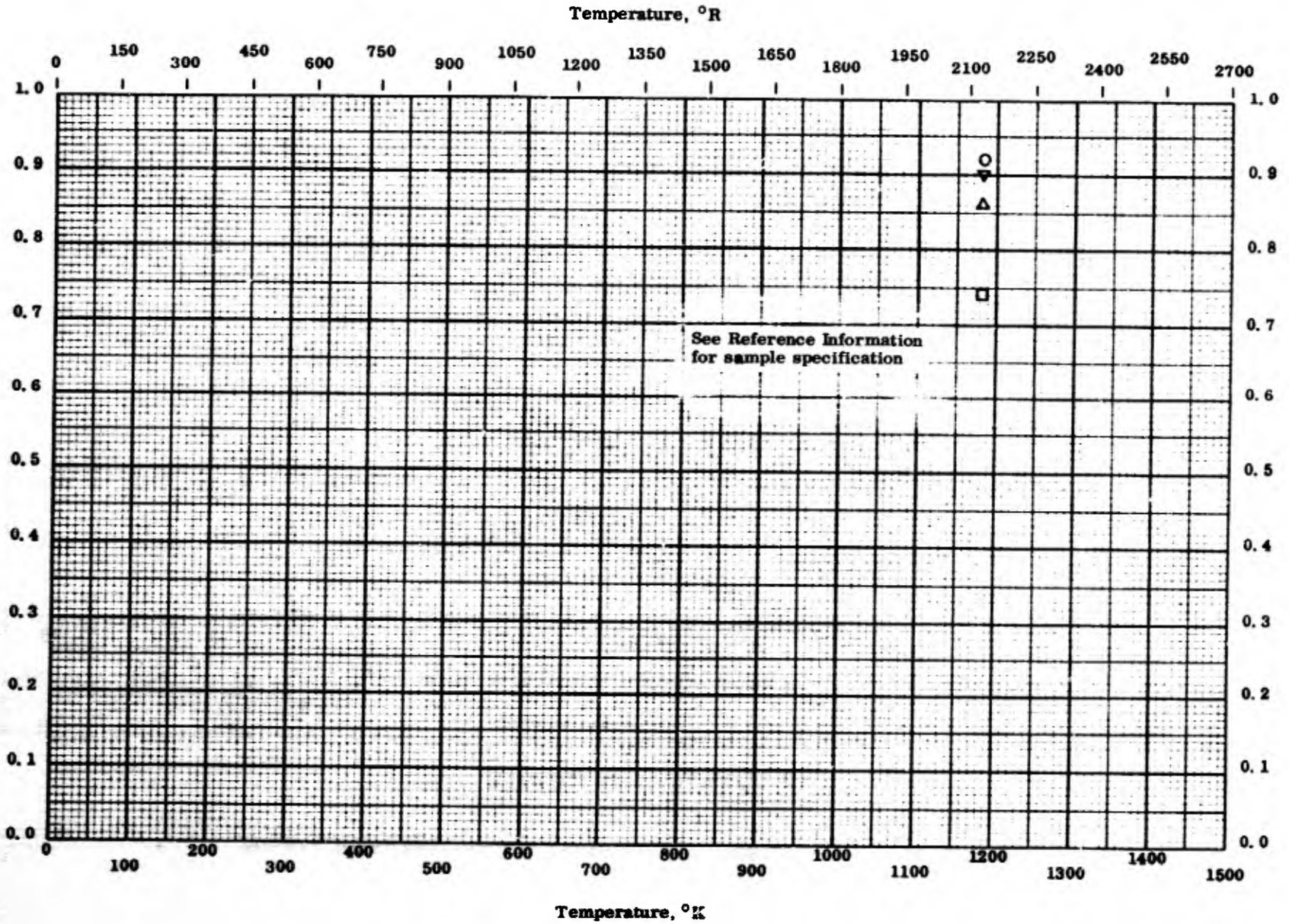


NORMAL SPECTRAL REFLECTANCE — TITANIUM DISILICIDE + PENTATITANIUM TRISILICIDE

NORMAL SPECTRAL REFLECTANCE -- TITANIUM DISILICIDE + PENTATITANIUM TRISILICIDE

REFERENCE INFORMATION

Symbol	Ref.	Temp. °K	Wavelength Range, μ	Rept. Error %	Sample Specifications	Remarks
○	63-16	298	0.23-2.65	5	50 $TiSi_2$ and 50 Ti_5Si_3; 0.07 in. thickness plate; density 3.22 g cm^{-3}.	Sintered at 1573 K for 2 hrs; data taken from a curve; normal incidence, hemispherical viewing; MgO as reference standard.
△	63-16	298	0.23-2.65	5	75 $TiSi_2$ and 25 Ti_5Si_3; 0.065 in. thickness plate; density 3.44 g cm^{-3}.	Same as above except sintered at 1623 K for 2 hrs.
□	63-16	298	0.23-2.65	5	90 $TiSi_2$ and 10 Ti_5Si_3; 0.063 in. thickness plate; density 3.49 g cm^{-3}.	Same as above.
▽	63-16	298	0.23-2.65	5	95 $TiSi_2$ and 5 Ti_5Si_3; 0.06 in. thickness plate; density 2.98 g cm^{-3}.	Sintered at 1573 K for 2 hrs; data taken from a curve; normal incidence, hemispherical viewing; MgO as reference standard.

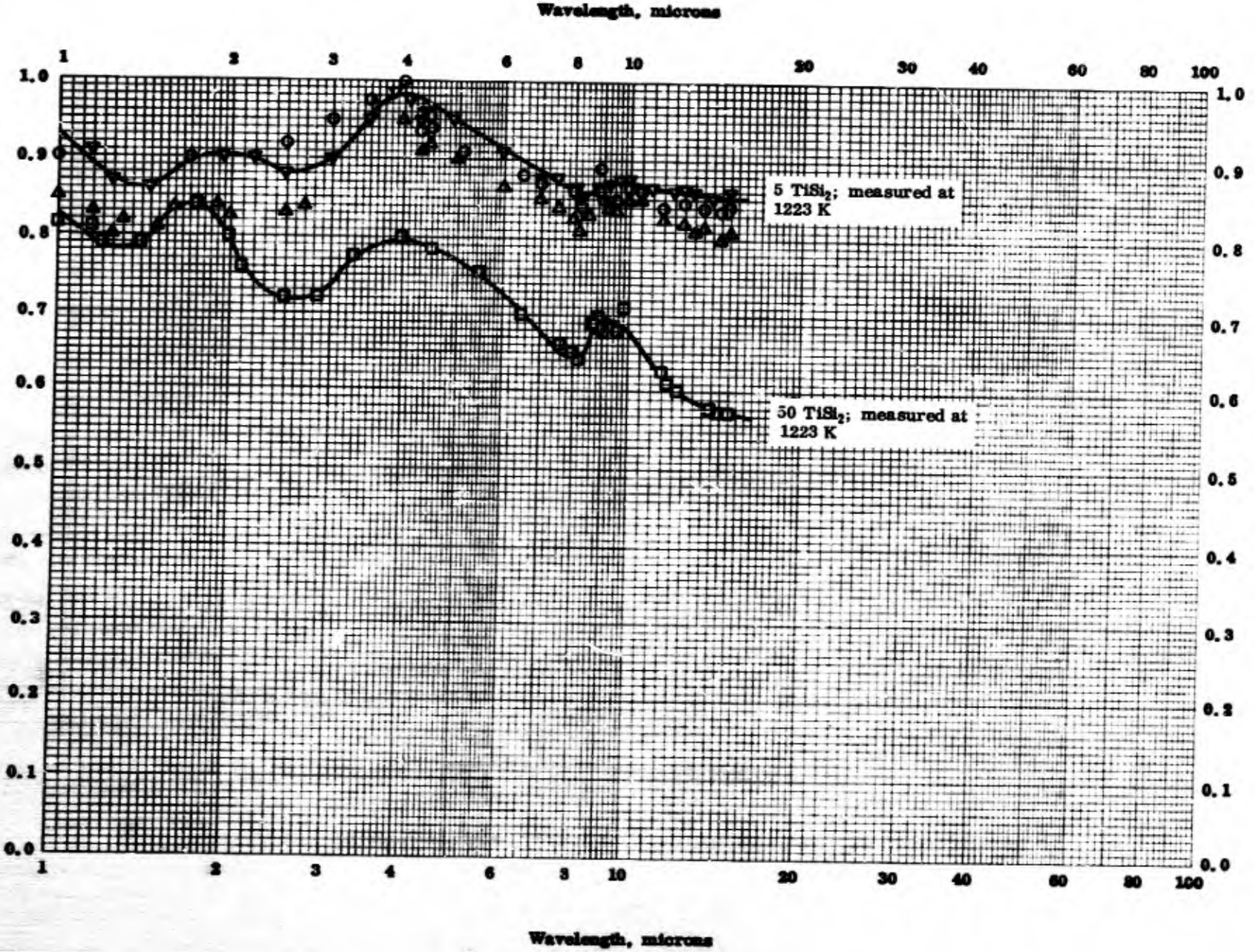


NORMAL TOTAL EMITTANCE -- PENTATITANIUM TRISILICIDE + TITANIUM DISILICIDE

NORMAL TOTAL EMITTANCE -- PENTATITANIUM TRISILICIDE + TITANIUM DISILICIDE

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
○	63-16	1223	± 8	90 Ti_5Si_3 and 10$TiSi_2$; 0.05 in. thickness plate; density 3.02 g cm^{-3}.	Sintered at 1573 K for 2 hrs; measured in argon; calculated from spectral data.
△	63-16	1223	± 8	75 Ti_5Si_3 and 25 $TiSi_2$; 0.031 in. thickness plate; density 3.02 g cm^{-3}.	Same as above.
□	63-16	1223	± 8	50 Ti_5Si_3 and 50 $TiSi_2$; 0.070 in. thickness plate; density 3.22 g cm^{-3}.	Same as above.
▽	63-16	1223	± 8	95 Ti_5Si_3 and 5 $TiSi_2$; 0.048 in. thickness plate; density 2.77 g cm^{-3}.	Same as above.

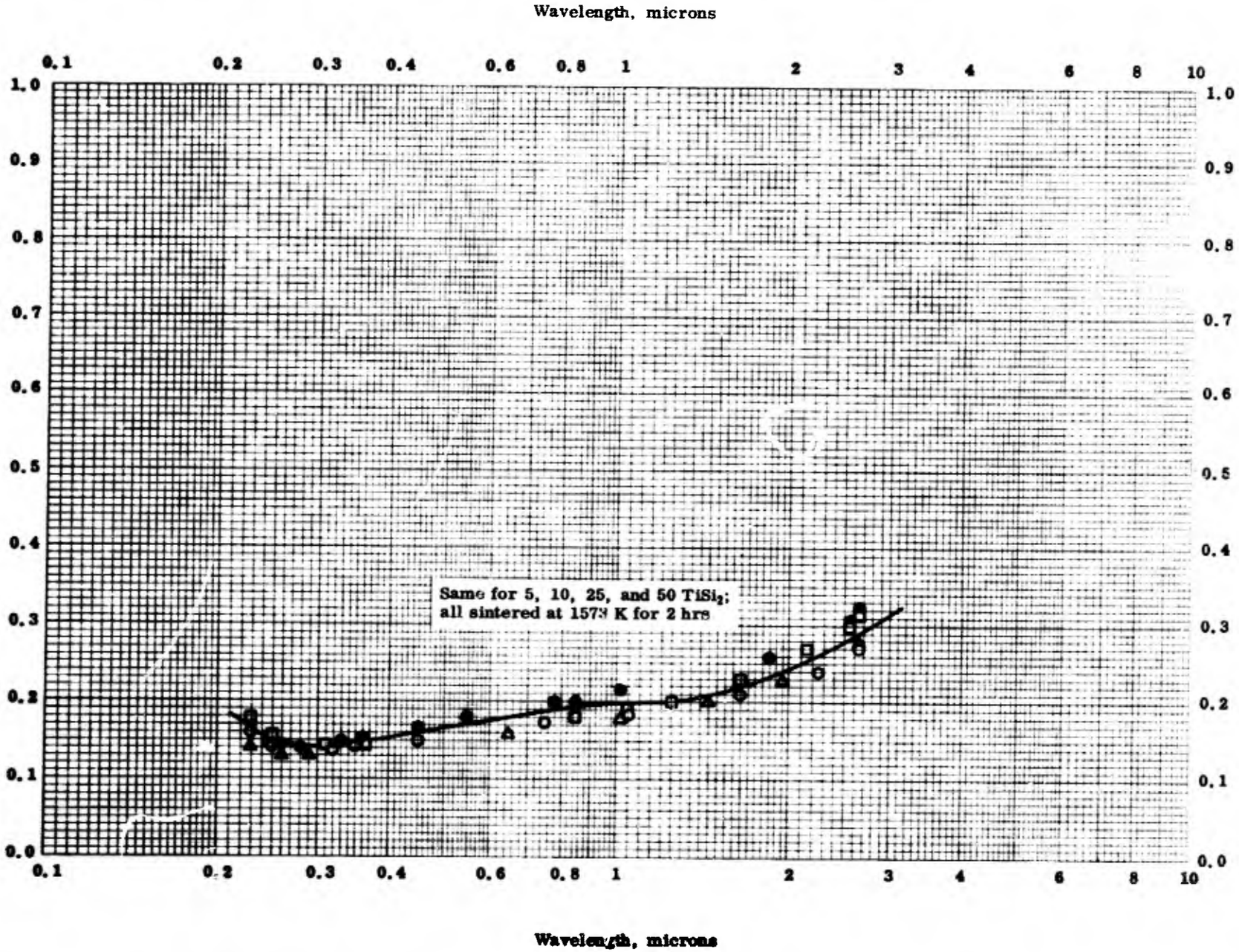


NORMAL SPECTRAL EMITTANCE -- PENTATITANIUM TRISILICIDE + TITANIUM DISILICIDE

NORMAL SPECTRAL EMITTANCE -- PENTATITANIUM TRISILICIDE + TITANIUM DISILICIDE

REFERENCE INFORMATION

Symbol	Ref.	Temp. °K	Wavelength Range, μ	Rept. Error %	Sample Specifications	Remarks
○	63-16	1223	1-15		90 Ti_5Si_3 and 10 $TiSi_2$; 0.05 in. thickness plate; density 3.02 g cm^{-3}.	Sintered at 1573 K for 2 hrs; measured in argon; data taken from a curve.
△	63-16	1223	1-15		75 Ti_5Si_3 and 25 $TiSi_2$; 0.031 in. thickness plate; density 3.02 g cm^{-3}.	Same as above.
□	63-16	1223	1-15		50 Ti_5Si_3 and 50 $TiSi_2$; 0.070 in thickness plate; density 3.22 g cm^{-3}.	Same as above.
▽	63-16	1223	1-15		95 Ti_5Si_3 and 5 $TiSi_2$; 0.048 in. thickness plate; density 2.77 g cm^{-3}.	Same as above.



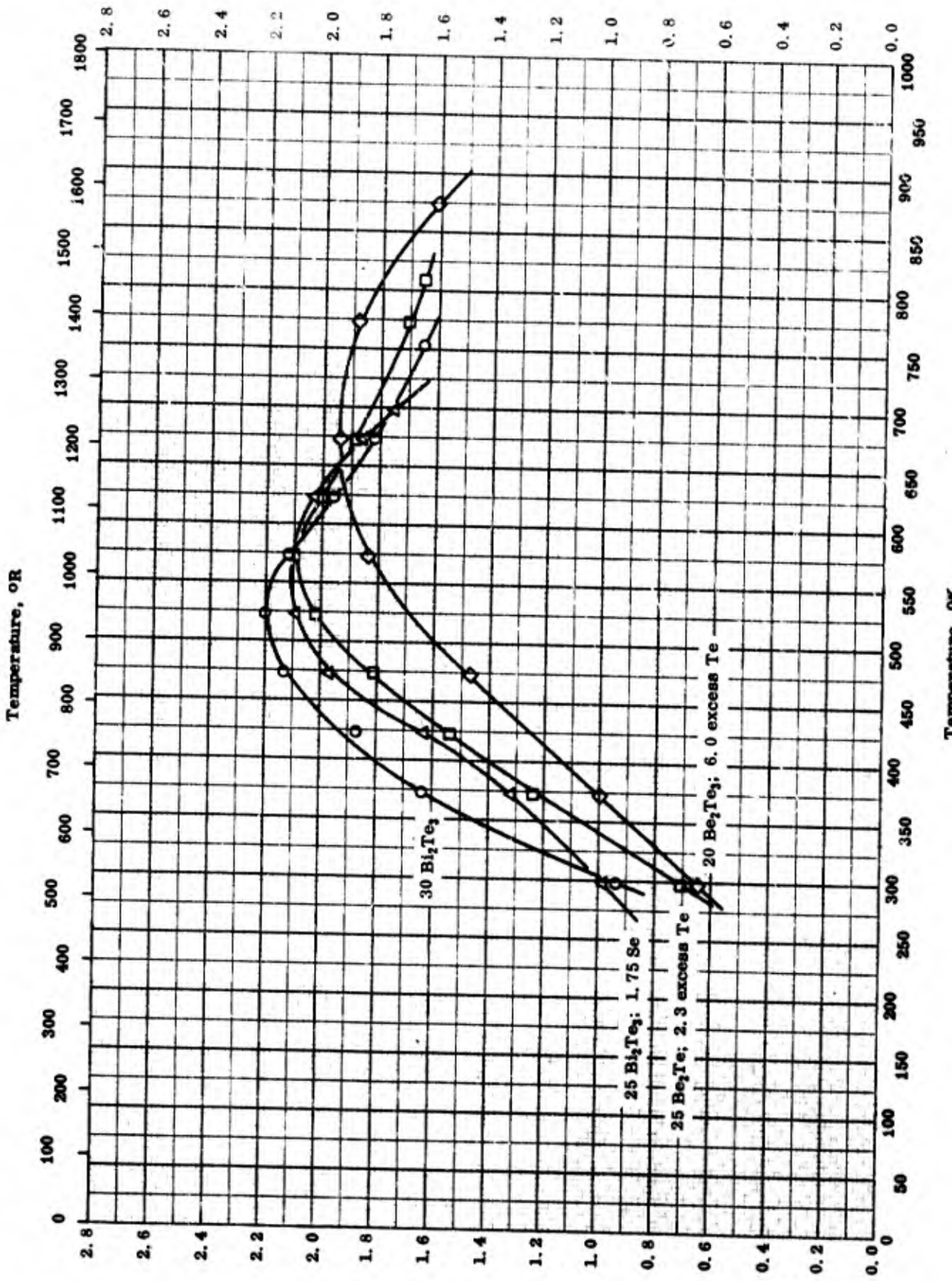
NORMAL SPECTRAL REFLECTANCE -- PENTATITANIUM TRISILICIDE + TITANIUM DISILICIDE

Normal Spectral Reflectance

NORMAL SPECTRAL REFLECTANCE -- PENTATITANIUM TRISILICIDE + TITANIUM DISILICIDE

REFERENCE INFORMATION

Symbol	Ref.	Temp. °K	Wavelength Range μ	Rept. Error%	Sample Specifications	Remarks
○	63-16	298	0.23-2.65	5	90 Ti_5Si_3 and 10 $TiSi_2$; 0.05 in. thickness plate; density 3.02 g cm^{-3}.	Sintered at 1573 K for 2 hrs; data taken from a curve; normal incidence, hemispherical viewing; MgO as reference standard.
△	63-16	298	0.23-2.65	5	75 Ti_5Si_3 and 25 $TiSi_2$; 0.031 in. thickness plate; density 3.02 g cm^{-3}.	Same as above.
□	63-16	298	0.23-2.65	5	50 Ti_5Si_3 and 50 $TiSi_2$; 0.070 in. thickness plate; density 3.22 g cm^{-3}.	Same as above.
●	63-16	298	0.23-2.65	5	95 Ti_5Si_3 and 5 $TiSi_2$; 0.048 in. thickness plate; density 2.77 g cm^{-3}.	Same as above.

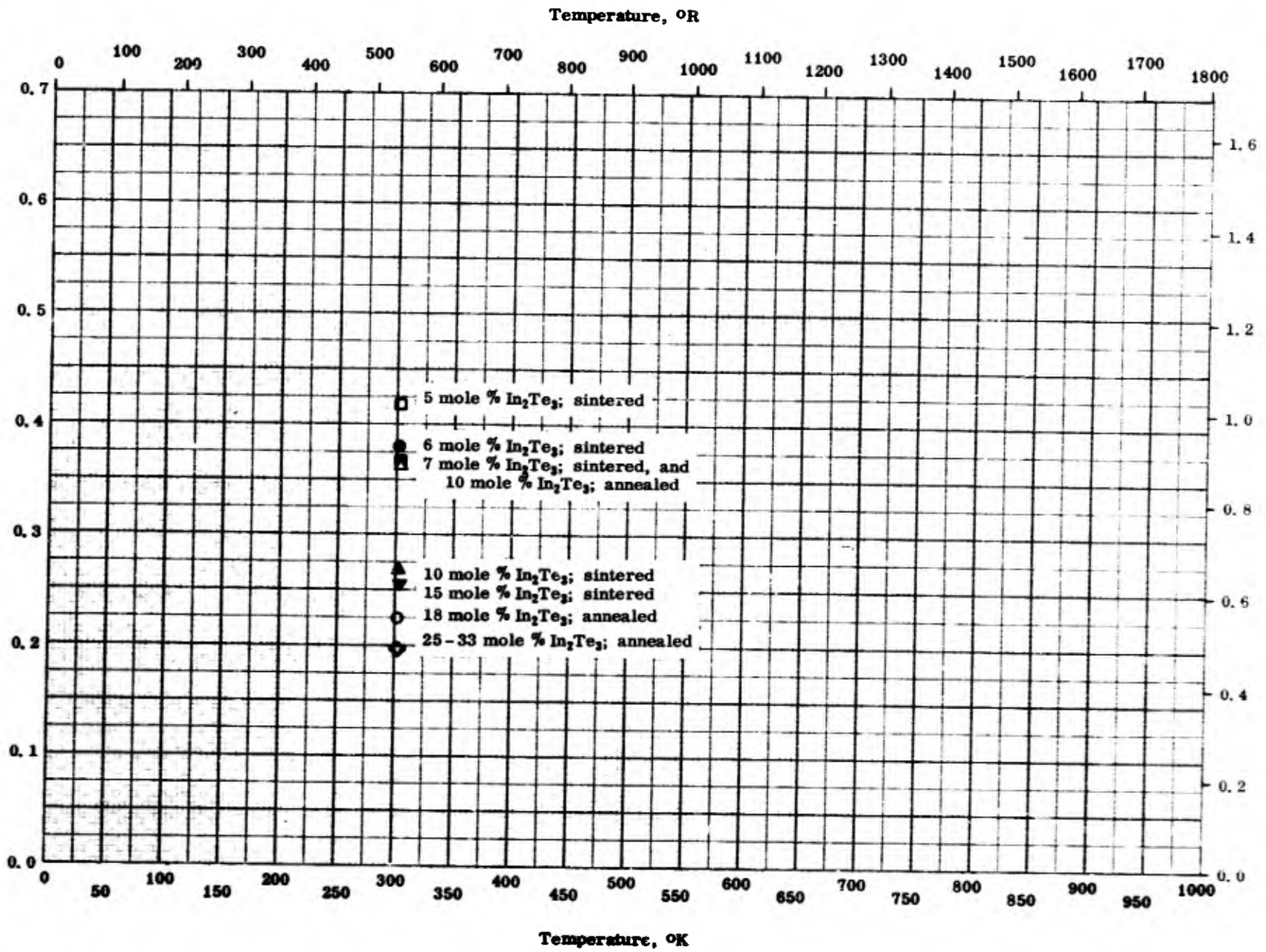


ELECTRICAL RESISTIVITY -- ANTIMONY TELLURIDE + BISMUTH TELLURIDE

ELECTRICAL RESISTIVITY -- ANTIMONY TELLURIDE + BISMUTH TELLURIDE

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
○	61-16	298-753		30 Bi_2Te_3 and 70 Sb_2Te_3; 2.0 excess Te, p-type.	
□	61-16	298-808		25 Bi_2Te_3 and 75 Sb_2Te_3; 2.3 excess Te; same as above.	
△	61-16	298-698		25 Bi_2Te_3 and 75 Sb_2Te_3; 1.75 Se added; p-type.	
◇	61-16	298-873		20 Bi_2Te_3 and 80 Sb_2Te_3; 6.0 excess Te; p-type.	



Thermal Conductivity, cal Sec^{-1} cm^{-1} K^{-1} x 10^3

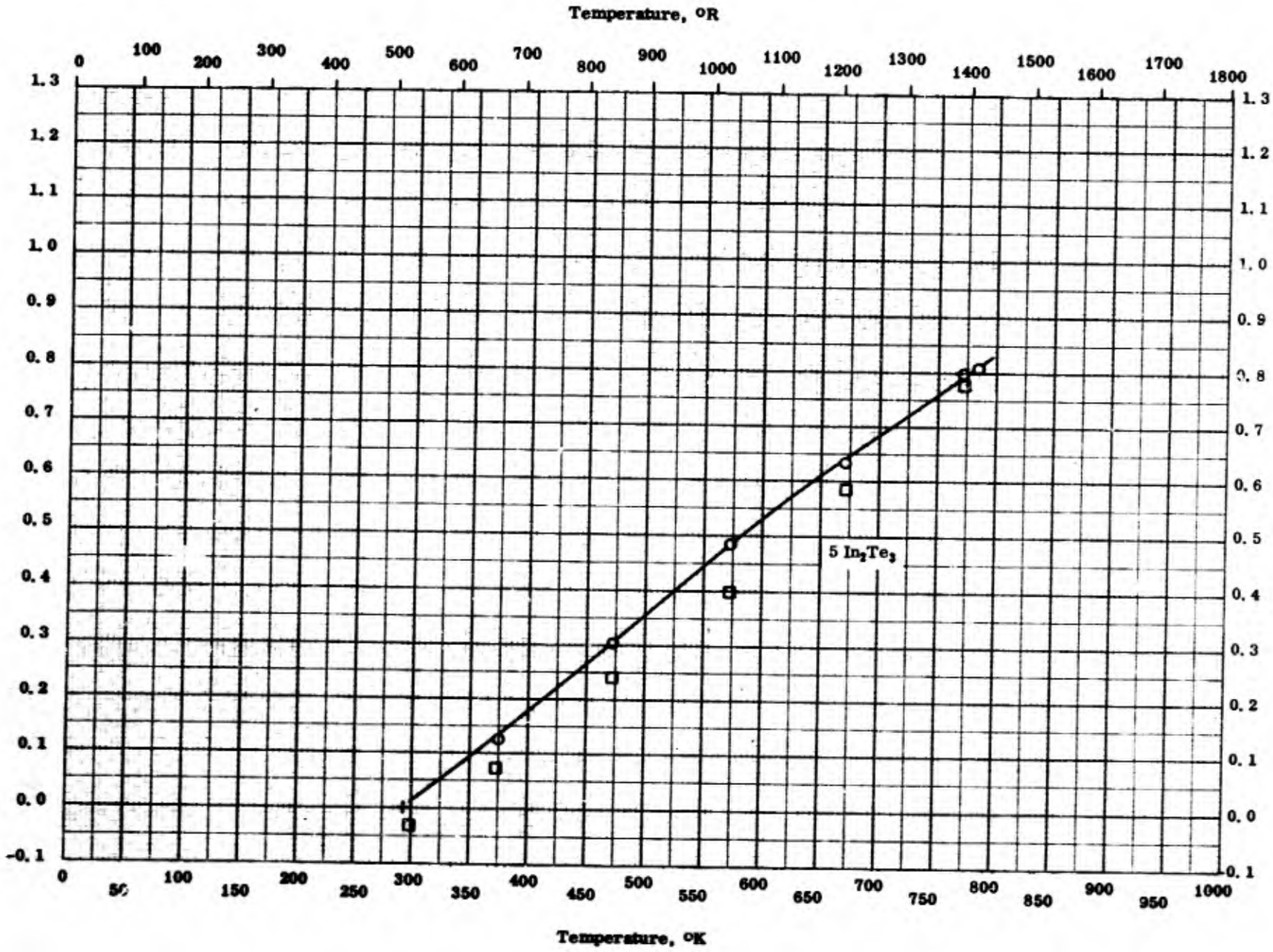
Thermal Conductivity, Btu hr^{-1} ft^{-1} R^{-1}

THERMAL CONDUCTIVITY -- ANTIMONY TELLURIDE + INDIUM TELLURIDE

THERMAL CONDUCTIVITY -- ANTIMONY TELLURIDE + INDIUM TELLURIDE

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
△	62-4	303		No. 75; 10 mole % of In_2Te_3; p-type.	Sintered and annealed for 8 hrs at 475 C.
○	62-4	303		No. 76; 18 mole % of In_2Te_3; p-type.	Same as above.
▽	62-4	303		No. 59; 25 mole % of In_2Te_3; p-type.	Same as above.
◇	62-4	303		No. 10; 33.3 mole % of In_2Te_3; p-type.	Same as above.
□	62-4	303		No. 3348; 5 mole % of In_2Te_3; p-type.	Cold-pressed and sintered.
●	62-4	303		No. 3421; 6 mole % of In_2Te_3; p-type.	Same as above.
■	62-4	303		No. 3423; 7 mole % of In_2Te_3; p-type.	Same as above.
▲	62-4	303		No. 3386; 10 mole % of In_2Te_3; p-type.	Same as above.
▼	62-4	303		No. 3390; 15 mole % of In_2Te_3; p-type.	Same as above.



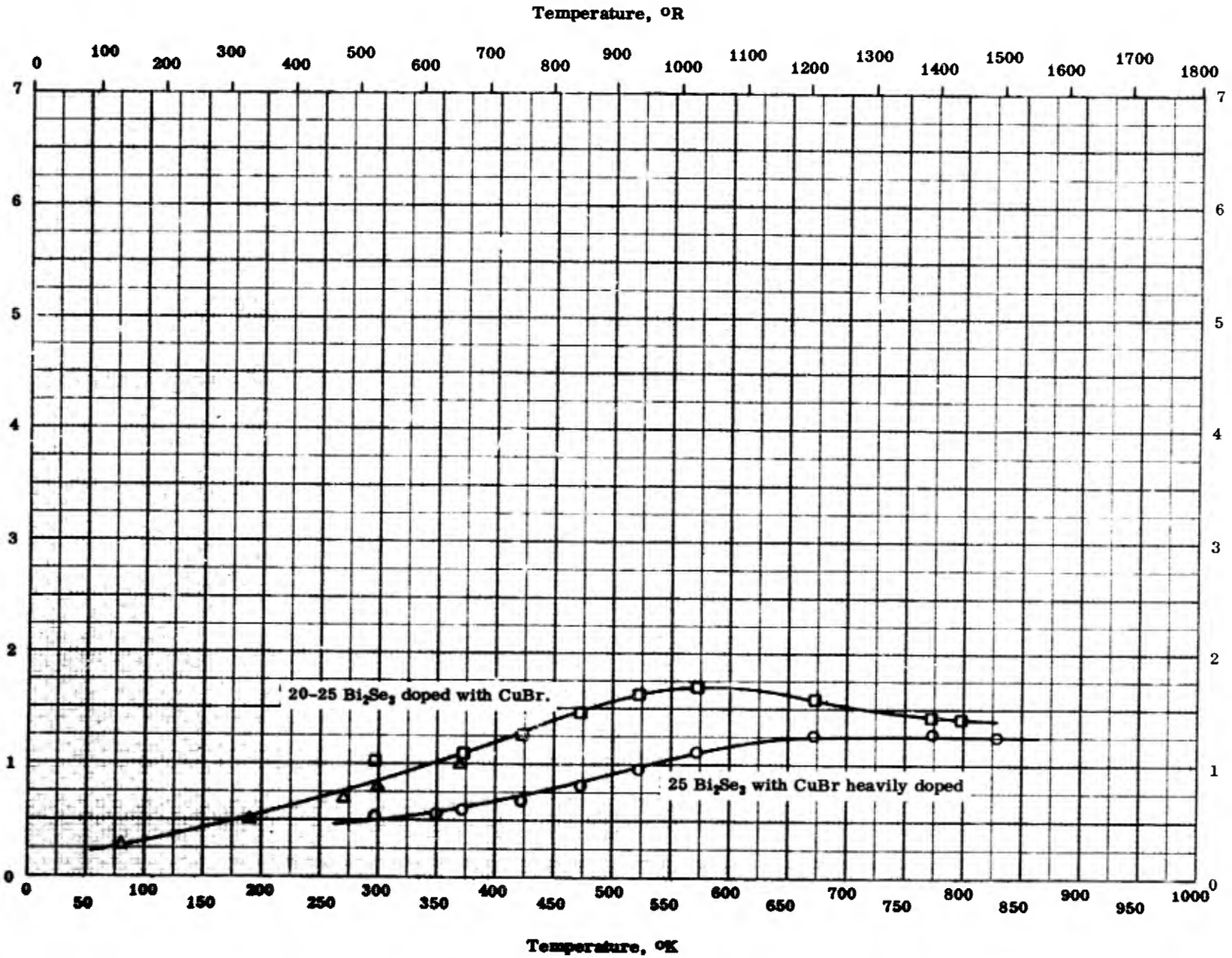
TPRC

THERMAL LINEAR EXPANSION -- ANTIMONY TELLURIDE + INDIUM TELLURIDE

THERMAL LINEAR EXPANSION -- ANTIMONY TELLURIDE + INDIUM TELLURIDE

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
○	62-4	298-784		5 In_2Te_3; 61.18 Te, 36.98 Sb and 1.84 In.	Prepared by induction melting in a graphite crucible at 750 C in a Balzers furnace under argon; cast the melt onto a carbon-coated water-cooled copper mold, hand crushing these chill-cast ingots to -60 mesh powder in a steel mortar and prestle, cold-pressed at 35 tsi in graphite-lubricated carbide-lined still dies, and then sintered at 500 C for 3 hrs in argon; heating.
□	62-4	298-784		Same as above.	Cooling data of above specimen.



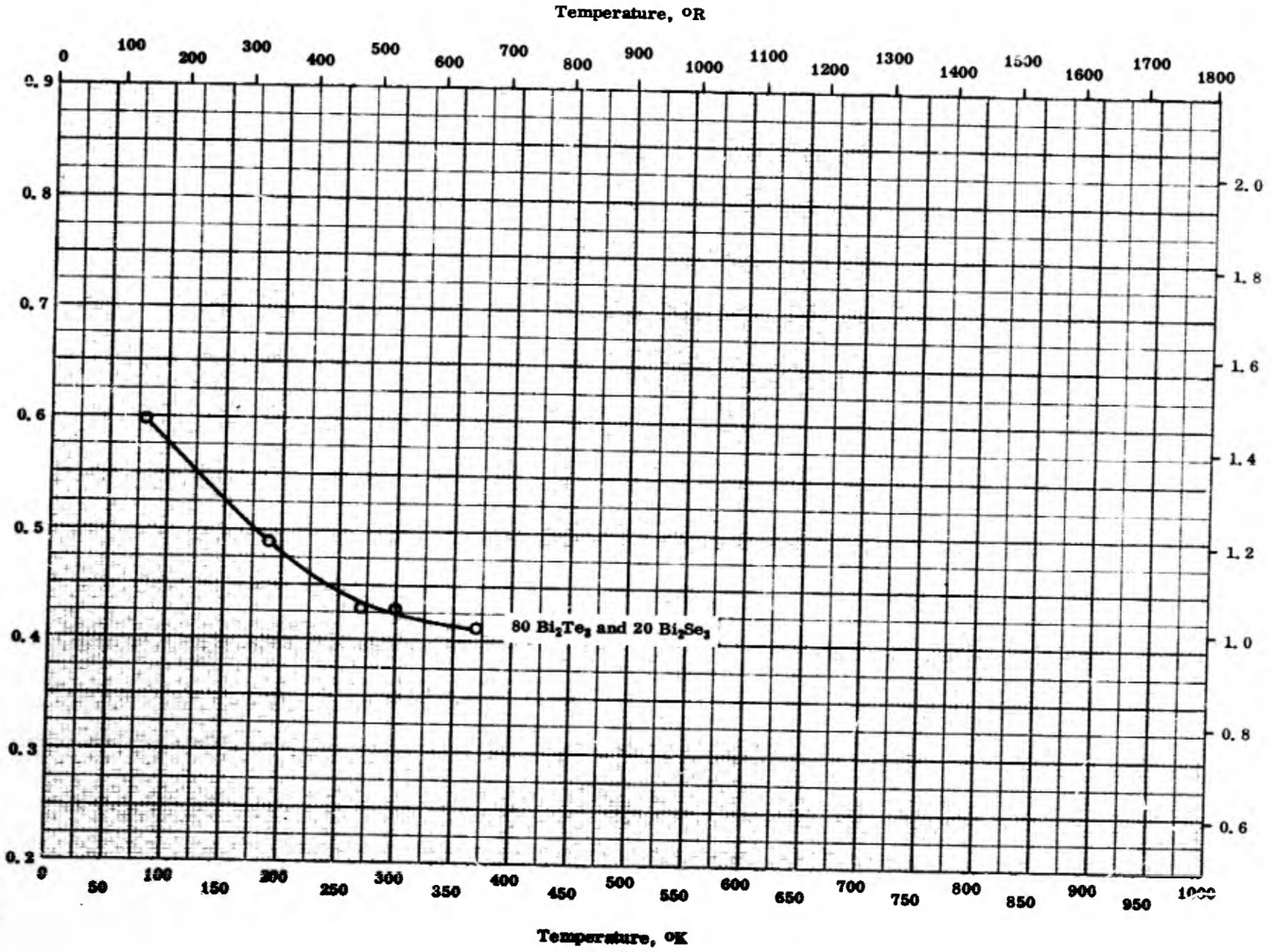
ELECTRICAL RESISTIVITY -- BISMUTH TELLURIDE + BISMUTH SELENIDE

Electrical Resistivity, ohm cm x 10³

ELECTRICAL RESISTIVITY -- BISMUTH TELLURIDE + BISMUTH SELENIDE

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
○	61-16	298-828		75 Bi_2Te_3 and 25 Bi_2Se_3; n-type; rather heavily doped with CuBr.	
□	61-16	298-797		Same as above; doped with CuBr.	
△	60-11	80-370		80 Bi_2Te_3 and 20 Bi_2Se_3 with 0.5 CrBr.	



Thermal Conductivity, cal Sec^{-1} cm^{-1} K^{-1} x 10^3

Thermal Conductivity, Btu hr^{-1} ft^{-1} R^{-1}

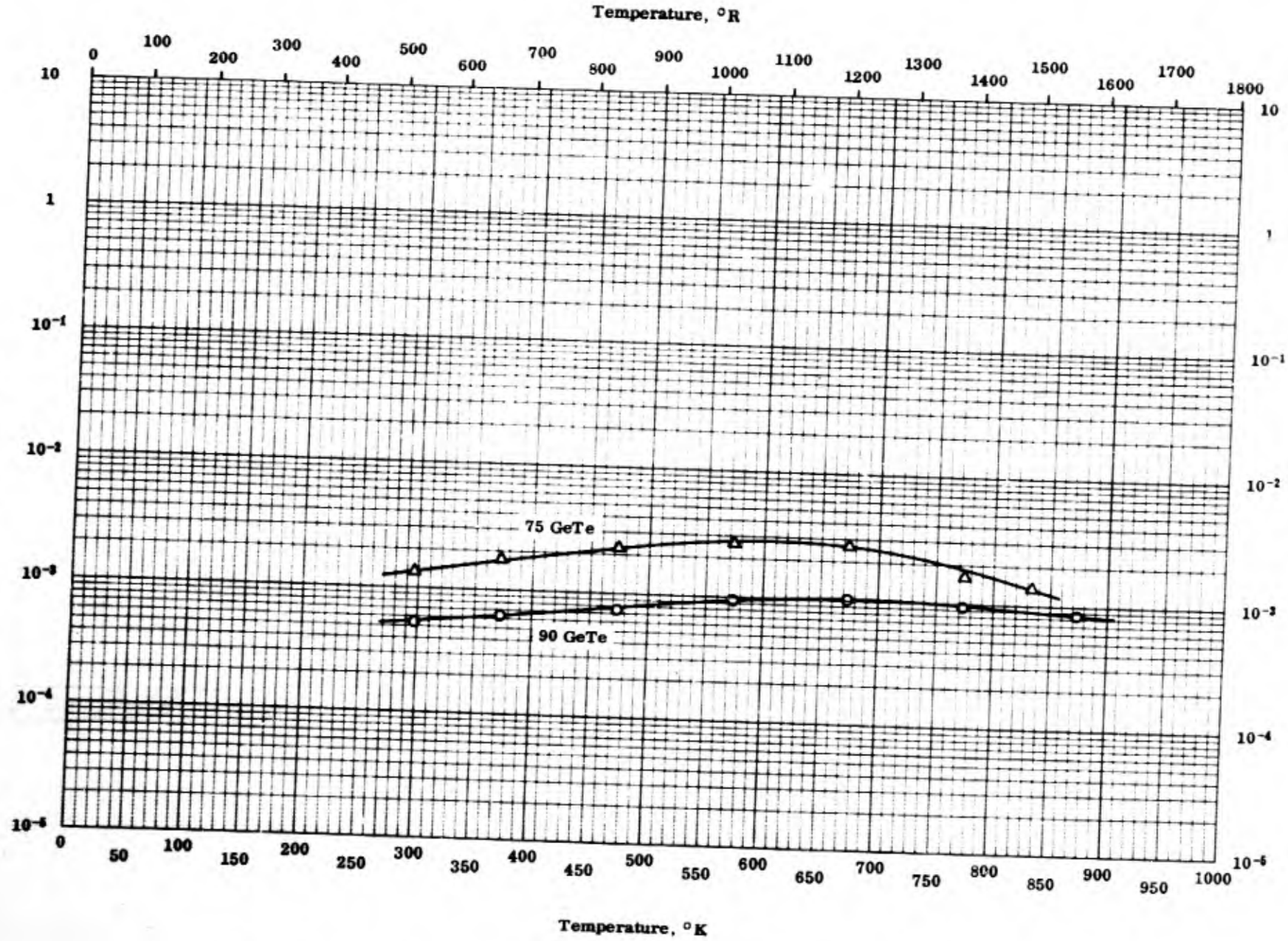
TPRC

THERMAL CONDUCTIVITY -- BISMUTH TELLURIDE + BISMUTH SELENIDE

THERMAL CONDUCTIVITY -- BISMUTH TELLURIDE + BISMUTH SELENIDE

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
O	60-11	80-370		80 Bi_2Te_3, 20 Bi_2Se_3, and 0.5 CuBr.	

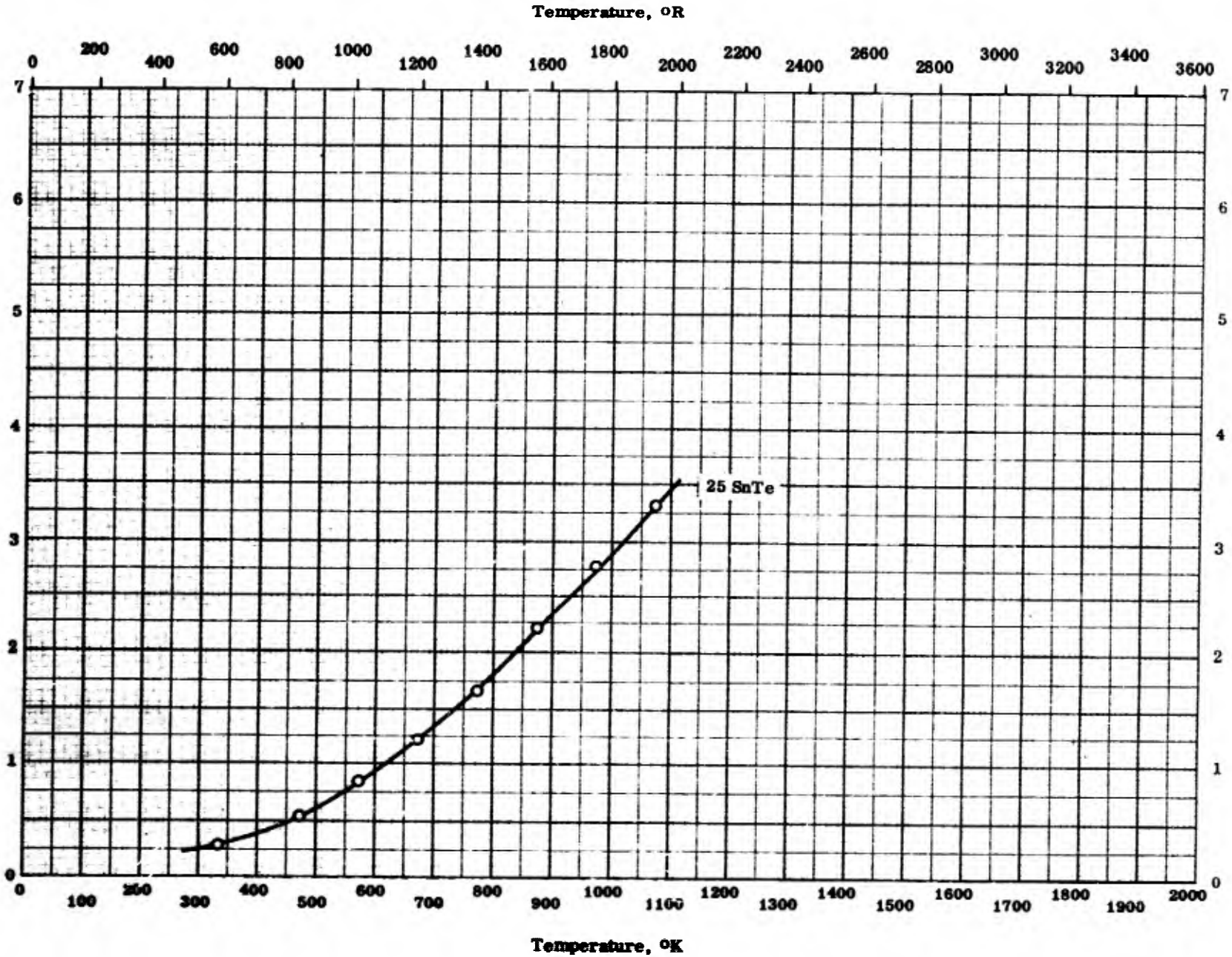


ELECTRICAL RESISTIVITY -- GERMANIUM TELLURIDE + SILVER ANTIMONY TELLURIDE

ELECTRICAL RESISTIVITY -- GERMANIUM TELLURIDE + SILVER ANTIMONY TELLURIDE

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
○	61-16	298-873		90 GeTe and 10 $AgSbTe_2$; p-type.	
△	61-16	298-833		75 GeTe and 25 $AgSbTe_2$; p-type.	



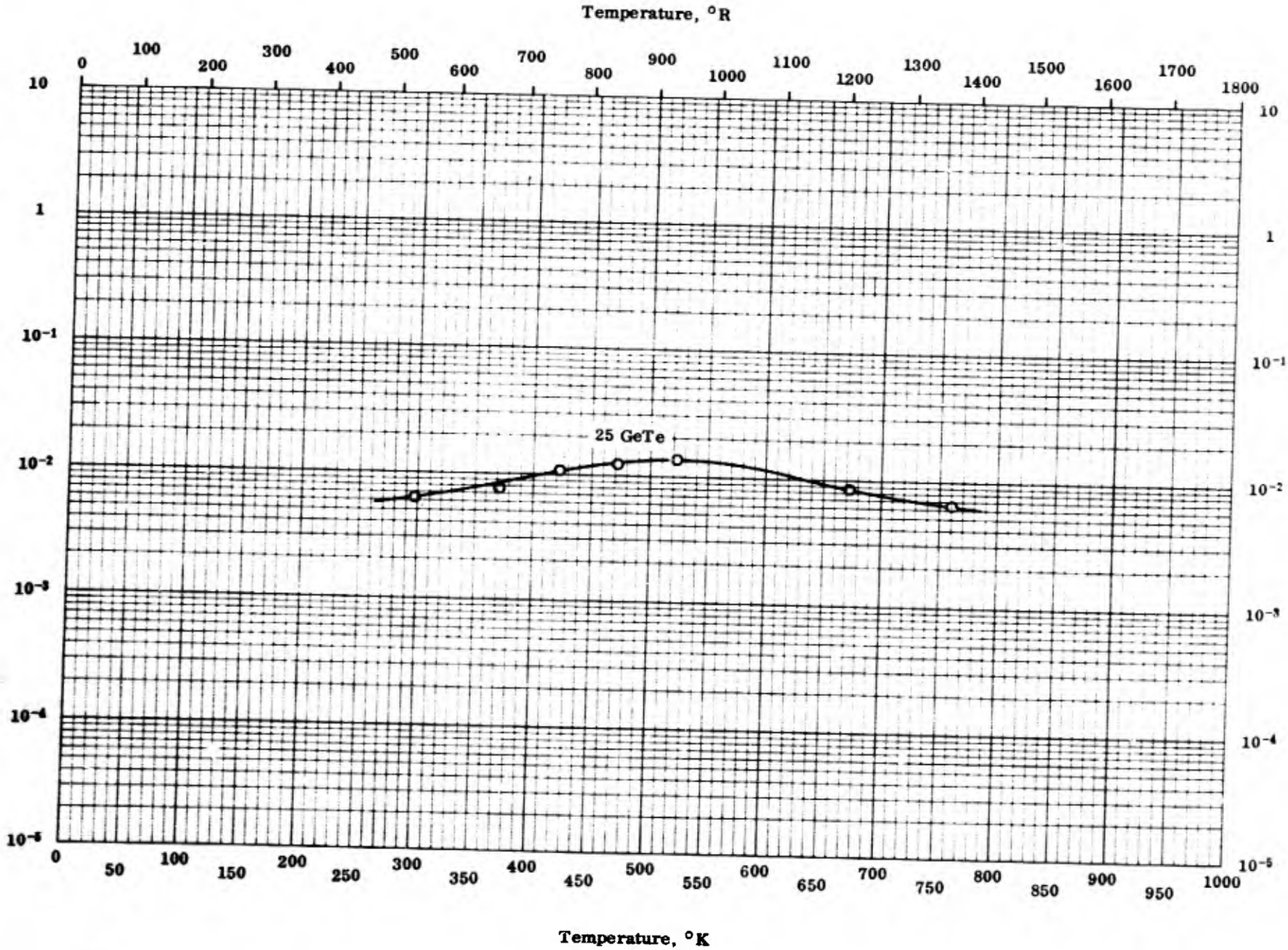
Electrical Resistivity, ohm cm x 10³

ELECTRICAL RESISTIVITY -- LEAD TELLURIDE + TIN TELLURIDE

ELECTRICAL RESISTIVITY -- LEAD TELLURIDE + TIN TELLURIDE

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
O	62-22	323-1073		75 PbTe and 25 SnTe.	Prepared by Brigdman method.



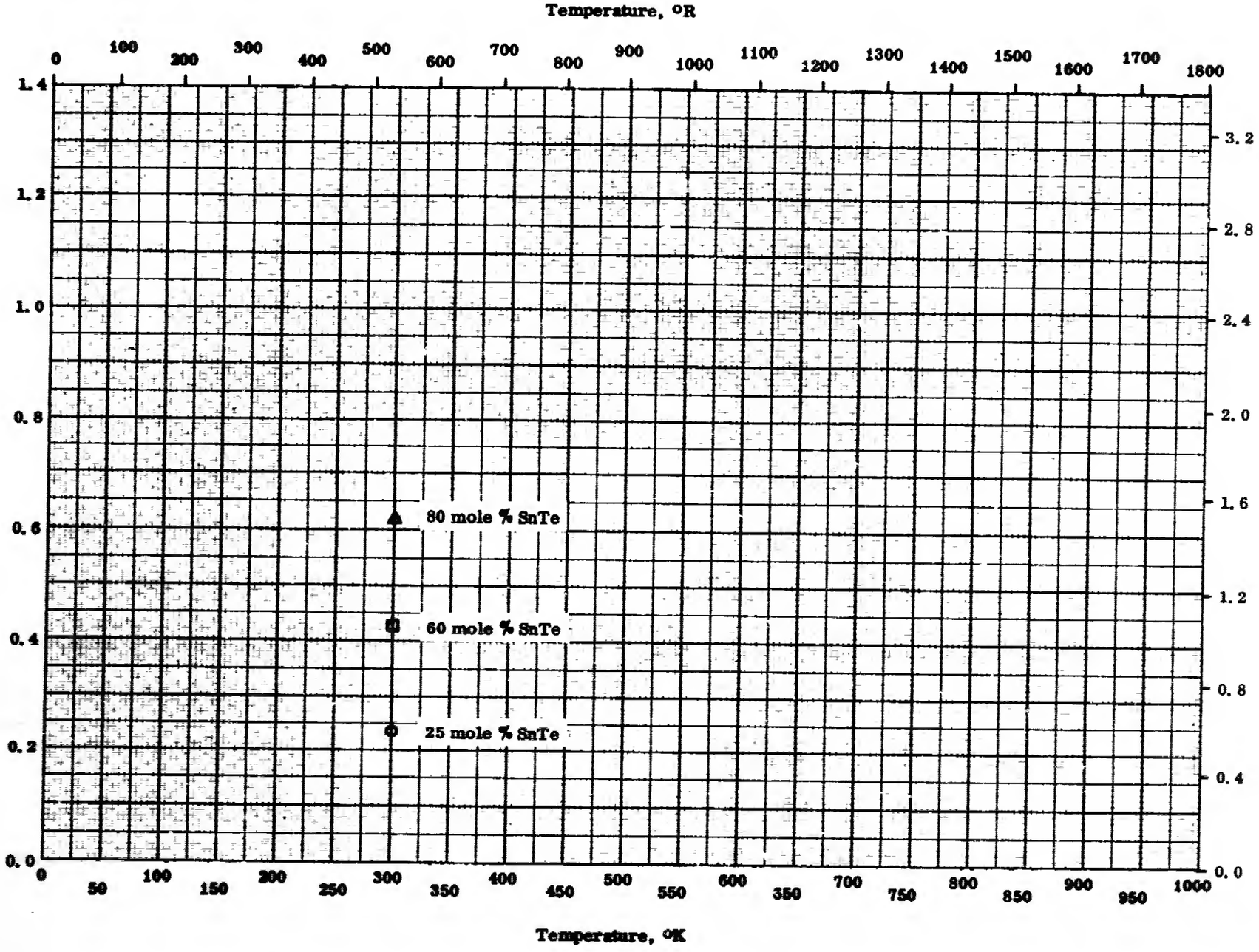
ELECTRICAL RESISTIVITY -- SILVER ANTIMONY TELLURIDE + GERMANIUM TELLURIDE

Electrical Resistivity, ohm cm

ELECTRICAL RESISTIVITY -- SILVER ANTIMONY TELLURIDE + GERMANIUM TELLURIDE

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
O	61-16	298-760		75 $AgSbTe_2$ and 25 GeTe; p-type.	



THERMAL CONDUCTIVITY -- SILVER ANTIMONY TELLURIDE + TIN TELLURIDE

THERMAL CONDUCTIVITY -- SILVER ANTIMONY TELLURIDE + TIN TELLURIDE

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
○	59-7	300		25 mole % of SnTe added to p-type $AgSbTe_2$.	
□	59-7	300		60 mole % of SnTe added to p-type $AgSbTe_2$.	
△	59-7	300		80 mole % of SnTe added to p-type $AgSbTe_2$.	

PROPERTIES OF OTHER INTERMETALLIC ALLOYS AND MIXTURES

REPORTED VALUES

Density		g cm^{-3}	lb ft^{-3}
▲	73 $MoSi_2$ and 27 $CrSi_2$	5.78	361
▼	90 ZrB_2 and 10 NbB_2	6.19	386
	88 ZrB_2 and 12 NbB_2	6.18	385
	75 ZrB_2 and 25 NbB_2	6.3	393
	50 ZrB_2 and 50 NbB_2	6.45	403
◆	98 ZrB_2 and 2 MoB_2	6.1	381
	95 ZrB_2 and 5 MoB_2	6.1	381
	90 ZrB_2 and 10 MoB_2	6.36	397
◁	95 ZrB_2 and 5 TaB_2	6.42	401
	90 ZrB_2 and 10 TaB_2	6.42	401
	80 ZrB_2 and 20 TaB_2	7.21	450
▷	70 CrB_2 and 30 TiB_2	4.95	309
	60 CrB_2 and 40 TiB_2	4.92	307
◀	90 CrB_2 and 10 VB_2	5.29	330
	50 CrB_2 and 50 VB_2	5.27	329
▶	87 NbB_2 and 13 ZrB_2	6.78	423
◇	90 VB_2 and 10 CrB_2	5.13	320
	75 VB_2 and 25 TiB_2	4.94	308
◈	99 TiB_2 and 1 CrB_2	4.54	283
	94 TiB_2 and 6 CrB_2	4.58	286
	85 TiB_2 and 15 CrB_2	4.58	286
	70 TiB_2 and 30 CrB_2	4.72	295
◈	98 TiB_2 and 2 VB_2	4.59	286
	95 TiB_2 and 5 VB_2	4.60	287
	88 TiB_2 and 12 VB_2	4.64	290
	75 TiB_2 and 25 VB_2	4.68	292
	50 TiB_2 and 50 VB_2	4.77	298
▲	97 TiB_2 and 3(Al + 2B)	4.41	275
	95 TiB_2 and 5(Al + 2B)	4.34	271
	90 TiB_2 and 10 (Al + 2B)	4.30	268
	85 TiB_2 and 15 (Al + 2B)	4.21	263
	80 TiB_2 and 20 (Al + 2B)	4.17	260
▲	63 $CrSi_2$ and 37 $MoSi_2$	5.34	333
	91 $CrSi_2$ and 9 $MoSi_2$	5.02	313

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PROPERTIES OF OTHER INTERMETALLIC ALLOYS AND MIXTURES (Continued)

REPORTED VALUES

Melting Point		K	R
○	75 Mo_2B and 25 $MoSi_2$	2363	4253
	50 Mo_2B and 50 $MoSi_2$	2293	4127
□	75 Mo_2B and 25 $TaSi_2$	2488	4478
	50 Mo_2B and 50 $TaSi_2$	2418	4352
	75 Mo_2B and 25 Ta_5Si_3	2523	4541
	50 Mo_2B and 50 Ta_5Si_3	2533	4559
△	75 Mo_2B and 25 Nb_5Si_3	2368	4262
	50 Mo_2B and 50 Nb_5Si_3	2443	4397
▽	75 TiB_2 and 25 $TaSi_2$	2363	4253
	50 TiB_2 and 50 Nb_5Si_3	2948	5306
●	75 Ta_5Si_3 and 25 Mo_2B	2653	4775
■	75 Nb_5Si_3 and 25 Mo_2B	2503	4505
▲	75 $MoSi_2$ and 25 ZrB_2	2318	4172
	50 $MoSi_2$ and 50 ZrB_2	2878	5180

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
○	55-28	2293-2363		Mo_2B and 25-50 $MoSi_2$.	Arc-melted; optical pyrometer sighting on liquid-solid interface.
□	55-28	2418-2533		Mo_2B with 25-50 $TaSi_2$ and Mo_2B with 25-50 Ta_5Si_3.	Same as above.
△	55-28	2368-2443		Mo_2B and 25-50 Nb_5Si_3.	Same as above.
▽	55-28	2363-2943		TiB_2 with 25 $TaSi_2$ and with 50 Nb_5Si_2.	Same as above.
◇	55-28	2653		Ta_5Si_3 and 25 Mo_2B.	Same as above.
●	55-28	2503		Nb_5Si_3 and 25 Mo_2B; phases at room temperature $\alpha + C_3$.	Same as above.
■	55-28	2318-2878		$MoSi_2$ with 25 ZrB_2 and with 50 ZrB_2.	Same as above.
▲	56-24	298		73 $MoSi_2$ and 27 $CrSi_2$.	Mixed element powders, compacted, heated in argon without melting, crushed, ball milled, compacted with 2 camphor, and sintered in H_2 to max densities.
▼	56-25	298		ZrB_2 and 10-50 NbB_2.	Produced by C reduction of metal oxide and B_2O_3 at 2000 C, crushed, milled 24 hrs, mixed, heated 1 hr at 2250 C, crushed again and hot-pressed in graphite dies; computed from x-ray measurements of lattice.
◆	56-25	298		ZrB_2 and 2-10 MoB_2.	Same as above except heated 1 hr at 1800 C.
◁	56-25	298		ZrB_2 and 5-20 TaB_2.	Same as above.
▷	56-25	298		CrB_2 and 30-40 TiB_2.	Same as above.

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PROPERTIES OF OTHER INTERMETALLIC ALLOYS AND MIXTURES (Continued)

REFERENCE INFORMATION

Symbol	Ref.	Temp. Range °K	Rept. Error %	Sample Specifications	Remarks
◀	56-25	298		CrB_2 and 10-50 VB_2.	Same as above.
▶	56-25	298		87 NbB_2 and 13 ZrB_2.	Same as above.
⬙	56-25	298		VB_2 with 10 CrB_2 and 75 VB_2 with 25 TiB_2.	Same as above.
◆	56-25	298		TiB_2 with 1-30 CrB_2.	Same as above.
◆	56-25	298		TiB_2 with 2-50 VB_2.	Same as above.
▲	56-25	298		TiB_2 with 3-20 (Al + 2B).	TiB_2 added by (Al + 2B) and reacted at 1400 C since AlB_2 alone could not be made; computed by x-ray measurements of lattice.
▲	56-24	298		$CrSi_2$ with 9 and 37 $MoSi_2$.	Mixed element powders, compacted, heated in argon without melting, crushed, ball-milled, compacted with 2 camphor, and sintered in H_2 to max density.