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THERMAL RADIATIVE PROPERTIES

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OF

SELECTED MATERIALS



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THERMAL RADIATIVE PROPERTIES OF SELECTED MATERIALS

by

W. D. Wood, H. W. Deem, and C. F. Lucks

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to

OFFICE OF THE DIRECTOR OF DEFENSE RESEARCH AND ENGINEERING

DEFENSE METALS INFORMATION CENTER Battelle Memorial Institute Columbus 1, Ohio

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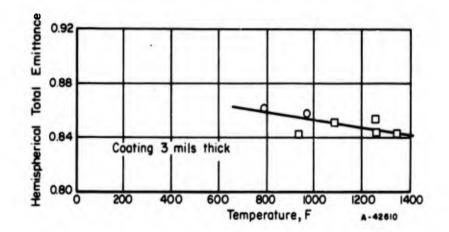
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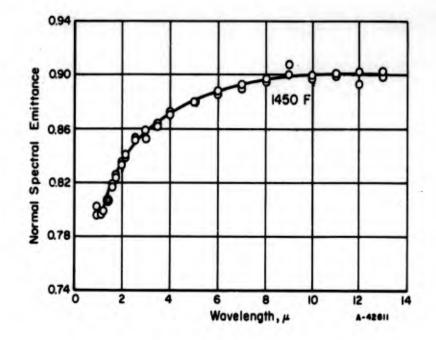
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HEMISPHERICAL TOTAL EMITTANCE OF CRYSTALLINE BORON ON COLUMBIUM

HEMISPHERICAL TOTAL EMITTANCE OF CRYSTALLINE BORON ON COLUMBIUM -- REFERENCE INFORMATION

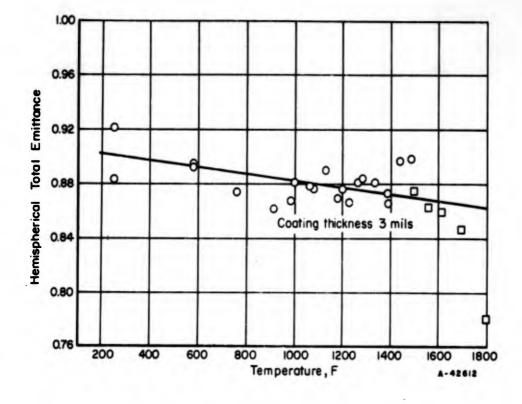
| Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|-----------------------------|---------------------------------|---|---|---|
| Pratt & Whitney Aircraft | | 3-mil-thick coating prepared by Linde Plasmarc process | Hemispherical total emittance. | Measured in vacuum |
| | | on columbium tube. | Resistance-heated tube specimen. Power dissipated in measured area. Temperatures measured | Data taken from curve. |
| | Investigator Pratt & Whitney | Investigator Symbol Pratt & Whitney | Investigator Symbol Surface Condition Pratt & Whitney 3-mil-thick coating prepared Aircraft by Linde Plasmarc process | Investigator Symbol Surface Condition Test Method Pratt & Whitney Aircraft 3-mil-thick coating prepared by Linde Plasmarc process on columbium tube. Hemispherical total emittance. Pratt & Whitney Aircraft 3-mil-thick coating prepared by Linde Plasmarc process on columbium tube. Hemispherical total emittance. Pratt & Whitney Aircraft Second Plasmarc process on columbium tube. Hemispherical total emittance. |



NORMAL SPECTRAL EMITTANCE OF CRYSTALLINE BORON ON COLUMBIUM

| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|-----------|-----------------------------|--------|--|---|---------------------------|
| 15 | Pratt & Whitney Aircraft | | 3-mil-thick coating prepared by Linde Plasmarc process | Normal spectral emittance. Electrically Meated | Measured in vacuum. |
| | | | on columbium tube. | tubular coated specimen. Integral blackbody slot in specimen tube. Temperatures measured with thermocouples and | Data taken from curve. |
| | | | | optical pyrometer. | |

NORMAL SPECTRAL EMITTANCE OF CRYSTALLINE BORON ON COLUMBIUM--REFERENCE INFORMATION

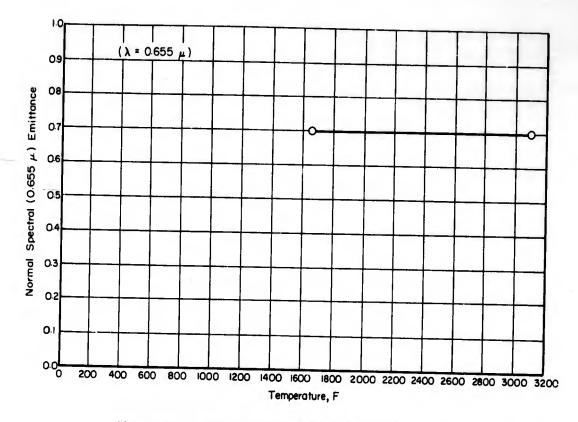


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HEMISPHERICAL TOTAL EMITTANCE OF CRYSTALLINE BORON ON MOLYBDENUM

HEMISPHERICAL TOTAL EMITTANCE OF CRYSTALLINE BORON ON MOLYBDENUM--REFERENCE INFORMATION

| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|-----------|-----------------------------|---|--|---|------------------------|
| 15 | Pratt & Whitney Aircraft | | Crystalline boron flame sprayed by Linde Plasmarc | Hemispherical total emittance. | Measured in vacuum. |
| | | | process on molybdenum strip. | Resistance-heated strip specimen. Power dissipated in | Data taken from curve. |
| | | Coating 3 mils thick (coated both sides). | measured area. Temperatures measured | | |
| | | | Note: coating loosened from molybdenum. | with thermocouples. | |



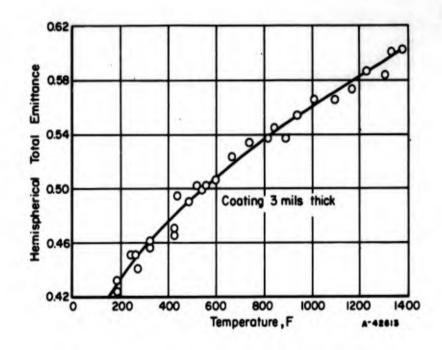
NORMAL SPECTRAL EMITTANCE OF TANTALUM BORIDE ON TUNGSTEN AND TANTALUM

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NORMAL SPECTRAL EMITTANCE OF TANTALUM BORIDE ON TUNGSTEN AND TANTALUM-REFERENCE INFORMATION

| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|-----------|---------------|--------|--|--|---|
| 6 | Morgan, F. H. | 0 | Purity or coating method not defined. Coating thickness not given. | Two methods used: (1) Coated-tungsten- strip heater. Temperatures meas- ured with thermo- couples. Brightness temperatures meas- ured with optical pyrometer. (2) Hole-in-tube method. Tantalum tube coated with test material. | Measured in vacuum. Data taken from table and discussion. Data appear to be average of hole-in- tube and strip heate methods. |

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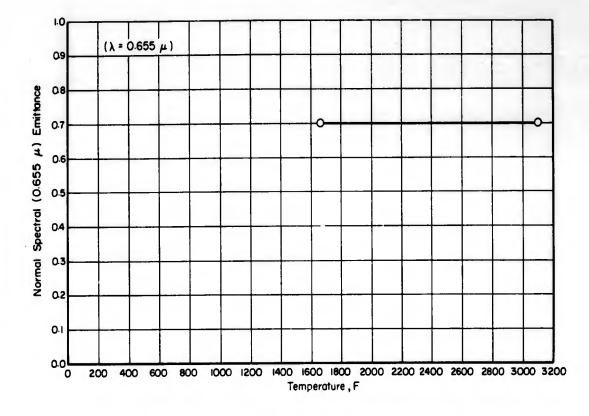


HEMISPHERICAL TOTAL EMITTANCE OF ZIRCONIUM BORIDE ON MOLYBDENUM

.

| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|-----------|-----------------------------|--------|---|---|---------------------------|
| 15 | Pratt & Whitney Aircraft | | 3-mil-thick coating of ZrB ₂ applied by the Linde | Hemispherical total emittance. | Measured in vacuum. |
| | | | Plasmarc process to a molybdenum strip. | Resistance-heated strip specimen. Power dissipated in measured area. Temperatures measured with thermocouples. | Data taken from curve, |

HEMISPHERICAL TOTAL EMITTANCE OF ZIRCONIUM BORIDE ON MOLYBDENUM--REFERENCE INFORMATION



NORMAL SPECTRAL EMITTANCE OF ZIRCONIUM BORIDE ON TANTALUM AND TUNGSTEN

NORMAL SPECTRAL EMITTANCE OF ZIRCONIUM BORIDE ON TANTALUM AND TUNGSTEN--REFERENCE INFORMATION

| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|-----------|---------------|--------|--|---|---|
| 6 | Morgan, F. H. | 0 | Purity or coating method not defined. Coating | Two methods used: | Measured in vacuum. Data taken from tabl |
| | | | thickness not given. (1) Coated-tungsten- | and discussion. Data appear to be average of hole-in- tube and strip heater methods. | |
| | | | | (2) Hole-in-tube method. Tantalum tube coated with test material. | |

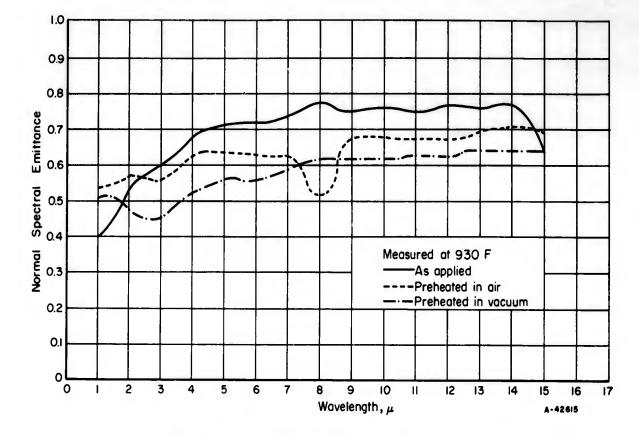
1.0 0.9 0.8 Measured at 480 F As applied -----Preheated in air —--Preheated in vacuum 0.2 0.1 0 10 н 12 13 14 15 16 17 6 9 2 3 5 8 4 7 ۱ Wavelength, µ A-42814

NORMAL SPECTRAL EMITTANCE OF BORON CARBIDE ON INCONEL X AT 480 F

NORMAL SPECTRAL EMITTANCE OF BORON CARBIDE ON INCONEL X AT 430 F--REFERENCE INFORMATION

| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|-----------|--------------|--------|---|--|-----------------|
| 14 | Adams, J. G. | | Flame sprayed on Inconel X As applied - untreated Heated 30 minutes in air at 1500 F Heated 30 minutes in 6.8 x 10 ⁻⁵ mm Hg pressure at 1500 F | Normal spectral emittance. Furnace-heated disk speci- men. Comparison blackbody (Hohlraun). Spectrometer-mono- chromator with photo- multiplier, lead sulphide, and thermo- couple detectors. Temperatures measured with thermocouples. | Measured in air |

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NORMAL SPECTRAL EMITTANCE OF BORON CARBIDE ON INCONEL X AT 930 F

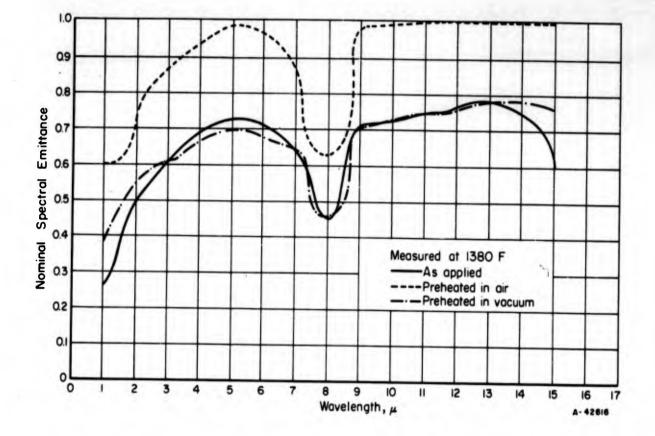
NORMAL SPECTRAL EMITTANCE OF BORON CARBIDE ON INCONEL X AT 930 F--REFERENCE INFORMATION

| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|-----------|--------------|--------|---|--|-----------------|
| 14 | Adams, J. G. | | Flame sprayed on Inconel X As applied - untreated Heated 30 minutes in air at 1500 F Heated 30 minutes in 6.8 x 10 ⁻⁵ mm Hg pressure at 1500 F | Normal spectral emittance. Furnace-heated disk speci- men. Comparison blackbody (Hohlraun). Spectrometer-mono- chromator with photo- multiplier, lead sulphide, and thermo- couple detectors. Temperatures measured with thermocouples. | Measured in air |

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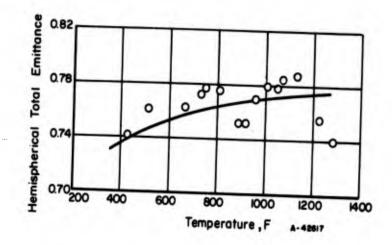


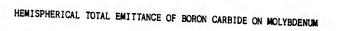
NORMAL SPECIRAL EMITTANCE OF BORON CARBIDE ON INCONEL X AT 1380 F

NORMAL SPECTRAL EMITTANCE OF BORON CARBIDE ON INCONEL X AT 1330 F--REFERENCE INFORMATION

| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|-----------|--------------|--------|---|--|-----------------|
| 14 | Adams, J. G. | | Flame sprayed on Inconel X As applied - untreated Heated 30 minutes in air at 1500 F Heated 30 minutes in 6.8 x 10 ⁻⁵ mm Hg pressure at 1500 F | Normal spectral emittance. Furnace-heated disk speci- men. Comparison blackbody (Hohlraun). Spectrometer-mono- chromator with photo- multiplier, lead sulphide, and thermo- couple detectors. Temperatures measured with thermocouples. | Measured in air |

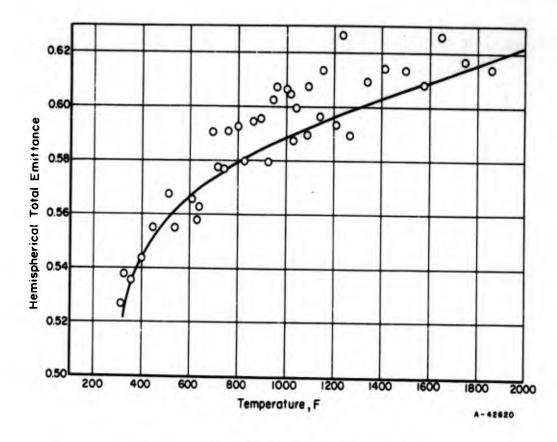
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| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|-----------|-----------------------------|--------|---|--|---|
| | Pratt & Whitney Aircraft | | 2-mil-thick coating applied by the Linde Plasmarc process to both sides of a molybdenum strip. | Hemispherical total emittance. Resistance-heated strip specimen. Power dissipated in measured area. Temperatures measured with thermocouples. | Measured in vacuum Data taken from curve. |

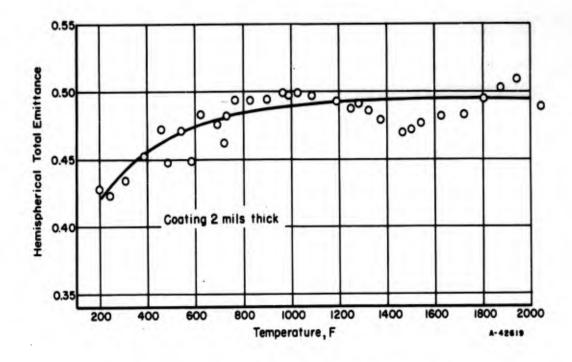
HEMISPHERICAL TOTAL EMITTANCE OF BORON CARBIDE ON MOLYBDENUM--REFERENCE INFORMATION



HEMISPHERICAL TOTAL EMITTANCE OF HAFNIUM CARBIDE ON MOLYBOENUM

| HEMISPHERICAL | TOTAL EMITTANCE | OF HAFNIUM | CARBIDE ON | MOLYBDENUMREFERENCE | INFORMATION |
|---------------|-----------------|------------|------------|---------------------|-------------|
| | | | ONIDIDE ON | MOLIDDENUMREFERENCE | INFORMATION |

| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|-----------|-----------------------------|--------|---|--|--|
| 15 | Pratt & Whitney Aircraft | | 3-mil-thick coating applied by the Linde Plasmarc process to both sides of a molybdenum strip. | Hemispherical total emittance. Resistance-heated strip specimen. Power dissipated in measured area. Temperatures measured with thermocouples. | Measured in vacuum. Data taken from curve. |

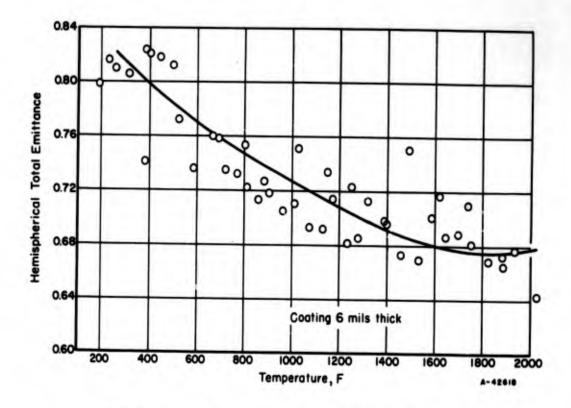


HEMISPHERICAL TOTAL EMITTANCE OF MOLYBDENUM CARBIDE ON MOLYBDENUM

HEMISPHERICAL TOTAL EMITTANCE OF MOLYBDENUM CARBIDE ON MOLYBDENUM--REFERENCE INFORMATION

| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|-----------|-----------------------------|--------|---|---|---------------------------|
| - | Pratt & Whitney Aircraft | | 2-mil-thick MoC coating applied by the Linde | Hemispherical total emittance. | Measured in vacuum. |
| | | | Plasmarc process to both sides of a molybdenum strip. | Resistance-heated strip specimen. Power dissipated in measured area. Temperatures measured with thermocouples. | Data taken from curve. |

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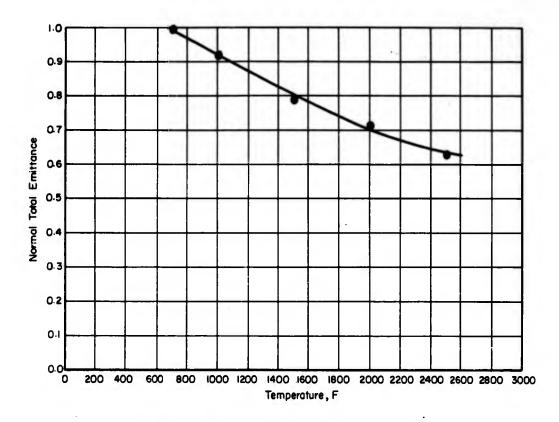
HEMISPHERICAL TOTAL EMITTANCE OF SILICON CARBIDE ON MOLYBDENUM

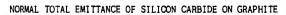
HEMISPHERICAL TOTAL EMITTANCE OF SILICON CARBIDE ON MOLYBDENUM-REFERENCE INFORMATION

| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|-----------|-----------------------------|--------|---|---|---------------------------|
| 15 | Pratt & Whitney Aircraft | | 6-mil-thick coating applied by an electrophoretic | Hemispherical total emittance. | Measured in vacuum. |
| | | | process and coated with an acrylic resin. | Resistance-heated strip specimen. Power dissipated in measured area. Temperatures measured with thermocouples. | Data taken from curve. |

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| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|-----------|-------------------|--------|---|--|---|
| 7 | Anthony and Peerl | • | As received. Coating thickness not given. | Normal total emittance. Induction-heated specimen. Thermopile detector. Comparison blackbody. Temper- atures measured with thermocouples and optical pyrometer. | Measured in con- tinuous purge of helium gas. |

NORMAL TOTAL EMITTANCE OF SILICON CARBIDE ON GRAPHITE -- REFERENCE INFORMATION

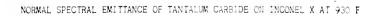
1.0 0.9 0.8 Measured at 480 F . -Untreated 0.2 ----Preheated in air -Preheated in air 0.1 ° 2 3 4 5 6 1 7 8 9 ю 11 12 13 14 15 16 17 Wavelength, μ A 42621

NORMAL SPECTRAL EMITTANCE OF TANTALUM CARBIDE ON INCONEL X AT 480 F

NORMAL SPECTRAL EMITTANCE OF TANTALUM CARBIDE ON INCONEL X AT 480 F--REFERENCE INFORMATION

| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|-----------|--------------|--------|---|--|-----------------|
| 14 | Adams, J. G. | | Flame sprayed on Inconel X As applied - untreated Heated 30 minutes in air at 1500 F Heated 30 minutes in 6.9 x 10 ⁻⁵ mm Hg pressure at 1500 F | Normal spectral emittance. Furnace-heated disk speci- men. Comparison blackbody (Hohlraun). Spectrometer-mono- chromator with photo- multiplier, lead sulphide, and thermo- couple detectors. Temperatures measured with thermocouples. | Measured in air |

0.9 0.8 Measured at 930 F -Untreated ----Preheated in air 0.2 ----Preheated in vacuum 0.1 0 L 0 8 9 IO Wavelength, μ 2 6 11 12 13 3 4 5 7 14 15 16 17 T A 42622



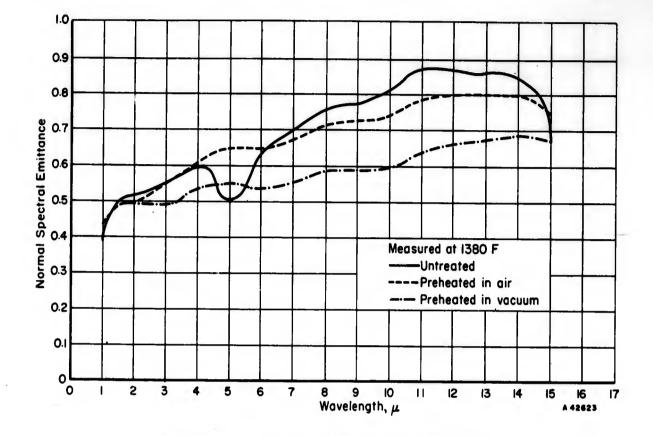
NORMAL SPECTRAL FMITTANCE OF TANTALUM CARBIDE ON INCOMEL X AT 930 F-REFERENCE INFORMATION

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| Reference | Investigator | Symbol | Composition and Surface Condition | Test Wethod | Remarks |
|-----------|--------------|--------|---|--|-----------------|
| 14 | Adams, J. G. | | Flame sprayed on Inconel X As applied - untreated Heated 30 minutes in air at 1500 F Heated 30 minutes in c.9 x 10-5 mm Hg pressure at 1500 F | Normal spectral emittance. Furnace-heated bisk speci- men. Comparison blackbody (Hohlraun). Spectrometer-mond- chromator with photo- multiplier, lead sulphide, and thermo- couple detectors. Temperatures measured with thermocouples. | MeasUreo in air |

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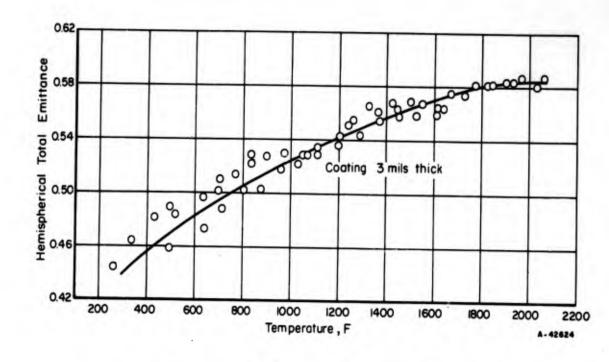
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NORMAL SPECTRAL EMITTANCE OF TANTALUM CARBIDE ON INCONEL X AT 1380 F

NORMAL SPECTRAL EMITTANCE OF TANTALUM CARBIDE ON INCONEL X AT 1380 F--REFERENCE INFORMATION

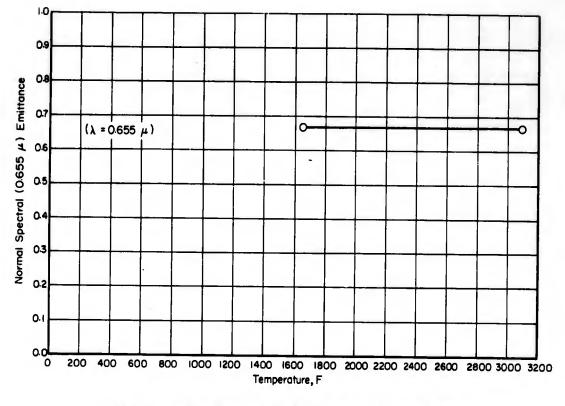
| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|-----------|--------------|--------|---|--|-----------------|
| 14 | Adams, J. G. | | Flame sprayed on Inconel X As applied - untreated Heated 30 minutes in air at 1500 F Heated 30 minutes in 6.9 x 10 ⁻⁵ mm Hg pressure at 1500 F | Normal spectral emittance. Furnace-heated disk speci- men. Comparison blackbody (Hohlraun). Spectrometer-mono- chromator with photo- multiplier, lead sulphide, and thermo- couple detectors. Temperatures measured with thermocouples. | Measured in air |



HEMISPHERICAL TOTAL EMITTANCE OF TANTALUM CARBIDE ON MOLYBDENUM

| HEMISPHERICAL IC | DTAL | EMITTANCE | OF | TANTALUM | CARBIDE | ON | MOLYBDENUM- | -REFERENCE | INFORMATION | |
|------------------|------|-----------|----|----------|---------|----|-------------|------------|-------------|--|
|------------------|------|-----------|----|----------|---------|----|-------------|------------|-------------|--|

| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|-----------|-----------------------------|--------|---|--|---------------------|
| 15 | Pratt & Whitney Aircraft | | 3-mil-thick coating applied by the Linde Plasmarc process to a molybdenum strip. | Hemispherical total emittance. Resistance-heated strip specimen. Power dissipated in measured area. Temperatures measured with thermocouples. | Measured in vacuum. |



NORMAL SPECTRAL EMITTANCE OF TANTALUM CARBIDE ON TANTALUM AND TUNGSTEN

NORMAL SPECTRAL EMITTANCE OF TANTALUM CARBIDE ON TANTALUM AND TUNGSTEN--REFERENCE INFORMATION

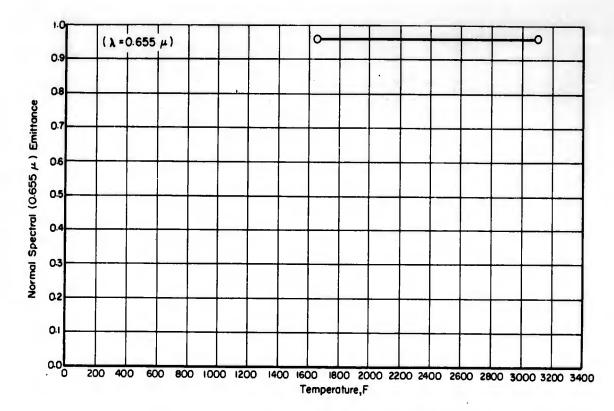
| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|-----------|---------------|--------|---|---|---|
| 6 | Morgan, F. H. | 0 | Purity or coating method not defined. Coating thickness not given. | Two methods used: (1) Coated-tungsten- strip heater. Temperatures measured with thermocouples. Brightness temper- atures measured with optical pyrometer. (2) Hole-in-tube method. Tantalum tube coated with test material. | Measured in vacuum. Data taken from table and discussion. Data appear to be average of hole-in- tube and strip heate methods. |

10 $(\lambda = 0.655 \mu)$ 0 0 0.9 0.8 Normal Spectral (0.655 μ) Emittance 07 0.6 0.5 0.4 0.3 0.2 0.1 مەل 200 400 600 800 1000 1200 1400 1600 1800 2000 2200 2400 2600 2800 3000 3200 3400 Temperature, F

NORMAL SPECTRAL EMITTANCE OF TITANIUM CARBIDE ON TANTALUM AND TUNGSTEN

NORMAL SPECTRAL EMITTANCE OF TITANIUM CARBIDE ON TANTALUM AND TUNGSTEN--REFERENCE INFORMATION

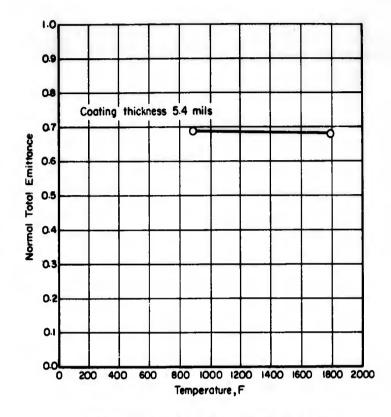
| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|-----------|---------------|--------|---|--|---|
| 6 | Morgan, F. H. | o | Purity or coating method not defined. Coating thickness not given. | Two methods used: (1) Coated-tungsten- strip heater. Temperatures measured with thermocouples. Brightness temper- ature measured with optical pyrometer, and | Measured in vacuum. Data taken from tabl and discussion. Data appear to be average of hole-in- tube and strip heater methods. |
| | | | | (2) Hole-in-tube method. Tantalum tube coated with test material. | |



NORMAL SPECTRAL EMITTANCE OF ZIRCONIUM CARBIDE ON TANTALUM AND TUNGSTEN

NORMAL SPECTRAL EMITTANCE OF ZIRCONIUM CARBIDE ON TANTALUM AND TUNGSTEN--REFERENCE INFORMATION

| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|-----------|---------------|--------|---|--|--|
| 6 | Morgan, F. H. | o | Purity or coating method not defined. Coating thickness not given. | Two methods used: (1) Coated-tungsten- strip heater with temperature measured with thermocouples, optical pyrometer for brightness temperatures and | Measured in vacuum. Data taken from table and dis- cussion. Data appear to be average of hole-in tube and strip heater methods. |
| | | | | (2) Hole-in-tube. Tantalum tube coated with test material. | |



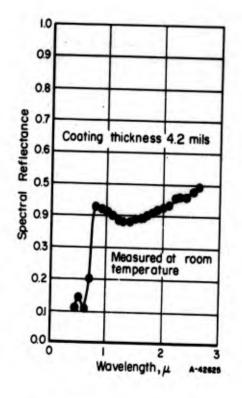
NORMAL TOTAL EMITTANCE OF A-418 ENAMEL ON INCONEL

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NORMAL TOTAL EMITTANCE OF A-418 ENAMEL ON INCONEL--REFERENCE INFORMATION

| 1 | Burgess, Jasperse, Marcus, Martin, and Flint | 0 | A-418 Enamel on Inconel. Coating thickness 5.4 mils. | Normal total emittance. Rotating, hollow, cylindrical, Globar heating element. Blackbody hole. Specimen mounted in heating element flush with wall. Temper- atures measured with thermocouples. Infrared spectrometer with prism replaced by plane mirror. Thermo- couple detector. | Measured in air. Data taken from tables. |
|---|--|---|--|--|--|

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SPECTRAL REFLECTANCE OF A-418 ENAMEL ON INCONEL

SPECTRAL EMITTANCE OF A-418 ENAMEL ON INCONEL--REFERENCE INFORMATION

| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|---------------------------------|--|--------|--|---|--|
| 1 | Burgess, Jasperse, Marcus, Martin, and Flint | • | Enamel A-418 on Inconel. Coating thickness 4.2 mils. | Spectral reflectance. Commercial reflect- ometer and spectro- photometer. Quartz prism mono- chromator. MgO standard. (Normal viewing-diffuse reflection) | Measured in air ai room temperature. Data taken from table. |
| Coating Comp | osition by Weight | | | | |
| NBS Frit N Cr ₂ O | 0. 332 - 70 per cent - 30 per cent | | | | |

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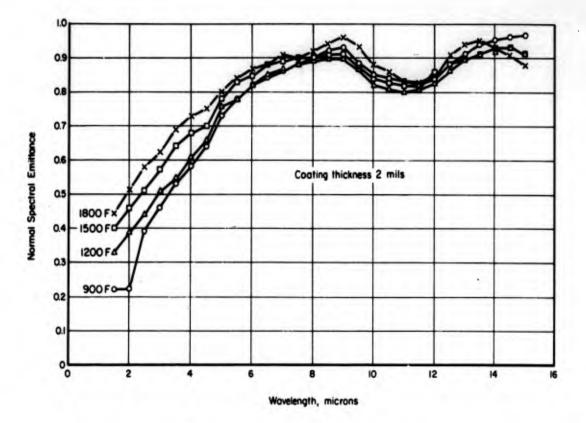
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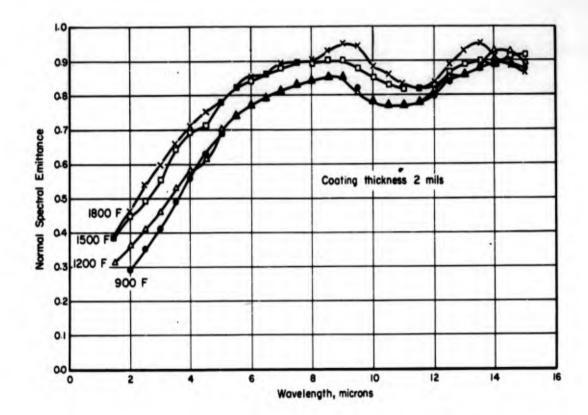


NORMAL SPECTRAL EMITTANCE OF A-418 ENAMEL ON INCONEL

NORMAL SPECTRAL EMITTANCE OF A-418 ENAMEL ON INCONEL-REFERENCE INFORMATION

| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|-----------|----------------------|---------|--|---|--|
| 2 | Richmond and Stewart | 0 4 0 × | A-418 consists of alkali- free barium beryllium silicate frit with addition of chromic oxide. Coating thick- ness 2 mils. Coated on Inconel. Runs made at the following temperatures: 900 F 1200 F 1500 F 1800 F | Normal spectral emittance. Double-beam infrared spectrometer with sodium chloride prism. Secondary standard [silicon carbide (Globar)] calibrated against laboratory blackbody. Temperatures measured with thermocouples. | Measured in air Data taken from table. |

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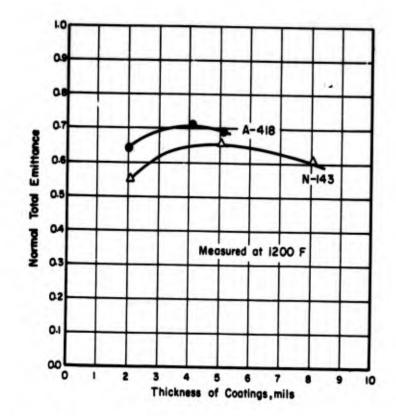
NORMAL SPECTRAL EMITTANCE OF A-418 ENAMEL ON TYPE 321 STAINLESS STEEL

NORMAL SPECTRAL EMITTANCE OF A-418 ENAMEL ON TYPE 321 STAINLESS STEEL-REFERENCE INFORMATION

| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|-----------|----------------------|-----------|--|---|---|
| 2 | Richmond and Stewart | • | A-418 consists of alkali- free barium beryllium silicate frit with addition of chromic oxide. Coating thickness 2 mils. Coated on Inconel. Runs made at the following temperatures: 900 F 1200 F 1500 F 1800 F | Normal spectral emittance. Double-beam infrared spectrometer with sodium chloride prism. Secondary standard [silicon carbide (Globar)] calibrated against laboratory blackbody. Temperatures measured with thermocouples. | Measured in air. Data taken from table. |

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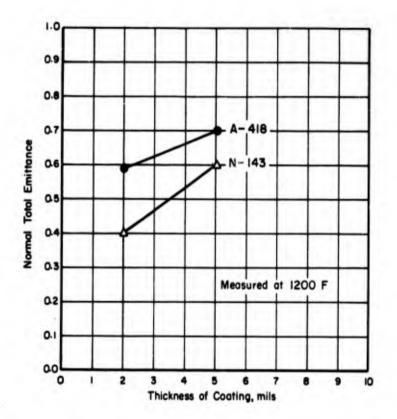
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VARIATION OF NORMAL TOTAL EMITTANCE WITH THICKNESS OF A-418 AND N-143 ENAMELS ON INCONEL AT 1200 F

| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|-----------|----------------------|--------|--------------------------------------|---|-------------------------------------|
| 2 | Richmond and Stewart | | Inconel coated with NBS coatings: | Normal total emittance. Thermopile detector. | Measured in air. Data taken from |
| | | • | A-418 N-143 | Comparison blackbody. Temperatures measured with thermocouples. | CUIVES, |

VARIATION OF NORMAL TOTAL EMITTANCE WITH THICKNESS OF A-418 AND N-143 ENAMELS ON INCONEL AT 1200 F-REFERENCE INFORMATION



VARIATION OF NORMAL TOTAL EMITTANCE VERSUS COATING THICKNESS OF A-418 AND N-143 ENAMELS ON TYPE 321 STAINLESS STEEL AT 1200 F

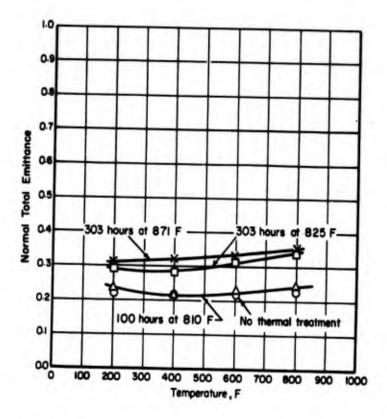
| VARIATION OF | NORMAL TOTAL | . EMITTANCE VERSUS | COATING THICKNESS | OF A-418 AND N-143 ENAMELS |
|--------------|--------------|--------------------|-------------------|----------------------------|
| | ON TYPE 321 | STAINLESS STEEL A | T 1200 FREFERENCE | INFORMATION |

| Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|----------------------|--------|--|---|---|
| Richmond and Stewart | | Type 321 stainless steel with NBS coatings: | Normal total emittance. Thermopile detector. Comparison blackbody. | Measured in air. Data taken from curves. |
| | • | A-418 | | |
| | Δ | N-143 | with thermocouples, | |
| | | Richmond and Stewart | Investigator Symbol Surface Condition Richmond and Stewart Type 321 stainless steel with NBS coatings: A-418 | Investigator Symbol Surface Condition Test Method Richmond and Stewart Type 321 stainless steel with NBS coatings: Normal total emittance. Thermopile detector. Comparison blackbody. Temperatures measured |

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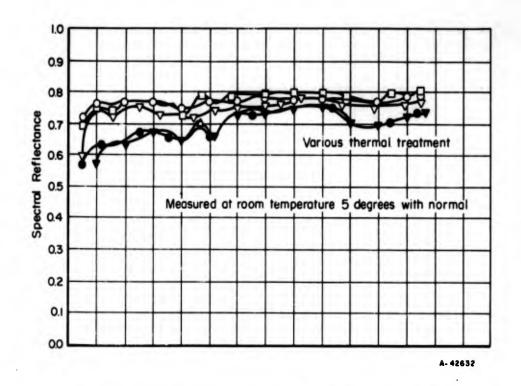
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NORMAL TOTAL EMITTANCE OF ALUMINIZED SILICONE PAINT ON TI-75A TITANIUM

| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|-----------|-----------------------------|--------|--|---|--|
| 3 | Bevans, Gier, and Dunkle | | Dow-Corning XP-310 aluminized-silicone paint, on Ti-75A titanium (Mat'l. Spec. AMS 4901). No thickness given. | Normal total emittance. Calibrated thermopile detector. Temperatures measured with thermocouples. | Measured in air. Data taken from tables. |
| | | 0 | No thermal treatment. | | • |
| | | Δ | 100 hours at 810 F. | | |
| | | | 303 hours at 825 F. | | |
| | | × | 303 hours at 871 F. | | |

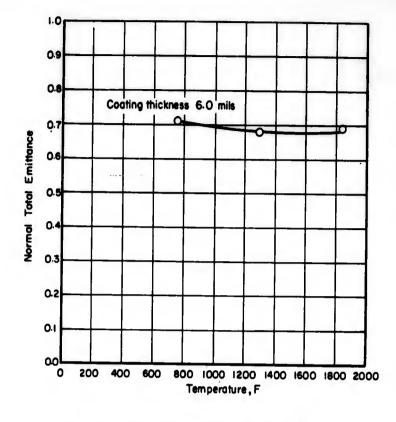
NORMAL TOTAL EMITTANCE OF ALUMINIZED SILICONE PAINT ON TI-75A TITANIUM--REFERENCE INFORMATION



SPECTRAL REFLECTANCE OF ALUMINIZED SILICONE PAINT ON Ti-75A TITANIUM

| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|-----------|-----------------------------|--------|---|--|---|
| 3 | Bevans, Gier, and Dunkle | | Dow-Corning XP-310 alumi- nized-silicone paint on Ti-75A (Mat'l. Spec. AMS 4901). No thickness given. | Spectral reflectance at 5 degrees with normal. Gier-Dunkle reflect- ometer monochromator. Temperatures measured | Measured in air at room temperature. Data taken from tables. |
| | | Δ | No thermal treatment. | with thermocouples. | |
| | | 0 | 300 hours at 600 F. | (Diffuse illumi- | |
| | | 0 | 100 hours at 810 F. | nation-normal | |
| | | • | 303 hours at 825 F. | viewing) | |
| | | ▲ | 303 hours at 871 F. | • | |

SPECTRAL REFLECTANCE OF ALUMINIZED-SILICONE PAINT ON TI-75A TITANIUM--REFERENCE INFORMATION

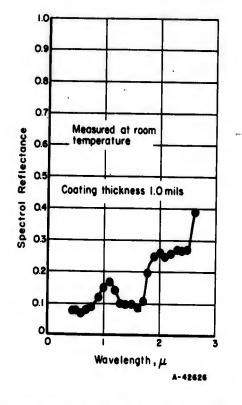


NORMAL TOTAL EMITTANCE OF B-1 ENAMEL ON INCONEL

| NORMAL | TOTAL | EMITTANCE | OF | B-1 | ENAMEL | ON | INCONELREFERENCE | INFORMATION |
|--------|-------|-----------|----|-----|--------|----|------------------|-------------|
|--------|-------|-----------|----|-----|--------|----|------------------|-------------|

| Referenc | e Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|----------|--|--------|--|---|--|
| 1 | Burgess, Jasperse, Marcus, Martin, and Flint | 0 | B-1 Enamel on Inconel. Coating thickness 6.0 mils. | Normal total emittance. Rotating, hollow, cylindrical, Globar heating element. | Measured in air. Data taken from tables. |
| | | | and a second | Blackbody hole. Specimen mounted in heating element flush | |
| | | | | with wall. Temperatures measured with thermocouples. | |
| | | | | Infrared spectrometer with prism replaced by plane mirror. | |
| Coating | Composition by Weight | | | Thermocouple detector. | |
| B1 | it No. 332 - 60 per cent ack Stain* - 25 per cent $r_{2}O_{3}$ - 15 per cent | | | | |

*Co₂O₃, 28 per cent; Fe₂O₃, 37 per cent; Cr₂O₃, 10 per cent; MnO₂, 11 per cent; NiO, 14 per cent.



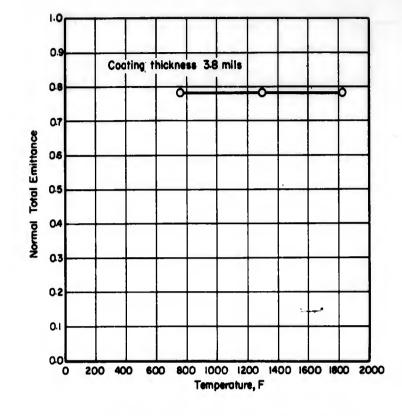
SPECTRAL REFLECTANCE OF INCONEL COATED WITH B-1 ENAMEL

| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|-----------|--|--------|--|---|--|
| 1 | Burgess, Jasperse, Marcus, Martin, and Flint | • | Enamel B-1 on Inconel. Coating thickness 1.0 mil. | Spectral reflectance. Commercial reflect- ometer and spectro- photometer with quartz prism mono- chromator. MgO standard. (Normal viewing-diffuse reflection) | Measured in air at room temperature. Data taken from table. |

SPECTRAL REFLECTANCE OF INCONEL COATED WITH B-1 ENAMEL-REFERENCE INFORMATION

| NBS | Frit No. 332 | - | 60 per | cent | |
|-----|--------------|---|--------|------|--|
| | Black Stain* | - | 25 per | cent | |
| | Cr203 | | 15 per | | |

*Co₂O₃, 28 per cent; Fe₂O₃, 37 per cent; Cr₂O₃, 10 per cent; MnO₂, 11 per cent; NiO, 14 per cent.

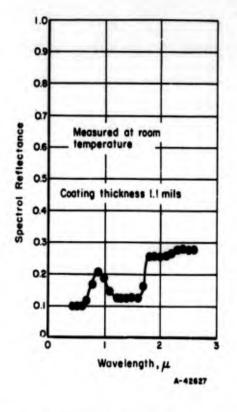


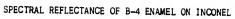
NORMAL TOTAL EMITTANCE OF B-4 ENAMEL ON INCONEL

| | | |
|-------|------------|------|
| Compo | sition and | |

NORMAL TOTAL EMITTANCE OF B-4 ENAMEL ON INCONEL--REFERENCE INFORMATION

| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|--------------------------------------|---|--------|--|---|--|
| 1 Coating Comp | Burgess, Jasperse, Marcus, Martin, and Flint | o | B-4 Enamel on Inconel. Coating thickness 3.8 mils. | Normal total emittance. Rotating hollow cylindrical Globar heating element. Blackbody hole. Specimen mounted in heating element flush with wall. Temper- atures measured with thermocouples. Infrared spectrometer with prism replaced by plane mirror. Thermo- couple detector. | Measured in air. Data taken from tables. |
| NBS Filt No Cr2O3 CoO Fe2O3 | a) 332 - 60 per cent b) 5 per cent c) 15 per cent c) 20 per cent | | | | |





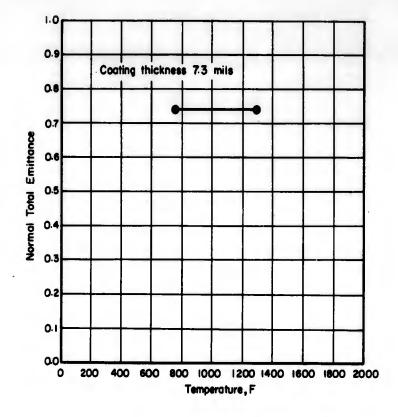
SPECTRAL REFLECTANCE OF B-4 ENAMEL ON INCONEL -- REFERENCE INFORMATION

| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|--------------------------------|--|--------|--|--|---|
| 1 | Burgass, Jasperse, Marcus, Martin, and Flint | • | Enamel B-4 on Inconel. Coating thickness l.1 mils. | Spectral reflectance. Commercial reflect- ometer with quartz prism monochromator. MgO standard. (Normal viewing- diffuse reflection) | Measured in air at room temperature. |
| Coating Com | position by Weight | | | | |
| NBS Frit N | lo. 332 - 60 per cent | | | | |
| Cr203 | - 5 per cent | | | | |
| Coð | - 15 per cent | | | | |
| Fe ₂ O ₃ | - 20 per cent | | | | |

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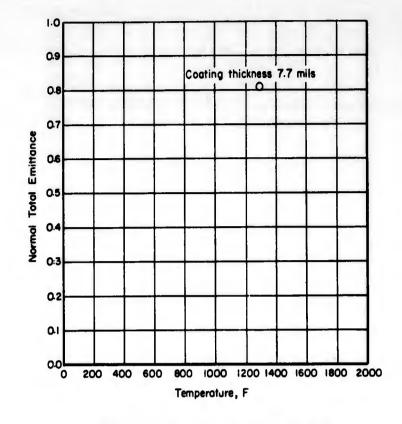
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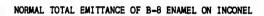


NORMAL TOTAL EMITTANCE OF B-7 ENAMEL ON INCONEL

NORMAL TOTAL EMITTANCE OF B-7 ENAMEL ON INCONEL--REFERENCE INFORMATION

| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|------------|--|--------|--|---|--|
| 1 | Burgess, Jasperse, Marcus, Martin, and Flint | • | B-7 Enamel on Inconel. Coating thickness 7.3 mils. | Normal total emittance. Rotating hollow cylindrical Globar heating element. Blackbody hole. Specimen mounted in heating element flush with wall. Temperatures measured with thermocouples. Infrared spectrometer with prism replaced by plane mirror. Thermocouple detector. | Measured in air. Data taken from tables. |
| oating Com | position by Weight | | | | |

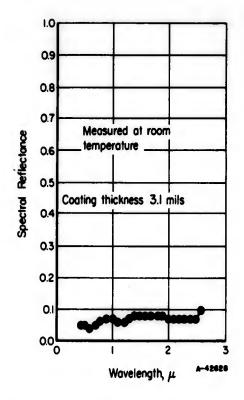




NORMAL TOTAL EMITTANCE OF B-8 ENAMEL ON INCONEL -- REFERENCE INFORMATION

| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|-------------|--|--------|--|--|--|
| 1 | Burgess, Jasperse, Marcus, Martin, and Flint | ο | B-8 Enamel on Inconel. Coating thickness 7.7 mils. | Normal total emittance. Rotating, hollow, cylindrical, Globar heating element. Blackbody hole. Specimen mounted in heating element flush with wall. Temperatures measured with thermocouples. Infrared spectrometer with prism replaced by plane mirror. Thermocouple detector. | Measured in air. Data taken from tables. |
| Coating Com | position by Weight | | | | |

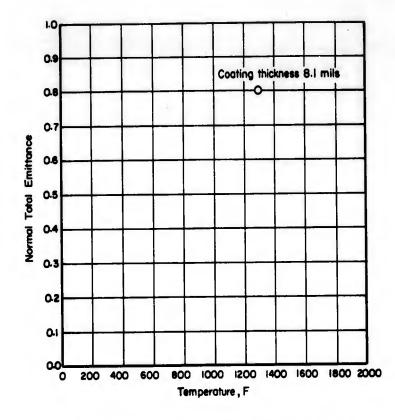
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SPECTRAL REFLECTANCE OF B-8 ENAMEL ON INCONEL

SPECTRAL REFLECTANCE OF B-8 ENAMEL ON INCONEL-REFERENCE INFORMATION

| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|-----------------------|--|--------|--|--|--|
| 1 | Burgess, Jasperse, Marcus, Martin, and Flint | • | Enamel B-8 on Inconel. Coating thickness 3.1 mils. | Spectral reflectance. Commercial reflect- ometer with quartz prism monochromator. MgO standard. (Normal viewing- diffuse reflection) | Measured in air at room temperature. Data taken from table. |
| Coating Comm | position by Weight | | 8 - | | |
| NBS Frit No NiO·Cr | 0. 332 - 60 per cent 2 ⁰ 3 - 40 per cent | | | | |



NORMAL TOTAL EMITTANCE OF B-9 ENAMEL ON INCONEL

NORMAL TOTAL EMITTANCE OF B-9 ENAMEL ON INCONEL--REFERENCE INFORMATION

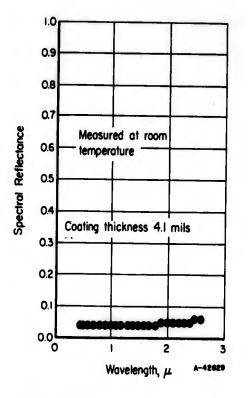
| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|-----------|--|--------|--|---|---|
| 1 | Burgess, Jasperse, Marcus, Martin, and Flint | 0 | B-9 Enamel on Inconel. Coating thickness 8.1 mils. | Normal total emittance. Rotating hollow cylindrical Globar heating element. Blackbody hole. Specimen mounted in heating element flush with wall. Temperatures measured with thermocouples. | Measured in air Data taken from tables. |

NBS Frit No. 332 - 60 per cent NiO·Fe₂O₃ spinel - 40 per cent

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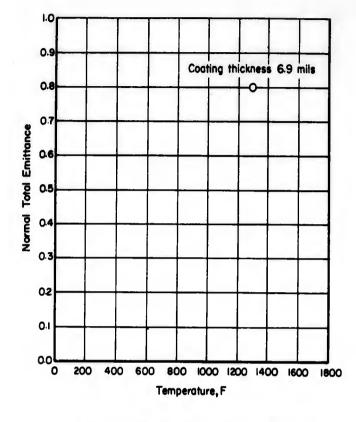
SPECTRAL REFLECTANCE OF B-9 ENAMEL ON INCONEL

SPECTRAL REFLECTANCE OF B-9 ENAMEL ON INCONEL -- REFERENCE INFORMATION

| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|-----------------------|--|--------|--|--|--|
| 1 | Burgess, Jasperse, Marcus, Martin, and Flint | • | Enamel B-9 on Inconel. Coating thickness 4.1 mils. | Spectral reflectance. Commercial reflect- ometer with quartz prism monochromator. MgO standard. (Normal viewing- diffuse reflection) | Measured in air at room temperature. Data take- from table. |
| Coating Com | position by Weight | | | | |
| NBS Frit No NiO·Fe | 2° . 332 - 60 per cent 2° - 40 per cent | | | | |

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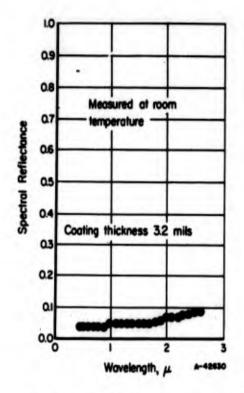
NORMAL TOTAL EMITTANCE OF B-11 ENAMEL ON INCONEL

NORMAI. TOTAL EMITTANCE OF B-11 ENAMEL ON INCONEL -- REFERENCE INFORMATION

| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|--------------|--|--------|---|--|--|
| 1 | Burgess, Jasperse, Marcus, Martin, and Flint | 0 | B-11 Enamel on Inconel. Coating thickness 6.9 mils. | Normal total emittance. Rotating, hollow, cylindrical, Globar heating element. Blackbody hole. Specimen mounted in heating element flush with wall. Temperatures measured with thermocouples. Infrared spectrometer with prism replaced by plane mirror. Thermocouple detector. | Measured in air. Data taken from tables. |
| Coating Comm | osition by Weight | | | | |

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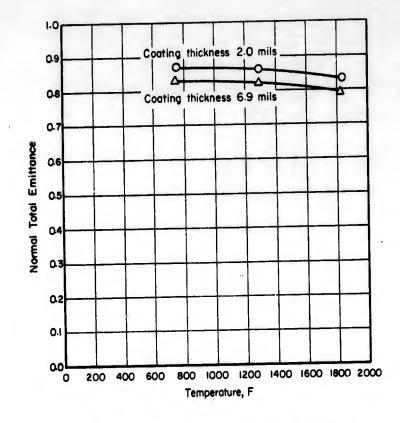


SPECTRAL REFLECTANCE OF B-11 ENAMEL ON INCONEL

SPECTRAL REFLECTANCE OF B-11 ENAMEL ON INCONEL--REFERENCE INFORMATION

| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|-----------------------|--|--------|---|--|--|
| 1 | Burgess, Jasperse, Marcus, Martin, and Flint | • | Enamel B-11 on Inconel. Coating thickness 3.2 mils. | Spectral reflectance. Commercial reflect- ometer and spectro- photometer with quartz prism monochromator. MgO standard. (Normal viewing- diffuse reflection) | Measured in air at room temperature. Data taken from table. |
| Coating Com | position by Weight | | | | |
| NBS Frit No CoO·Fe | 0. 332 - 60 per cent 2^{0}_{3} - 40 per cent | | | | |

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NORMAL TOTAL EMITTANCE OF B-12 ENAMEL ON INCONEL

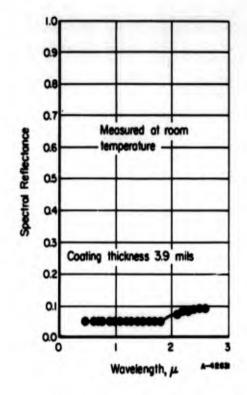
NORMAL TOTAL EMITTANCE OF B-12 ENAMEL ON INCONEL-REFERENCE INFORMATION

| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remaiks |
|-----------|--|--------|---|--|---|
| 1 | Burgess, Jasperse, Marcus, Martin, and Flint | 0 | B-12 Enamel on Inconel. Coating thickness 2.0 mils. Coating thickness 6.9 mils. | Normal total emittance. Rotating, hollow, cylindrical, Globar heating element. Blackbody hole. Specimen mounted in heating element flush with wall. Temperatures measured with thermocouples. Infrared spectrometer with prism replaced by plane mirror. Thermocouple detector. | Measured in air Data taken from tables. |

Coating Composition by Weight

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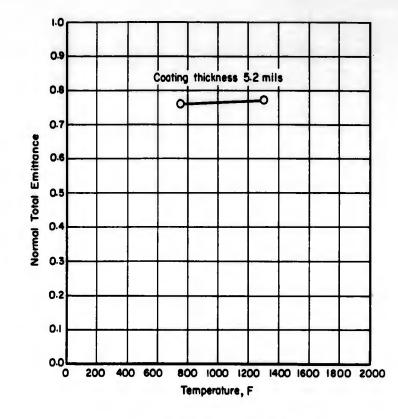
NBS Frit No. 332 - 60 per cent $Co0 \cdot Mn_2O_3$ spinel - 40 per cent



SPECTRAL REFLECTANCE OF B-12 ENAMEL ON INCONEL

SPECTRAL REFLECTANCE OF B-12 ENAMEL ON INCONEL-----

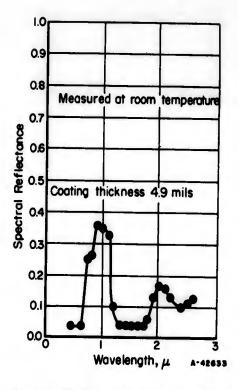
| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|----------------------|---|--------|--|--|--|
| 1 | Burgess, Jasperse, Marcus, Martin, and Flint | • | Enamel B-12 on Inconel. Coating thickness 3.9 mils. | Spectral reflectance (normal viewing- diffuse reflection). Commercial reflect- ometer and spectro- photometer. Quartz prism mono- chromator. MgO standard. | Measured in air at room temperature. Data taken from table. |
| Coating Com | position by Weight | | | | |
| NBS Frit N CoO·Mn | 0. $332 - 60$ per cent $2^{0}_{3} - 40$ per cent | | | | |



NORMAL TOTAL EMITTANCE OF B-13 ENAMEL ON INCONEL

NORMAL TOTAL EMITTANCE OF B-13 ENAMEL ON INCONEL--REFERENCE INFORMATION

| Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|--|--|---|--|--|
| Burgess, Jasperse, Marcus, Martin, and Flint | 0 | B-13 Enamel on Inconel. Coating thickness 5.2 mils. | Normal total emittance. Rotating, hollow, cylindrical, Globar heating element. Blackbody hole. Specimen mounted in heating element flush with wall. Temperatures measured with thermocouples. Infrared spectrometer with prism replaced by plane mirror. Thermocouple detector. | Measured in air. Data taken from tables. |
| sition by Weight | | | | |
| | Burgess, Jasperse, Marcus, Martin, and Flint | Burgess, Jasperse, O Marcus, Martin, and Flint | Burgess, Jasperse, O B-13 Enamel on Inconel. Marcus, Martin, and Coating thickness 5.2 Flint mils. | Burgess, Jasperse, Marcus, Martin, and Flint Burgess, Jasperse, Flint Bis. B-13 Enamel on Inconel. Coating thickness 5.2 mils. Bis. Normal total emittance. Rotating, hollow, cylindrical, Globar heating element. Blackbody hole. Specimen mounted in heating element flush with wall. Temperatures measured with thermocouples. Infrared spectrometer with prism replaced by plane mirror. Thermocouple detector. |

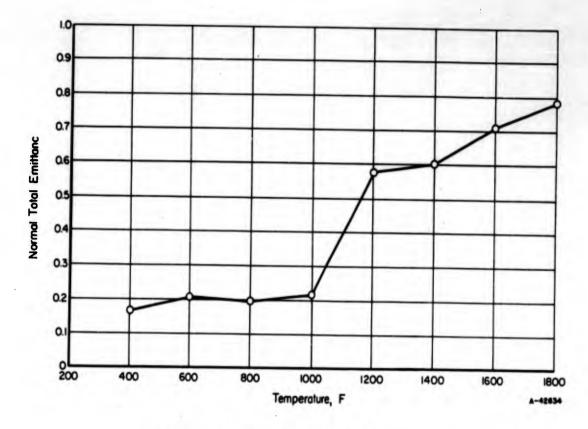


SPECTRAL REFLECTANCE OF B-13 ENAMEL ON INCONEL

SPECTRAL REFLECTANCE OF B-13 ENAMEL ON INCONEL-REFERENCE INFORMATION

| Reference | Investigator | Symbol | Composition and Surface Condition | 'Test Method | Remarks |
|------------------------|--|--------|---|--|--|
| 1 | Burgess, Jasperse, Marcus, Martin, and Flint | • | Enamel B-13 on Inconel. Coating thickness 4.9 mils. | Spectral reflectance. (Normal viewing- diffuse reflection.) Commercial reflectometer and spectrophotometer. Quartz prism mono- chromator. MgO standard. | Measured in air at room temperature. Data taken from table. |
| Coating Com | position by Weight | | | | |
| NBS Frit No CoO.Cr, | 0. 332 - 50 per cent 2 ⁰ 3 - 50 per cent | | | | |

,

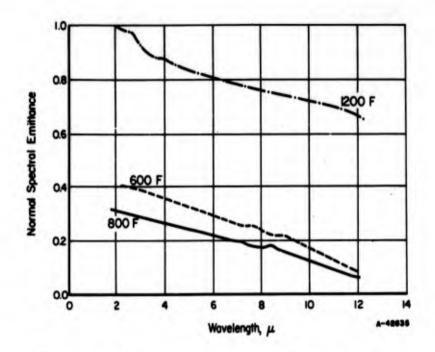


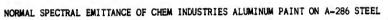


NORMAL TOTAL EMITTANCE OF CHEM INDUSTRIES ALUMINUM PAINT ON A-286 STEEL-REFERENCE INFORMATION

| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|-----------|------------------|--------|--|--|--|
| 13 | Gravina and Katz | | Chem Industries high- temperature silicone-base aluminum paint. Coating thickness and surface condition not given. | Normal total emittance. Resistance-heated strip specimen. Thermistor-bolometer detector. Reference blackbody. Temperatures measured with thermocouples. | Measured in air. Data taken from curves. |

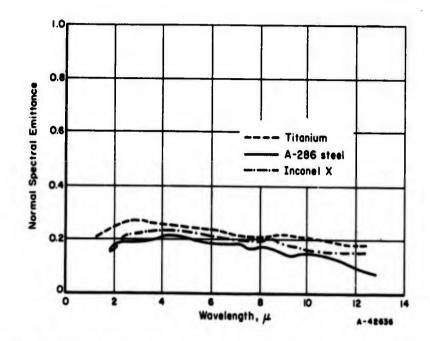
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| NORMAL SPECTRA | L EMITTANCE OF CHEM | INDUSTRIES ALL | UMINUM PAINT ON | A-286 | STEELREFERENCE INFORMATION |
|----------------|---------------------|----------------|-----------------|-------|----------------------------|
|----------------|---------------------|----------------|-----------------|-------|----------------------------|

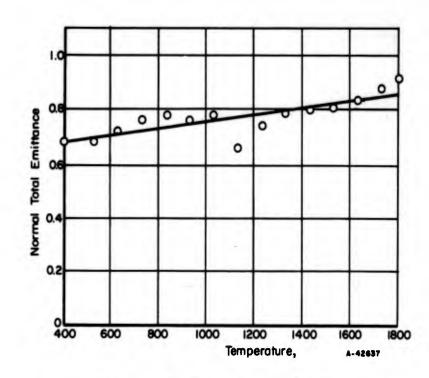
| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|-----------|------------------|-------------------------------------|--|---|------------------|
| 13 | Gravina and Katz | | Chem Industries high- temperature aluminum, | Normal spectral emittance. Resistance-heated strip | Measured in air. |
| | | silicone-base paint on A-286 steel. | specimen. Thermistor-bolometer de- | Data taken from curves. | |
| | 5 | | Thickness and surface | tector. Monochromator. | |
| | | | condition not given. Measured at: | Reference blackbody. | |
| | | | 600 F | Temperatures measured | |
| | | 800 F | with thermocouples. | | |
| | | | 1200 F | | |



NORMAL SPECTRAL EMITTANCE OF CHEM INDUSTRIES ALUMINUM PAINT ON TITANIUM, STEEL, AND INCONEL X AT 800 F

| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|-----------|------------------|--------|---|---|--|
| 13 | Gravina and Katz | | Chem Industries high- temperature, silicone- base aluminum paint. Thickness and surface condition not given. Coated on: 6A1-4V Titanium Inconel X A-286 steel All measurements at 800 F. | Normal spectral emittance. Resistance-heated strip specimen. Thermistor-bolometer detector. Monochromator. Reference blackbody. Temperatures measured with thermocouples. | Measured in air. Data taken from curves. |

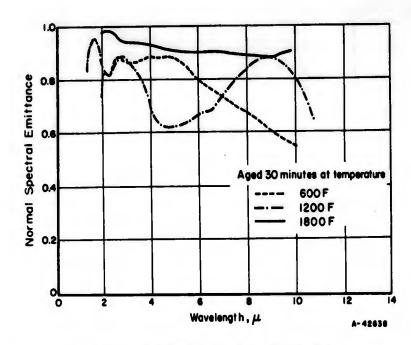
NORMAL SPECTRAL EMITTANCE OF CHEM INDUSTRIES ALUMINUM PAINT ON TITANIUM, STEEL, AND INCONEL X-REFERENCE INFORMATION



NORMAL TOTAL EMITTANCE OF DU LITE -0 ON A-286 STEEL

NORMAL TOTAL EMITTANCE OF DULITE 3-0 COATING ON A-286 STEEL--REFERENCE INFORMATION

| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|-----------|------------------|--------|---|--|--|
| 13 | Gravina and Katz | | DuLite 3-0, an oxide surface conversion coating. Composition or coating thickness not given. | Normal total emittance. Resistance-heated strip specimen. Thermistor-bolometer detector. Reference blackbody. Temperatures measured with thermocouples. | Measured in air. Data taken from curves. |

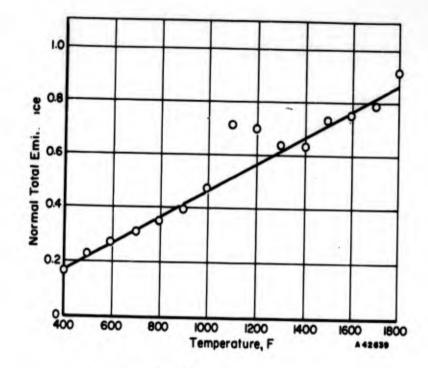


NORMAL SPECTRAL EMITTANCE OF DU LITE 3-0 ON A-286 STEEL

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NORMAL SPECTRAL EMITTANCE OF DULITE 3-0 COATING ON A-286 STEEL-REFERENCE INFORMATION

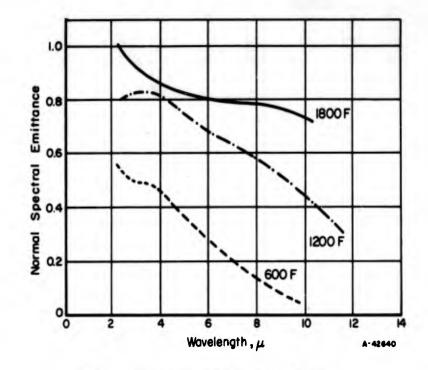
| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|-----------|------------------|--------|---|---|---|
| 13 | Gravina and Katz | | DuLite 3-0, an oxide conversion coating. No thickness or composition given. Aged 30 minutes at temperature. Measured at: 600 F 1200 F 1800 F | Normal spectral emittance. Resistance-heated strip specimen. Thermistor-bolometer de- tector. Monochromator. Reference blackbody. Temperatures measured with thermocouples. | Measured in air Data taken from curves. |



NORMAL TOTAL EMITTANCE OF DU LITE 3-0 ON INCONEL X

| NORMAL IDIAL EMITTANCE OF DULITE 3-0 COATING ON INCONEL X-REFERENCE INFORMATIC |
|--|
|--|

| eference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|-----------------|------------------|--------|--|--|--|
| , ¹³ | Gravina and Katz | | DuLite 3-0, an oxide surface conversion coating. Composition or coating thickness not given. | Normal total emittance. Resistance-heated strip specimen. Thermistor-bolometer de- tector. Reference blackbody. Temperatures measured with thermocouples. | Measured in air. Data taken from curves, |



NORMAL SPECTRAL EMITTANCE OF DU LITE 3-0 ON INCONEL X

| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|-----------|------------------|--------|--|---|------------------|
| 13 | Gravina and Katz | | DuLite 3—0, an oxide conversion coating of the | Normal spectral emittance. Resistance-heated strip | Measured in air. |
| | | | base metal. | specimen. | Data taken from |
| | | | Thickness or surface condition not given. | Thermistor-bolometer de- tector. | curves. |
| | | | Measured at: | Monochromator. | |
| | | | 600 F | Reference blackbody. | |
| | | | 1200 F | Temperatures measured | |
| | | | 1800 F | with thermocouples. | |

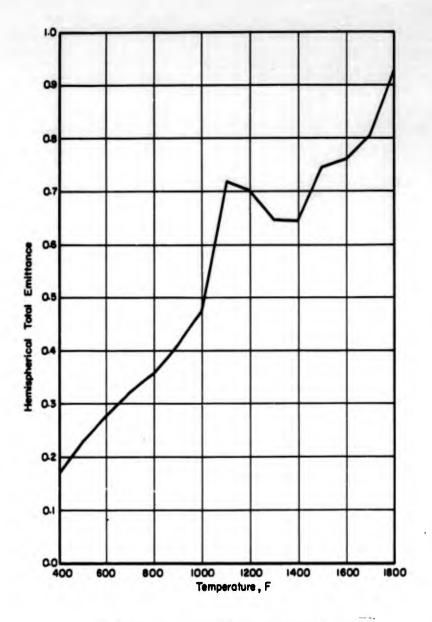
NORMAL SPECTRAL EMITTANCE OF DULITE 3-0 ON INCONEL X--REFERENCE INFORMATION

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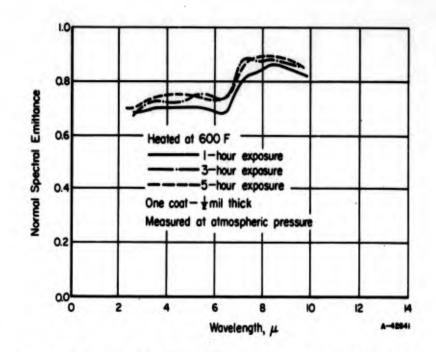
HEMISPHERICAL TOTAL EMITTANCE OF DULITE 3-0 ON TITANIUM

HEMISPHERICAL TOTAL EMITTANCE OF DULITE 3-0 ON TITANIUM--REFERENCE INFORMATION

| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|-----------|--------------|--------|---|--|--|
| 4 | Dull, R. L. | | DuLite 3-O coating on titanium. No thickness given. (DuLite 3-O is an oxide conversion coating of the base metal.) Note: Color of specimen surface changed con- siderably as the temperature increased. Original color - black. | Hemispherical total emittance. Resistance-heated strip. Specimens coated with test material. Measured power input to test section. Temperatures measured with thermocouples. | Measured in air. Data taken from curves. |

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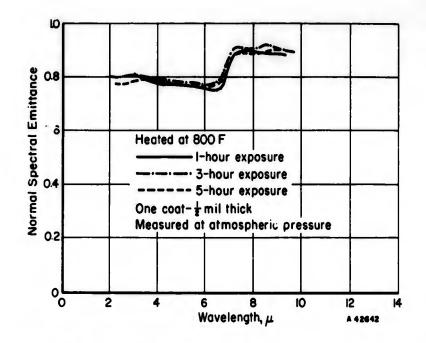
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NORMAL SPECTRAL EMITTANCE OF GULTON CERAMIC COATING 6013 ON A-286 STEEL AT 600 F

| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|-----------|------------------|--------|---|---|------------------|
| 13 | Gravina and Katz | | Gulton ceramic coating 6013. A high chrome-bearing | Normal spectral emittance. Resistance-heated strip | Measured in air. |
| | | | coating. Applied as a slip, dried, and fired. | specimen. Thermistor-bolometer | Data taken from |
| | | | One coat, 1/2-mil thick, | detector. | CUrves. |
| | | | continuously heated at | Monochromator. | |
| | | | 600 F: | Reference blackbody. | |
| | | | 1 hour | Temperatures measured | |
| | | | 3 hours | with thermocouples. | |
| | | | 5 hours | | |

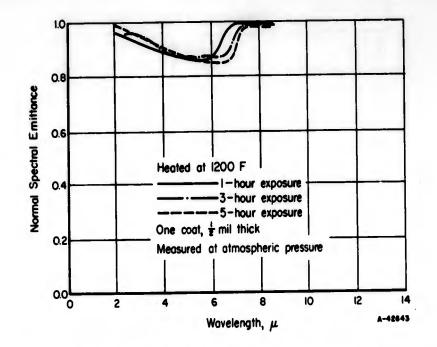
NORMAL SPECTRAL EMITTANCE OF GULTON CERAMIC COATING 6013 ON A-286 STEEL AT 600 F--REFERENCE INFORMATION



NORMAL SPECTRAL EMITTANCE OF GULTON CERAMIC COATING 6013 ON A-286 STEEL AT 800 F

NORMAL SPECTRAL EMITTANCE OF GULTON CERAMIC COATING 6013 ON A-286 STEEL AT 800 F--REFERENCE INFORMATION

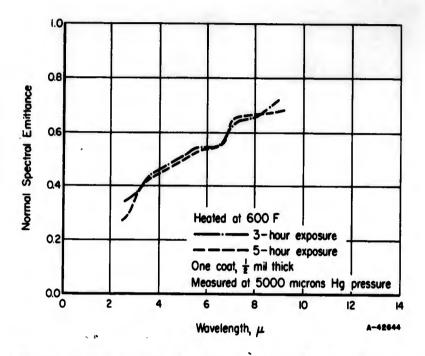
| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|-----------|------------------|--------|---|---|----------------------------|
| 13 | Gravina and Katz | | Gulton ceramic coating 6013. A high chrome-bearing coating. Applied as a slip | Normal spectral emittance. Resistance-heated strip specimen. | Measured in air. |
| | | | on sand-blasted A-286 steel, dried, and fired. One coat, 1/2 mil thick, continuously heated at 800 F: 1 hour 3 hours 5 hours | Thermistor-bolometer de- tector. Monochromator. Reference blackbody. Temperatures measured with thermocouples. | Data taken from curves. |



NORMAL SPECTRAL EMITTANCE OF GULTON CERAMIC COATING 6013 ON A-286 STEEL AT 1200 F

NORMAL SPECTRAL EMITTANCE OF GULTON CERAMIC COATING 6013 ON A-286 STEEL AT 1200 F-REFERENCE INFORMATION

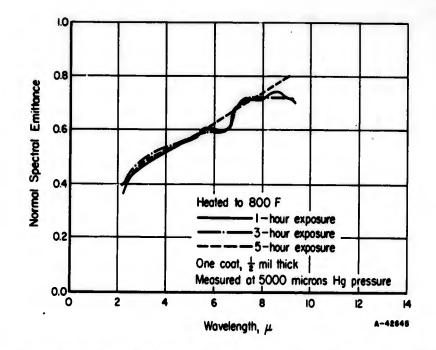
| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|-----------|------------------|--------|---|---|--|
| 13 | Gravina and Katz | | Gulton ceramic coating 6013. A high-chrome-bearing coating. Applied as a slip on sand-blasted A-286 steel, dried, and fired. 1 coat, 1/2-mil thick, continuously heated at 1200 F: 1 hour 3 hours 5 hours | Normal spectral emittance. Resistance-heated strip specimen. Thermistor-bolometer detector. Monochromator. Reference blackbody. Temperatures measured with thermocouples. | Measured in air. Data taken from curves. |



NORMAL SPECTRAL EMITTANCE OF GULTON CERAMIC COATING 6013 ON A-286 STEEL AT 600 F

| NORMAL SPECTRAL | EMITTANCE C | F GULTON | CERAMIC COATING | 6013 C | ON A-286 | STEEL A | T 600 | FREFERENCE INFORMA | TION |
|-----------------|-------------|----------|-----------------|--------|----------|---------|-------|--------------------|------|
|-----------------|-------------|----------|-----------------|--------|----------|---------|-------|--------------------|------|

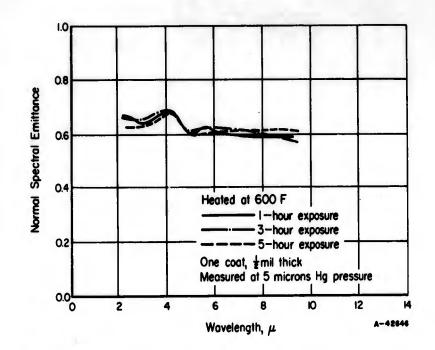
| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|-----------|------------------|--------|---|---|--|
| 13 | Gravina and Katz | | Gulton peramic coating,6013. A high-chrome-bearing coating. Applied as a slip on sand-blasted material, dried, and fired. l coat, 1/2 mil thick. Heated at 600 F: 3 hours 5 hours | Normal spectral emittance. Resistance-heated strip specimen. Thermistor-bolometer detector. Monochromator. Reference blackbody. Temperatures measured with thermocouples. | Measured in 5000 micron Hg pressure. Data taken from curves. |



NORMAL SPECTRAL EMITTANCE OF GULTON CERAMIC COATING 6013 ON A-286 STEEL AT 800 F

NORMAL SPECTRAL EMITTANCE OF GULTON CERAMIC COATING 6013 ON A-286 STEEL AT 800 F--REFERENCE INFORMATION

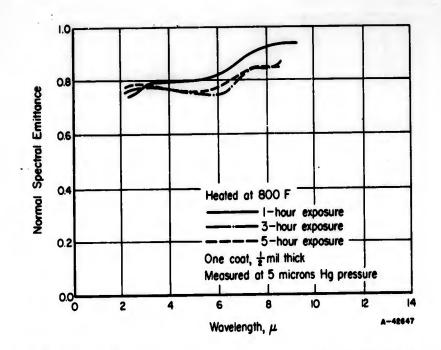
| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|-----------|------------------|--------|---|---|--|
| 13 | Gravina and Katz | | Gulton ceramic coating 6013. A high-chrome-bearing coating. Applied as a slip on sand-blasted material, dried, and fired. l coat, 1/2 mil thick. | Normal spectral emittance. Resistance-heated strip specimen. Thermistor-bolometer detector. Monochromator. | Measured in 5000 micron Hg pressure. Data taken from curves. |
| | | • | Heated at 800 F: 1 hour 3 hours 5 hours | Reference blackbody. Temperatures measured with thermocouples. | |



NORMAL SPECTRAL EMITTANCE OF GULTON CERAMIC COATING 6013 ON A-286 STEEL AT 600 F

NORMAL SPECTRAL EMITTANCE OF GULTON CERAMIC COATING 6013 ON A-286 STEEL AT 600 F-REFERENCE INFORMATION

| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|-----------|------------------|--------|--|--|---|
| 13 | Gravina and Katz | | Gulton ceramic coating 6013. A high-chrome-bearing coating. Applied as a slip on sand-blasted material, | Normal spectral emittance. Resistance-heated strip specimen. Thermistor-bolometer | Measured in 5 micron Hg pressure. |
| | | | dried, and fired. l coat, 1/2-mil thick. Heated at 600 F: | detector. Monochromator. Reference blackbody. | Data taken fro curves. |
| • | | | 1 hour 3 hours 5 hours | Temperatures measured with thermocouples. | |

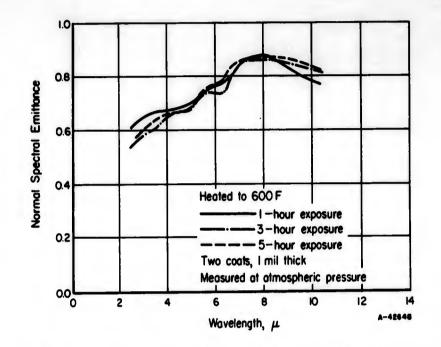


NORMAL SPECTRAL EMITTANCE OF GULTON CERAMIC COATING 6013 ON A-286 STEEL AT 800 F

NORMAL SPECTRAL EMITTANCE OF GULTON CERAMIC COATING 6013 ON A-286 STEEL AT 800 F--REFERENCE INFORMATION

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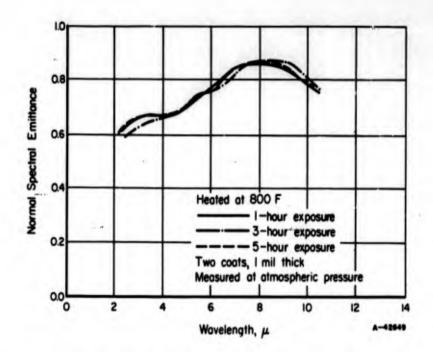
| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|-----------|------------------|--------|---|---|--|
| 13 | Gravina and Katz | | Gulton ceramic coating 6013. A high-chrome-bearing coating. Applied as a slip on sand-blasted material, dried, and fired. 1 coat, 1/2-mil thick. Heated at 800 F: 1 hour 3 hours 5 hours | Normal spectral emittance. Resistance-heated strip specimen. Thermistor-bolometer detector. Monochromator. Reference blackbody. Temperatures measured with thermocouples. | Measured in 5 microns Hg pressure. Data taken from curves. |



NORMAL SPECTRAL EMITTANCE OF GULTON CERAMIC COATING 6013 ON A-286 STEEL AT 600 F

NORMAL SPECTRAL EMITTANCE OF GULTON 6013 CERAMIC COATING ON A-286 STEEL AT 600 F-REFERENCE INFORMATION

| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|-----------|------------------|--------|--|---|--|
| 13 | Gravina and Katz | | Gulton ceramic coating 6013. A high-chrome-bearing coating. Applied as a slip to sand-blasted A-286 steel, dried, and fired. 2 coats, 1 mil thick. Continuously heated at 1600 F: 1 hour 3 hours 5 hours | Normal spectral emittance. Resistance-heated strip specimen. Thermistor-bolometer detector. Monochromator. Reference blackbody. Temperatures measured with thermocouples. | Measured in air. Data taken from curves. |



NORMAL SPECTRAL EMITTANCE OF GULTON CERAMIC COATING 6013 ON A-286 STEEL AT 800 F

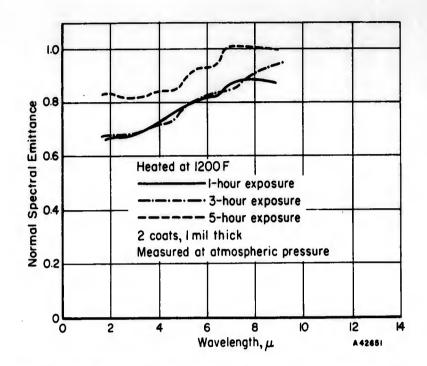
| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|---------------------|--------------|---|---|-----------------------------------|-----------------|
| 13 Gravina and Katz | | Gulton ceramic coating 6013. A high-chrome-bearing | Normal spectral emittance. Resistance-heated strip | Measured in air | |
| | | | coating. Applied as a slip | specimen. | Data taken from |
| | | | on sand-blasted A-286 steel, dried, and fired. | Thermistor-bolometer detector. | curves. |
| | | · | 2 coats, 1 mil thick. | Monochromator. | •• |
| | | Continuously heated at | Reference blackbody. | | |
| | | 800 F: | Temperatures measured | | |
| | | l hour | with thermocouples. | | |
| | | | 3 hours | | |
| | | | 5 hours | | |

NORMAL SPECTRAL EMITTANCE OF GULTON 6013 CERAMIC COATING ON A-286 STEEL AT 800 F-REFERENCE INFORMATION

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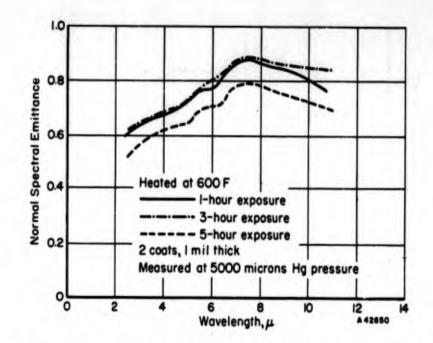


NORMAL SPECTRAL EMITTANCE OF GULTON CERAMIC COATING 6013 ON A-286 STEEL AT 1200 F

NORMAL SPECTRAL EMITTANCE OF GULTON 6013 CERAMIC COATING ON A-286 STEEL AT 1200 F--REFERENCE INFORMATION

| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|-----------|------------------|--------|--|---|---|
| 13 | Gravina and Katz | | Gulton ceramic coating 6013. A high-chrome-bearing coating. Applied as a slip on sand-blasted A-286 steel, dried, and fired. 2 coats, 1 mil thick. Heated at 1200 F: 1 hour 3 hours 5 hours | Normal spectral emittance. Resistance-heated strip specimen. Thermistor-bolometer detector. Monochromator. Reference blackbody. Temperatures measured with thermocouples. | Measured in air Data taken from curves. |

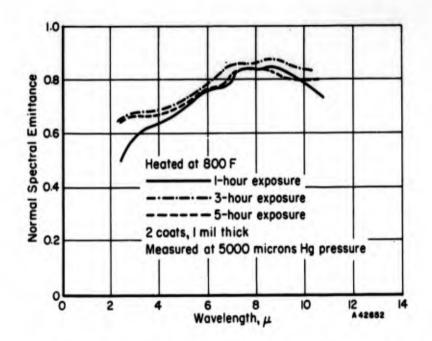
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NORMAL SPECTRAL EMITTANCE OF GULTON CERAMIC COATING 6013 ON A-286 STEEL AT 600 F

NORMAL SPECTRAL EMITTANCE OF GULTON 6013 CERAMIC COATING ON A-286 STEEL AT 600 F-REFERENCE INFORMATION

| Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|------------------|--------|---|--|---|
| Gravina ard Katz | | Gulton ceramic coating 6013. A high-chrome-bearing coating. Applied as a slip on sand-blasted A-286 steel, | Normal spectral emittance. Resistance-heated strip specimen. Thermistor-bolometer | Measured in 5000 micron Hg pressure. |
| | | dried, and fired. 2 coats, 1 mil thick. Heated at 600 F: 1 hour 3 hours 5 hours | detector. Monochromator. Reference blackbody. Temperatures measured with thermocouples. | Data taken from curves. |
| | | · · · · · | Investigator Symbol Surface Condition Gravina and Katz Gulton ceramic coating 6013. A high-chrome-bearing coating. Applied as a slip on sand-blasted A-286 steel, dried, and fired. 2 coats, 1 mil thick. Heated at 600 F: 1 hour 3 hours | InvestigatorSymbolSurface ConditionTest MethodGravina ard KatzGulton ceramic coating 6013. A high-chrome-bearing coating. Applied as a slip on sand-blasted A-286 steel, dried, and fired. 2 coats, 1 mil thick.Normal spectral emittance. Resistance-heated strip specimen.00sand-blasted A-286 steel, dried, and fired. 2 coats, 1 mil thick.Normal spectral emittance. Resistance-heated strip specimen.1hour BabursThermistor-bolometer detector.2high-chrome-bearing coating. Applied as a slip on sand-blasted A-286 steel, detector.Thermistor-bolometer detector.2coats, 1 mil thick. l hour 3 hoursMonochromator. Temperatures measured with thermocouples. |

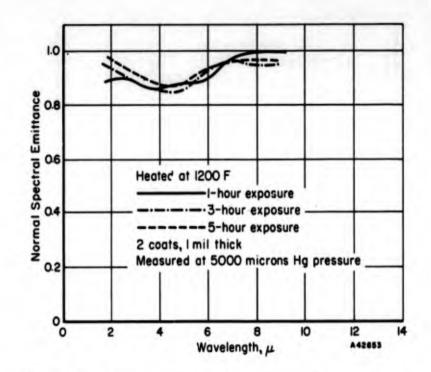


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NORMAL SPECTRAL EMITTANCE OF GULTON CERAMIC COATING 6013 ON A-286 STEEL AT 800 F

NORMAL SPECTRAL EMITTANCE OF GULTON 6013 CERAMIC COATING ON A-286 STEEL AT 800 F--REFERENCE INFORMATION

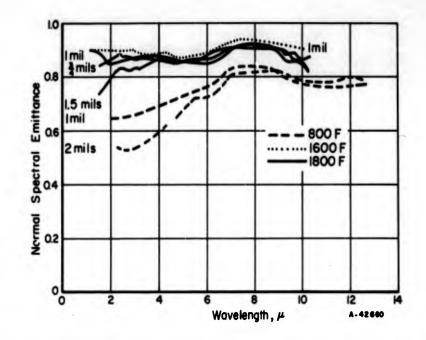
| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|---------------------|--------------|---|--|---|----------------------------|
| 13 Gravina and Katz | | Gulton ceramic coating 6013. A high-chrome-bearing coating. Applied as a slip on sand-blasted A-286 steel. | Normal spectral emittance. Resistance-heated strip specimen. Thermistor-bolometer | Measured in 5000 micron pressure. | |
| | | | dried, and fired. 2 coats, 1 mil thick. Heated at 800 F: 1 hour 3 hours 5 hours | detector. Monochromator. Reference blackbody. Temperatures measured with thermocouples. | Data taken fron curves. |



NORMAL SPECTRAL EMITTANCE OF GULTON CERAMIC COATING 6013 ON A-286 STEEL AT 1200 F

NORMAL SPECTRAL EMITTANC : OF GULTON 6013 CERAMIC COATING ON A-286 STEEL AT 1200 F-REFERENCE INFORMATION

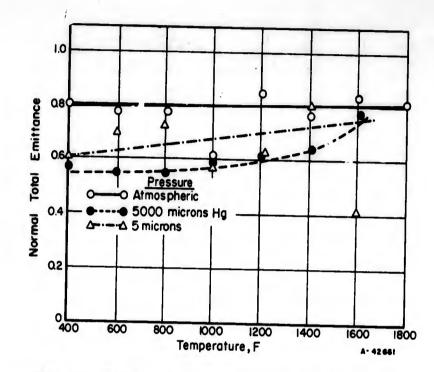
| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|--------------------|------------------|--------|---|--|-------------------------------------|
| 13 Gravina and Kat | Gravina and Katz | | Gulton ceramic coating 6013. A high-chrome-bearing coating. Applied as a slip | Normal spectral emittance. Resistance-heared strip specimen. | Measured in 5000 micron pressure |
| | | | on sand-blasted A-286 steel, dried, and fired. 2 coats, 1 mil thick. | Thermistor-bolometer detector. Monochromator. | Data taken from curves. |
| | | | Heated at 1200 F: 1 hour | Reference blackbody. Temperatures measured | |
| | | | 3 hours 5 hours | with thermocouples. | |



VARIATION OF THE NORMAL SPECTRAL EMITTANCE OF GULTON CERAMIC COATING 6013 ON INCONEL X WITH COATING THICKNESS AND TEMPERATURE

NORMAL SPECTRAL EMITTANCE OF GULTON CERAMIC COATING 6013 ON INCONEL X-REFERENCE INFORMATION

| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|-----------|------------------|--------|--|---|---|
| 13 | Gravina and Katz | | Gulton ceramic coating 6013. A high-chrome-bearing coating. Applied as a slip on sand-blasted material, •dried, and fired. Coating thicknesses, 3/4, 1, 1.5, and 2 mils Measured at: 800 F 1600 F 1800 F | Normal spectral emittance. Resistance-heated strip specimen. Thermistor-bolometer detector. Monochromator. Reference blackbody. Temperatures measured with thermocouples. | Measured in air Data taken from curves. |

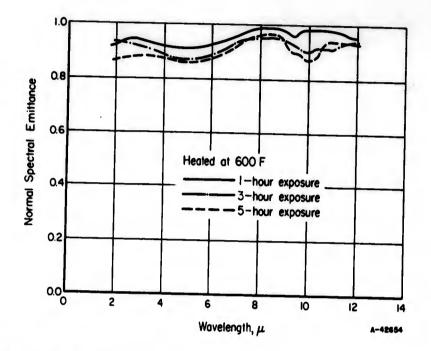


NCRMAL TOTAL EMITTANCE OF NATIONAL LEAD BLACK PAINT 46H47 ON A-286 STEEL

| NORMAL IVIAL | EMITTANCE OF | NATIONAL LEA | D BLACK | PAINT | 46H47 | ON A-286 | STEEL-REFERENCE | INFORMATION |
|--------------|--------------|--------------|---------|-------|-------|----------|-----------------|-------------|
|--------------|--------------|--------------|---------|-------|-------|----------|-----------------|-------------|

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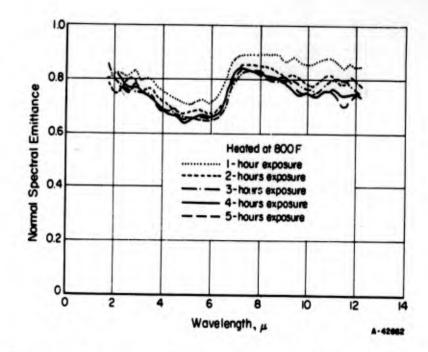
| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|-----------|------------------|--------|---|--|--|
| 13 | Gravina and Katz | | National Lead 46H47 black paint. Composition or thickness not given. Measured at: Atmospheric pressure 500C microns Hg 5 microns Hg. | Normal total emittance. Resistance-heated strip specimen. Thermistor-bolometer detector. Reference blackbody. Temperatures measured with thermocouples. | Measured in air and vacuum. Data taken from curves. |



NORMAL SPECTRAL EMITTANCE OF NATIONAL LEAD BLACK PAINT 46H47 ON A-286 STEEL AT 600 F

NORMAL SPECTRAL EMITTANCE OF NATIONAL LEAD BLACK PAINT 46H47 ON A-286 STEEL AT 600 F--REFERENCE INFORMATION

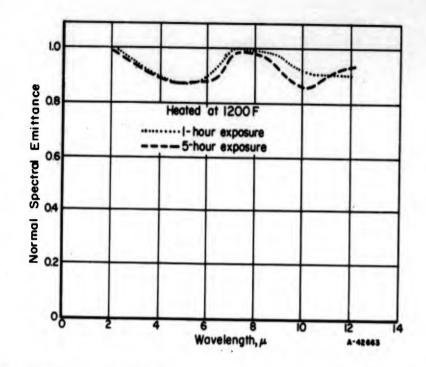
| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|-----------|------------------|--------|---|---|--|
| 13 | Gravina and Katz | | National Lead 46H47 "high heat black" paint. Composition or thickness not given. Heated at 600 F: 1 hour 3 hours 5 hours | Normal spectral emittance. Resistance-heated strip specimen. Thermistor-bolometer detector. Monochromator. Reference blackbody. Temperatures measured with thermocouples. | Measured in air. Data taken from curves. |



NORMAL SPECTRAL EMITTANCE OF NATIONAL LEAD BLACK PAINT 46H47 ON A-286 STEEL AT 800 F

| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|-----------|------------------|--------|--|---|-------------------------|
| 13 | Gravina and Katz | | National Lead 46H47 "high heat black" paint. | Normal spectral emittance. Resistance-heated strip | Measured in air. |
| | | | Composition or thickness not given. Heated at 800 F: | specimen. Thermistor-bolometer detector. | Data taken from curves. |
| | | | 1 hour | Monochromator. | |
| 1 | | | 2 hours 3 hours | Reference blackbody. | |
| | | | 4 hours | Temperatures measured with thermocouples. | |
| | | | 5 hours | area chermocoupres. | |

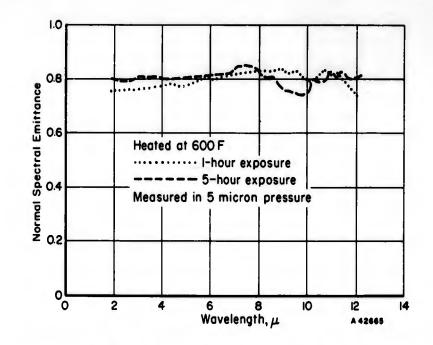
NORMAL SPECTRAL EMITTANCE OF NATIONAL LEAD BLACK PAINT 46H47 ON A-286 STEELS AT 800 F--REFERENCE INFORMATION



NORMAL SPECTRAL EMITTANCE OF NATIONAL LEAD BLACK PAINT 46H47 ON A-286 STEEL AT 1200 F

NORMAL SPECTRAL EMITTANCE OF NATIONAL LEAD BLACK PAINT 46H47 ON A-286 STEEL AT 1200 F--REFERENCE INFORMATION

| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|-----------|------------------|--------|---|--|--|
| 13 | Gravina and Katz | | National Lead 46H47 "high heat black" paint. Composition or thickness not given. Heated at 1200 F: 1 hour 5 hours | Normal spectral emittance. Resistance-heated strip specimen. Thermistor-bolometer detector. Monochromator. Reference blackbody. Temperatures measured | Measured in air. Data taken from curves. |
| | | | | with thermocouples. | |



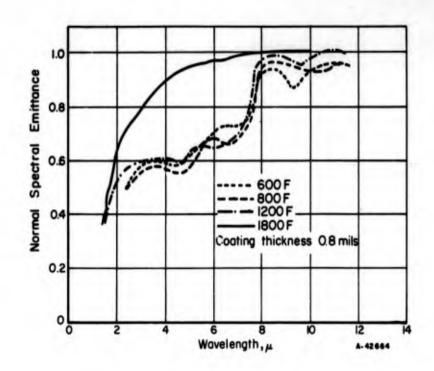
NORMAL SPECTRAL EMITTANCE OF NATIONAL LEAD BLACK PAINT 46H47 ON A-286 STEEL AT 600 F

NORMAL SPECTRAL EMITTANCE OF NATIONAL LEAD BLACK PAINT 46H47 ON A-286 STEEL AT 600 F AND 5 MICRONS PRESSURE--REFERENCE INFORMATION

| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|-----------|------------------|--------|---|---|--|
| 13 Gra | Gravina and Katz | | National Lead 46H47 "high heat black" paint. Composition or thickness not given. | Normal spectral emittance. Resistance-heated strip specimen. Thermistor-bolometer | Measured in 5 microns Hg pressure. |
| | | | Heated at 600 F: 1 hour 5 hours | detector. Monochromator. Reference blackbody. Temperatures measured with thermocouples. | Data taken from curves. |

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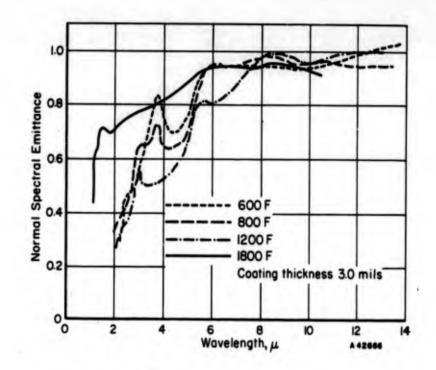
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NORMAL SPECTRAL EMITTANCE OF VITA VAR PV100 ON A-286 STEEL

| NORMAL SPECTRAL EMITTANCE OF VITA VAR PV 100 PAINT ON A-286 STEEL RE | -REFERENCE INFORMATION |
|--|------------------------|
|--|------------------------|

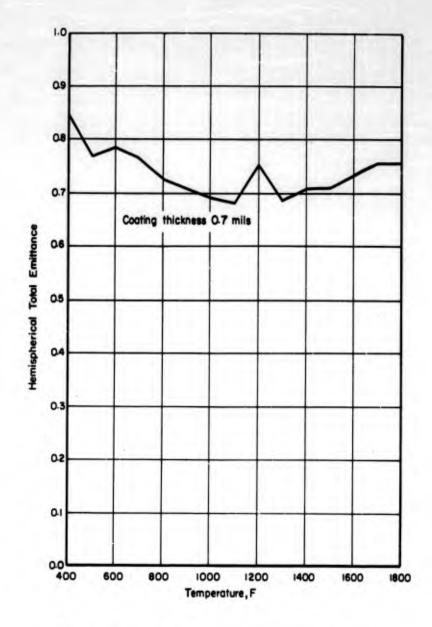
| eference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|----------|------------------|--------|--|---|------------------|
| 13 | Gravina and Katz | | Vita Var PV 100 paint. A titanium dioxide pigment | Normal spectral emittance. Resistance-heated strip | Measured in air. |
| | | | in silicone vehicle. | specimen. | Data taken from |
| | | | Coating thickness 0.8 mil. | Thermistor-bolometer | curves. |
| | | | Measured at: | detector. | |
| | | | 600 F | Monochromator. | |
| | | | 800 F | Reference blackbody. | |
| | | | 1200 F | Temperatures measured | |
| | | | 1800 F | with thermocouples. | |



NORMAL SPECTRAL EMITTANCE OF VITA VAR PV 100 ON A-286 STEEL

| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|-----------|------------------|--------|--|---|------------------|
| 13 G | Gravina and Katz | | Vita Var PV 100 paint. A titanium dioxide pigment | Normal spectral emittance. Resistance-heated strip | Measured in air. |
| | | | in silicone vehicle. | specimen. | Data taken from |
| | | | Coating thickness 3.0 mils. Measured at: | Thermistor-bolometer detector. | curves. |
| | | | 600 F | Monochromator. | |
| | | | 800 F Reference blackbody. | Reference blackbody. | |
| | | | 1200 F | Temperatures measured | |
| | | | 1800 F | with thermocouples. | |

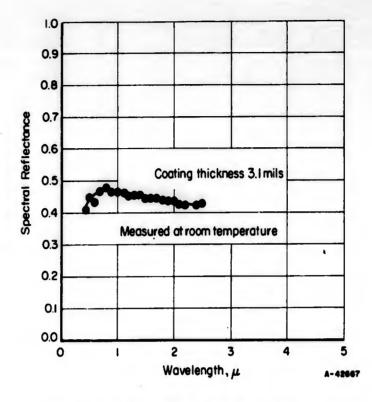
NORMAL SPECTRAL EMITTANCE OF VITA VAR PV 100 PAINT ON A-286 STEEL--REFERENCE INFORMATION



HEMISPHERICAL TOTAL EMITTANCE OF VITA VAR PV100 PAINT ON TITANIUM

| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|-----------|--------------|--------|--|---|--|
| 4 | Dull, R. L. | | <pre>Vita Var PV100 coating on titanium. Coating thickness 0.7 mil. (Vita Var PV100 is a white paint with a silicone vehicle and titanium dioxide pigment.) Note: Color began to change at 400 F and varied through yellow, tan, white, cream until brown and flaking at 1800 F.</pre> | Hemispherical total emittance Resistance-heated strip specimen coated with test material. Measured power input to test section. Temperatures measured with thermocouples. | Measured in air. Data taken from curves. |

HEMISPHERICAL TOTAL EMITTANCE OF VITA VAR PV100 PAINT ON TITANIUM--REFERENCE INFORMATION

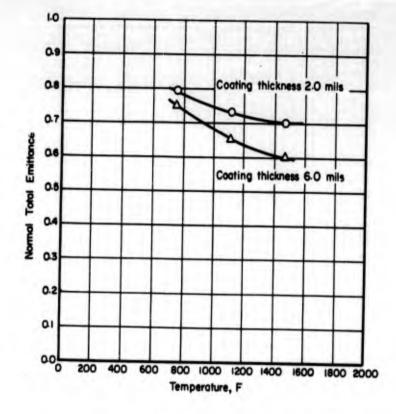


SPECTRAL REFLECTANCE OF W-1 WHITE ENAMEL ON INCONEL

| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|---------------------------------------|--|--------|---|---|---|
| 1 | Burgess, Jasperse, Marcus, Martin, and Flint | • | W-1 white enamel on Inconel. Coating thickness 3.1 mils. | Spectral reflectance. Integrating sphere re- flectometer. Commercial spectro- photometer, mono- chromator, lead sulphide detector. Hemispherical viewing. Illumination not clear from description whether diffuse or normal. | Measured in air at room temper- ature. Data taken from table. |
| Coating Com | position by Weight | | | | |
| NBS Frit N CeO ₂ MgO | 0. 332 - 60 per cent - 30 per cent - 10 per cent | | | | |

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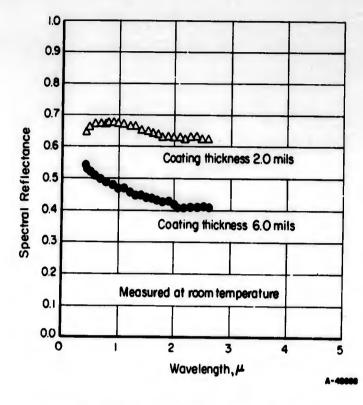
SPECTRAL REFLECTANCE OF W-1 WHITE ENAMEL ON INCONEL--REFERENCE INFORMATION



NORMAL TOTAL EMITTANCE OF W-3 WHITE ENAMEL ON INCONEL

| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|---|---|--------|---|---|--|
| 1 | Burgess, Jasperse, Marcus, Martin, and Flint | 0 4 | W-3 white enamel on Inconel. Coating thickness 2.0 mils. Coating thickness 6.0 mils. | Normal total emittance. Sample recessed (flush) in wall of hollow, cylindrical, Globar heater. Comparison blackbody, hole. Infrared spectrometer with prism replaced by plane mirror. Thermocouple detector. Temperatures measured with thermocouples | Measured in air Data taken from table. |
| Coating Com | position by Weight | | | | |
| NBS Frit No CeO ₂ SnO ₂ | 332 - 60 per cent 20 per cent 20 per cent | | | | |

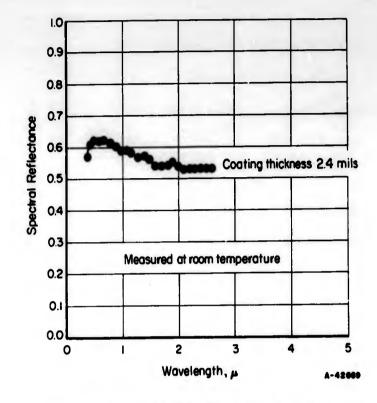
NORMAL TOTAL EMITTANCE OF W-3 WHITE ENAMEL ON INCONEL--REFERENCE INFORMATION



SPECTRAL REFLECTANCE OF W-3 WHITE ENAMEL ON INCONEL

| SPECTRAL REFLECTANCE OF W-3 WHITE ENAN | L ON INCONEL-REFERENCE INFORMATION |
|--|------------------------------------|
|--|------------------------------------|

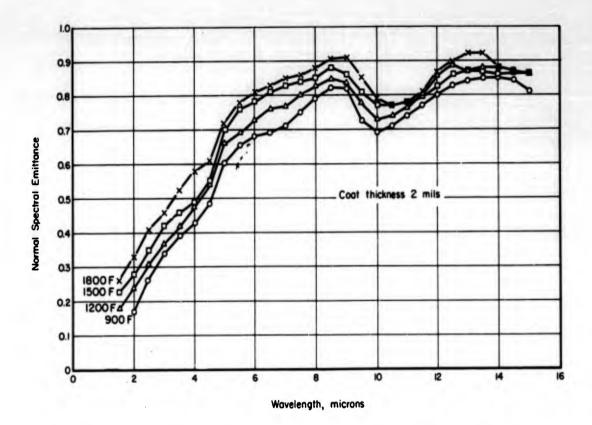
| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|---|--|--------|---|---|--|
| 1 | Burgess, Jasperse, Marcus, Martin, and Flint | • | W-3 white enamel on Inconel. Coating thickness 2.0 mils. Coating thickness 6.0 mils. | Spectral reflectance. Integrating sphere re- flectometer. Commercial spectro- photometer, mono- chromator, and lead sulphide detector. Hemispherical viewing. Illumination not clear from description whether diffuse or normal. | Measured in air at room temperature. Data taken from table. |
| Coating Comp | osition by Weight | | | -1 | |
| NBS Frit No CeO ₂ SnO ₂ | 0. 332 - 60 per cent - 20 per cent - 20 per cent | | | | |



SPECTRAL REFLECTANCE OF W-4 WHITE ENAMEL ON INCONEL

SPECTRAL REFLECTANCE OF W-4 WHITE ENAMEL ON INCONEL-REFERENCE INFORMATION

| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|--|--|--------|---|---|--|
| 1 | Burgess, Jasperse, Marcus, Martin, and Flint | | W-4 white enamel on Inconel. Coating thickness 2.4 mils. | Spectral reflectance. Integrating sphere re- flectometer. Commercial spectro- photometer, mono- chromator, lead sulphide detector. Hemispherical viewing. Illumination not clear from description whether diffuse or normal. | Measured in air at room temperature. Data taken from table. |
| Coating Com | position by Weight | | | | |
| NBS Frit N CeO ₂ ZrO ₂ | o. 332 - 60 per cent - 20 per cent - 20 per cent | | | | |

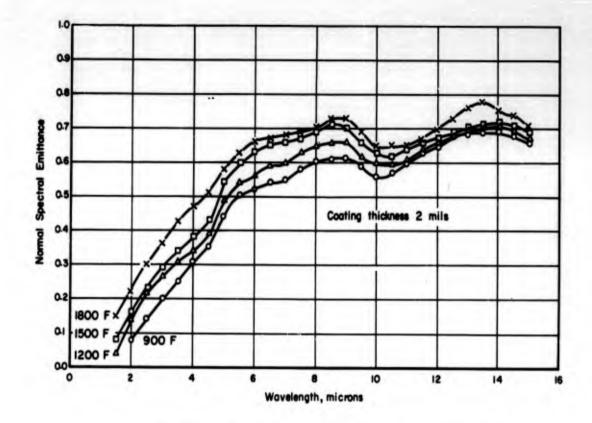


NORMAL SPECTRAL EMITTANCE OF N-143 ENAMEL ON INCONEL

NORMAL SPECTRAL EMITTANCE OF N-143 ENAMEL ON INCONEL--REFERENCE INFORMATION

| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|-----------|----------------------|-------------|---|---|--|
| 2 | Richmond and Stewart | 0 0 x | N-143 consists of boron- free barium beryllium silicate frit with addition of cerium oxide. Coating thickness 2 mils. Coated on Inconel. Runs made at the following temperatures: 900 F 1200 F 1500 F 1800 F | Normal spectral emittance. Double-beam infrared spectrometer with sodium chloride prism. Secondary standard [silicon carbide (Globar)] cali- brated against laboratory black- body. Temperatures meas- ured with thermo- couples. | Measured in air. Data taken from tables. |

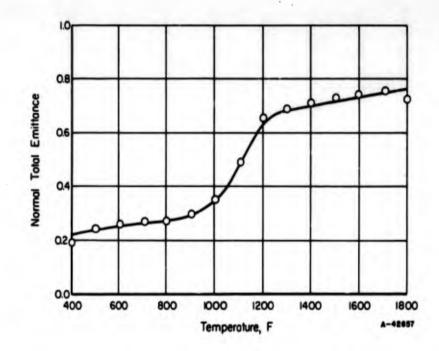
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NORMAL SPECTRAL EMITTANCE OF N-143 ENAMEL ON TYPE 321 STAINLESS STEEL

| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|-----------|----------------------|--------|---|---|--|
| 2 | Richmond and Stewart | 0 | N-143 consists of boron- free barium beryllium silicate frit with addition of cerium oxide. Coating thickness 2 mils. Coated on Inconel. Runs made at the following temperatures: 900 F 1200 F | Normal spectral emittance. Double-beam infrared spectrometer with sodium chloride prism. Secondary standard [silicon carbide (Globar)] cali- brated against laboratory black- | Measured in air. Data taken from tables. |
| | | - x | 1500 F 1800 F | body. Temperatures meas- ured with thermo- couples. | |

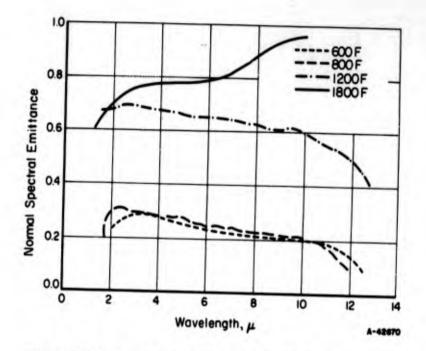
NORMAL SPECTRAL EMITTANCE OF N-143 ENAMEL ON TYPE 321 STAINLESS STEEL-REFERENCE INFORMATION



NORMAL TOTAL EMITTANCE FOR PRATT AND LAMBERT 91-1524 PAINT ON INCONEL X

NORMAL TOTAL EMITTANCE OF PRATT AND LAMBERT 91-1524 PAINT ON INCONEL X-REFERENCE INFORMATION

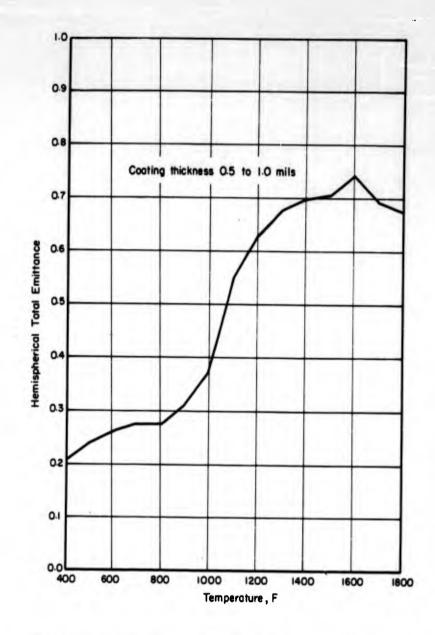
| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|-----------|------------------|--------|---|--|-------------------------|
| 13 | Gravina and Katz | | Pratt and Lambert 91-1524 coating. Butyl titanate | Normal total emittance. Resistance-heated strip | Measured in air. |
| | | | paint with aluminum pigment. | specimen. Thermistor-bolometer | Data taken from curves. |
| | | | prgmente. | detector. | Cu1 ve3. |
| | | | | Reference blackbody. | |
| | | | | Temperatures measured with thermocouples. | |



NORMAL SPECTRAL EMITTANCE OF PRATT AND LAMBERT 91-1524 PAINT ON INCONEL X

NORMAL SPECTRAL EMITTANCE OF PRATI AND LAMBERT 91-1524 PAINT ON INCONEL X-REFERENCE INFORMATION

| Reference | Investigator | Symbol | Composition and Surface Condition | Frest Method | Remarks |
|-----------|------------------|--------|--|---|--|
| 13 | Gravina and Katz | | Pratt and Lambert 91-1524, a butyl titanate paint with aluminum pigment. Measured at: 600 F 800 F 1200 F 1800 F | Normal spectral emittance. Resistance-heated strip specimen. Thermistor-bolometer detector. Monochromator. Reference blackbody. Temperatures measured with thermocouples. | Measured in air. Data taken from curves. |



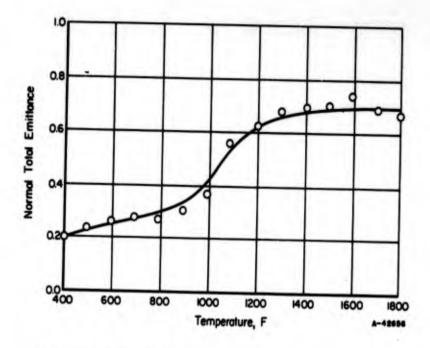
HEMISPHERICAL TOTAL EMITTANCE OF PRATT AND LAMBERT 91-1524 PAINT ON TITANIUM

| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|-----------|--------------|--------|---|--|---|
| 4 | Du11, R. L. | | Pratt and Lambert coating No. 91-1524 on titanium. Coating thickness 0.5 to 1.0 mil. (Coating is a butyl titanate paint with aluminum pigment.) Note: Surface began minute blistering at 1500 F and turned to dark brown, peeling flakes at 1800 F. | Hemispherical total emittance. Resistance-heated strip specimens coated with test material. Measured power in- put to test section. Temperatures measured with thermocouples. | Measured in air Data taken from curves. |

HEMISPHERICAL TOTAL EMITTANCE OF PRATT AND LAMBERT 91-1524 PAINT ON TITANIUM--REFERENCE INFORMATION

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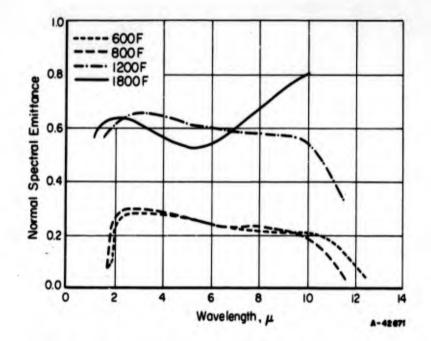
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NORMAL TOTAL EMITTANCE FOR PRATT AND LAMBERT 91-1524 PAINT ON TITANIUM

| eference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|----------|------------------|--------|---|--|---|
| 13 | Gravina and Katz | | Pratt and Lambert 91-1524 coating. Butyl titanate paint with aluminum pigment. | Normal total emittance. Resistance-heated strip specimen. Thermistor-bolometer detector. Reference blackbody. Temperatures measured with thermocouples. | Measured in air Data taken from curves. |

NORMAL TOTAL EMITTANCE OF PRATT AND LAMBERT 91-1524 PAINT ON TITANIUM-REFERENCE INFORMATION



NORMAL SP_CTRAL EMITTANCE OF PRATT AND LAMBERT 91-1524 PAINT ON TITANIUM

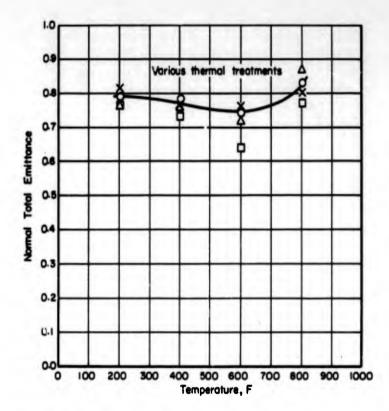
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NORMAL SPECTRAL EMITTANCE OF PRATT AND LAMBERT 91-1524 PAINT ON TITANIUM--REFERENCE INFORMATION

| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|-----------|------------------|--------|--|---|--|
| 13 | Gravina and Katz | | Pratt and Lambert 91-1524, a butyl titanate paint with aluminum pigment. Measured at: 600 F 800 F 1200 F 1800 F | Normal spectral emittance. Resistance-heated strip specimen. Thermistor-bolometer detector. Monochromator. Reference blackbody. Temperatures measured with thermocouples. | Measured in air. Data taken from curves. |

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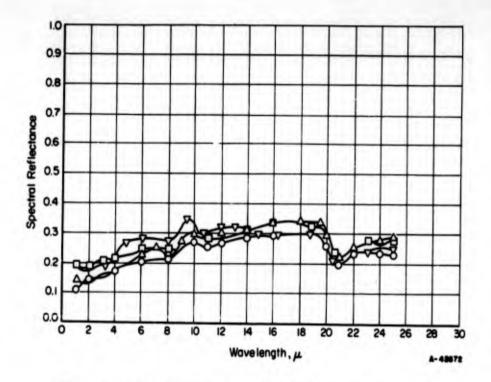
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NORMAL TOTAL EMITTANCE OF RINSHED-MASON H12144 ENAMEL ON TYPE 321 STAINLESS STEEL

NORMAL TOTAL EMITTANCE OF RINSHED-MASON H12144 ENAMEL ON TYPE 321 STAINLESS STEEL -- REFERENCE INFORMATION

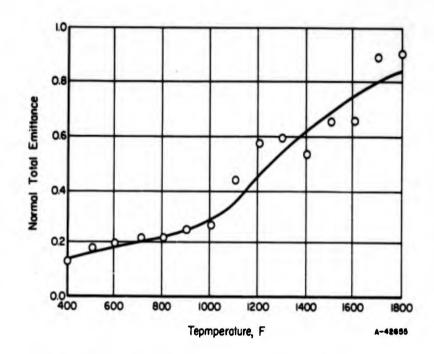
| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|-----------|-----------------------------|--------|--|---|--|
| 3 | Bevans, Cier, and Dunkle | | Rinshed-Mason black heat- resistant, air-dry enamel H12144, painted on Type 321 stainless steel (Mat'1. Spec. MIS-S-6721.) No thickness given. | Normal total emittance. Calibrated thermopile detector. Temperatures measured with thermocouples. | Measured in air. Data taken from tables. |
| | | 0 | No thermal treatment. | | |
| | | Δ | 300 hours at 497 F. | | |
| | | 0 | 307 hours at 690 F. | | |
| | | × | 1000 hours at 705 F. | | |



SPECTRAL REFLECTANCE OF RINSHED-MASON H12144 ENAMEL ON TYPE 321 STAINLESS STEEL

SPECTRAL REFLECTANCE OF RINSHED-MASON H12144 ENAMEL ON TYPE 321 STAINLESS STEEL--REFERENCE INFORMATION

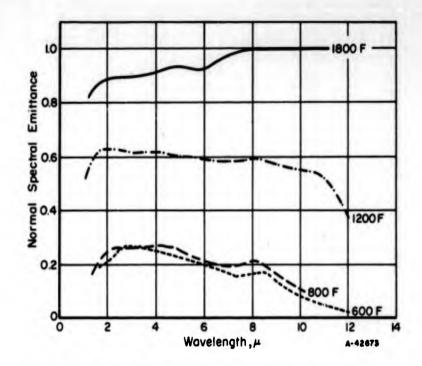
| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|-----------|-----------------------------|-------------|---|---|---|
| 3 | Bevans, Gier, and Dunkle | 0 4 2 | Rinshed-Mason black heat-resistant, air- dry Enamel H12144, painted on Type 321 stainless steel (Mat'1. Spec. MIS-S-6721.) No thickness given. No thermal treatment. 300 hours at 497 F. 307 hours at 690 F. 1000 hours at 705 F. | Spectral reflectance at 5 degrees with normal. Gier-Dunkle reflect- ometer-monochromator. Tomperatures measured with thermocouples. (Diffuse illumination- normal viewing.) | Measured in air at room temperature. Data taken from tables. |

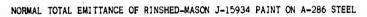


NORMAL SPECTRAL EMITTANCE OF RINSHED-MASON J-15934 PAINT ON A-286 STEEL

| NORMAL TOTAL EMITTANCE OF | RINSHED-MASON J-15934 | PAINT ON A-286 | STEELREFERENCE INFORMATION |
|---------------------------|-----------------------|----------------|----------------------------|
|---------------------------|-----------------------|----------------|----------------------------|

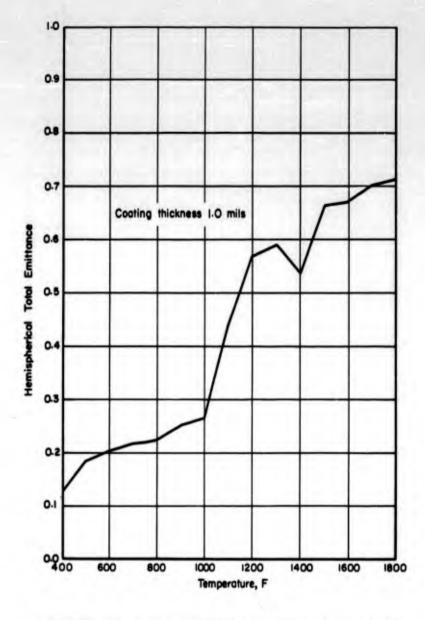
| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|-----------|------------------|--------|---|--|--|
| 13 | Gravina and Katz | | Rinshed-Mason J-15934, silicone paint with aluminum pigment. Coating thickness not given. | Normal total emittance. Resistance-heated strip specimen. Thermistor-bolometer detector. Reference blackbody. Temperatures measured with thermocouples. | Measured in air. Data taken from curves. |





NORMAL SPECTRAL EMITTANCE OF RINSHED-MASON J-15934 PAINT ON A-286 STEEL-REFERENCE INFORMATION

| Reference | Investigator | Symbol | Composition and •Surface Condition | Test Method | Remarks |
|-----------|------------------|--------|---|---|------------------|
| 13 | Gravina and Katz | | Rinshed-Mason Paint J-15934, silicone vehicle, aluminum | Normal spectral emittance. Resistance-heated strip | Measured in air. |
| | | | pigment. | specimen. | Data taken from |
| | | | Coating thickness not given. | Thermistor-bolometer detector. | curves. |
| | | | Measured at: | Monochromator. | |
| | | | 600 F | Reference blackbody. | |
| | | | 800 F | Temperatures measured | |
| | | | 1200 F | with thermocouples. | |
| | | | 1800 F | | |

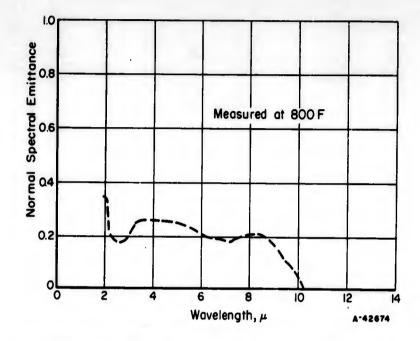


HEMISPHERICAL TOTAL EMITTANCE OF RINSHED-MASON J-15934 PAINT ON TITANIUM

| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|-----------|--------------|--------|--|--|---|
| 4 | Dull, R. L. | | Rinshed-Mason Coating J-15934 on titanium. Coating thickness 1.0 mil. (A silicone paint with aluminum pigment.) Note: Extensive peeling began at about 1300 F. Nearly all peeled off at 1800 F. | Hemispherical total emittance. Resistance-heated strip specimens coated with test material. Measured power input to test section. Temperatures measured with thermocouples. | Measured in air Data taken from curves. |

HEMISPHERICAL TOTAL EMITTANCE OF RINSHED-MASON J-15934 PAINT ON TITANIUM--REFERENCE INFORMATION

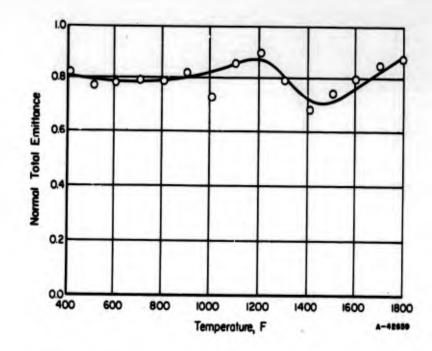
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NORMAL SPECTRAL EMITTANCE OF RINSHED-MASON J-15934 PAINT ON TITANIUM

NORMAL SPECTRAL EMITTANCE OF RINSHED-MASON J-15934 PAINT ON TITANIUM--REFERENCE INFORMATION

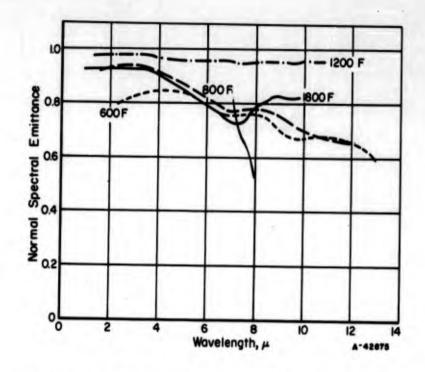
| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|-----------|------------------|--------|---|---|------------------|
| 13 | Gravina and Katz | | Rinshed-Mason Paint J-15934, a silicone paint with | Normal spectral emittance. Resistance-heated strip | Measured in air. |
| | | | aluminum pigment. Coating thickness not | specimen. | Data taken from |
| | | | given. | Thermistor-bolometer detector. | curves. |
| | | | Measured at 800 F | Monochromator. | |
| | | | | Reference blackbody. Temperatures measured | |
| | | | | with thermocouples. | |



NORMAL TOTAL EMITTANCE OF RINSHED-MASON Q36K802 PAINT ON A-286 STEEL

| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|-----------|------------------|--------|---|--|--|
| 13 | Gravina and Katz | | Rinshed-Mason Q36K802, silicone paint with carbon black pigment. Coating thickness not given. | Normal total emittance. Resistance-heated strip specimen. Thermistor-bolometer detector. Reference blackbody. Temperatures measured with thermocouples. | Measured in air. Data taken from curves. |

NORMAL TOTAL EMITTANCE OF RINSHED-MASON Q36K802 PAINT ON A-286 STEEL--REFERENCE INFORMATION



NORMAL SPECTRAL EMITTANCE OF RINSHED-MASON Q36K802 PAINT ON A-286 STEEL

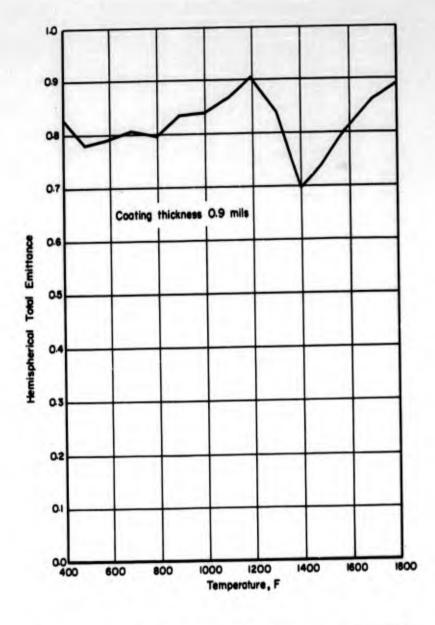
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NORMAL SPECTRAL EMITTANCE OF RINSHED-MASON Q36K802 PAINT ON A-286 STEEL-REFERENCE INFORMATION

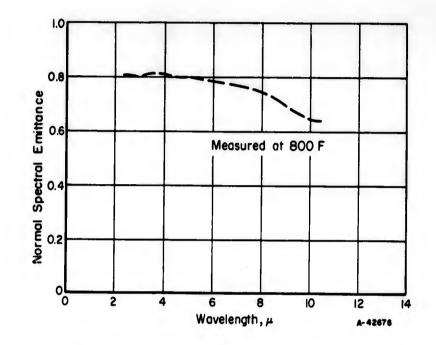
| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|-----------|------------------|--------|--|---|--|
| 13 | Gravina and Katz | | Rinshed-Mason Q36K802 black paint is a sili- cone paint with carbon black pigment. Coating thickness not given. Measured at: 600 F 800 F 1200 F 1800 F | Normal spectral emittance. Resistance-heated strip specimen. Thermistor-bolometer detector. Monochromator. Reference blackbody. Temperatures measured with thermocouples. | Measured in air. Data taken from curves. |



HEMISPHERICAL TOTAL EMITTANCE OF RINSHED-MASON Q-36K802 PAINT ON TITANIUM

| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|-----------|--------------|--------|---|--|---|
| 4 | Dull, R. L. | | Rinshed-Mason Q-36K802 coating on titanium. Coating thickness 0.9 mil. (A silicone paint with carbon black pigment.) Note: Discoloration began at 400 F. Blistering | Hemispherical total emittance. Resistance-heated strip. Specimen coated with test material. Measured power input to test section. | Measured in air Data taken from curves. |
| | | | began at about 1600 F. | Temperatures measured with thermocouples. | |

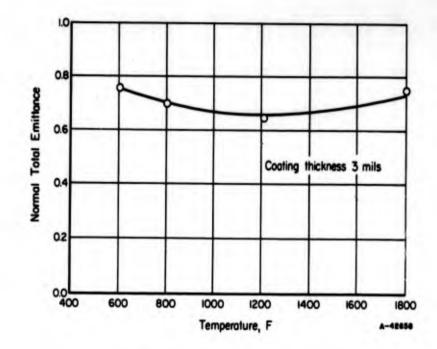
HEMISPHERICAL TOTAL EMITTANCE OF RINSHED-MASON Q-36K802 PAINT ON TITANIUM--REFERENCE INFORMATION





| NORMAL | SPECTRAL | EMITTANCE OF | RINSHED-MASON | Q36K802 | PAINT ON | TITANIUM- | -REFERENCE | INFORMATION |
|--------|----------|--------------|---------------|---------|----------|-----------|------------|-------------|
|--------|----------|--------------|---------------|---------|----------|-----------|------------|-------------|

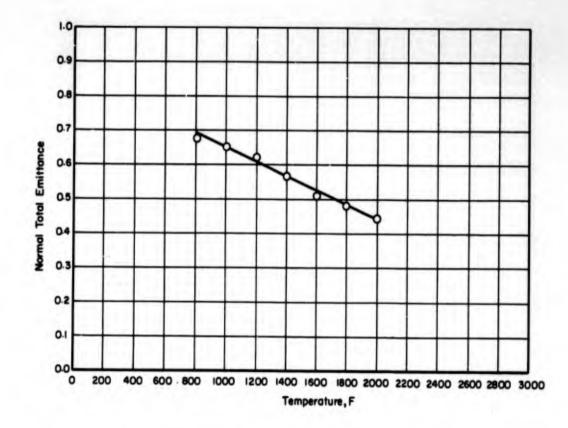
| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|-----------|------------------|--------|---|---|------------------|
| 13 | Gravina and Katz | | Rinshed-Mason Q36K802 black paint. A sili- | Normal spectral emittance. Resistance-heated strip | Measured in air. |
| | | | cone paint with carbon | specimen. | Data taken from |
| | | | <pre>black pigment. Coating thickness not</pre> | Thermistor-bolometer detector. | curves. |
| | | | given. | Monochromator. | |
| | | | Measured at 800 F | Reference blackbody. | |
| | | | | Temperatures measured with thermocouples. | |



NORMAL TOTAL EMITTANCE OF VITA VAR PV100 ON A-286 STEEL

NORMAL TOTAL EMITTANCE OF VITA VAR PV 100 PAINT ON A-286 STEEL--REFERENCE INFORMATION

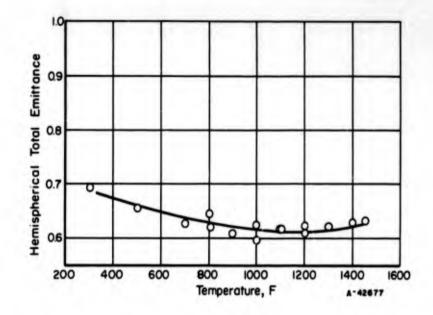
| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|-----------|------------------|--------|--|--|--|
| 13 | Gravina and Katz | | Vita Var PV 100, silicone paint with titanium dioxide pigment. Coating thickness 3 mils | Normal total emittance. Resistance-heated strip specimen. Thermistor-bolometer detector. Reference blackbody. Temperatures measured with thermocouples. | Measured in air. Data taken from curves. |





| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|-----------|--------------|--------|--------------------------------------|---|------------------------------------|
| 10 | Wade, W. R. | o | Flame-sprayed alumina on | Normal total emittance. | Measured in air. |
| | | | Inconel heater strip. | Thermopile detector. Resistance-heated Inconel | Temperatures given are those of |
| | | | Thickness not given. | strip with test material flame sprayed | Inconel heater strip. |
| | | | | to "opaque" thickness. | Data taken from curve. |

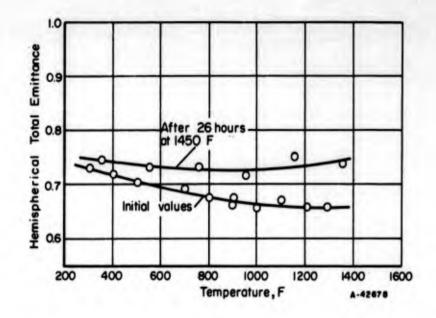
NORMAL TOTAL EMITTANCE OF ALUMINUM OXIDE ON INCONEL-REFERENCE INFORMATION



HEMISPHERICAL TOTAL EMITTANCE OF ALUMINUM OXIDE ON TYPE 310 STAINLESS STEEL

HEMISPHERICAL TOTAL EMITTANCE OF ALUMINUM OXIDE ON TYPE 310 STAINLESS STEEL -- REFERENCE INFORMATION

| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|-----------|-----------------------------|--------|---|---|----------------------------|
| 13 | Pratt & Whitney Aircraft | | Plasmadyne powder. Coated on both sides. | Hemispherical total emittance. | Measured in vacuum. |
| | | | Flame sprayed on Type 310 stainless strip. | Resistance-heated strip specimen. Power dissipated in measured area. Temperatures measured with thermocouples. | Data taken from curves. |



HEMISPHERICAL TOTAL EMITTANCE OF ALUMINUM OXIDE ON TYPE 310 STAINLESS STEEL

| HEMISPHERICAL TOTAL EMIT | NCE OF ALUMINU | M OXIDE ON TYPE 310 | STAINLESS STEEL- | -REFERENCE INFORMATION |
|--------------------------|----------------|---------------------|------------------|------------------------|
|--------------------------|----------------|---------------------|------------------|------------------------|

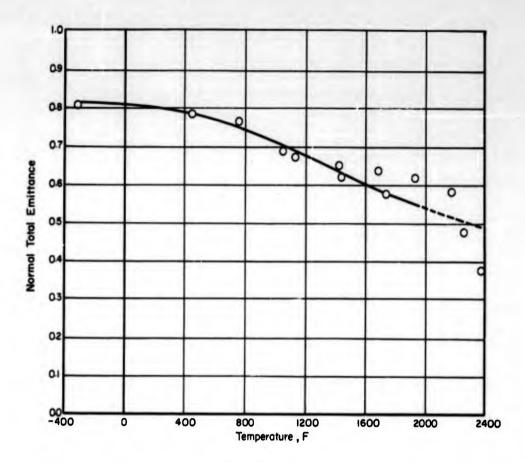
| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|-----------|-----------------------------|--------|---|---|----------------------------|
| 17 | Pratt & Whitney Aircraft | | Metco 101 powder. Coated on both sides. | Hemispherical total emittance. | Measured in vacuum. |
| | | | Flame sprayed. Initial runs After 26 hours at 1450 F | Resistance-heated strip specimen. Power dissipated in measured area. | Data taken from curves. |
| • | | | | Temperatures measured with thermocouples. | |

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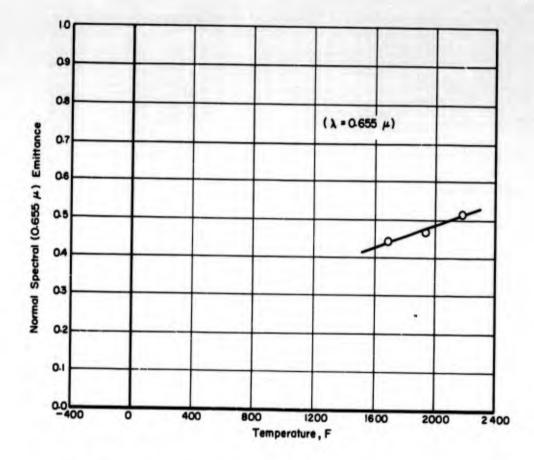
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NORMAL TOTAL EMITTANCE OF ALUMINUM OXIDE (ROKIDE) ON TYPE 446 STAINLESS STEEL

NORMAL TOTAL EMITTANCE OF ALUMINUM OXIDE (ROKIDE) ON TYPE 446 STAINLESS STEEL --- REFERENCE INFORMATION

| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|-----------|------------------|--------|--|---|---|
| 11 | Olson and Morris | 0 | As received. Showed purple discolor- ation after test. Thickness or surface condition not given. | Normal total emittance. Comparison blackbody. Furnace heated speci- mens. Temperatures measured with thermocouples. Thermistor-bolometer detector. | Measured in air Data taken from curves. |

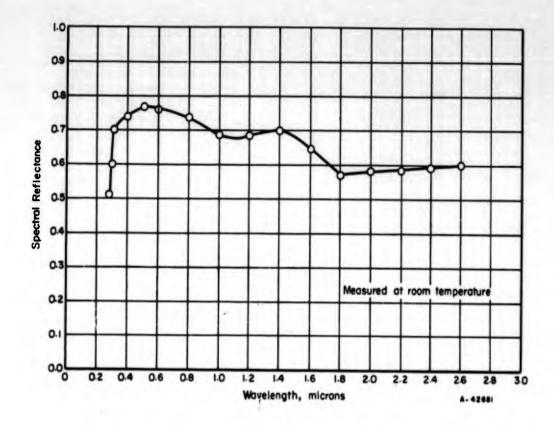


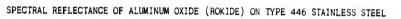
NORMAL SPECTRAL EMITTANCE OF ALUMINUM OXIDE (ROKIDE) ON TYPE 446 STAINLESS STEEL

| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|-----------|------------------|--------|--|---|--|
| 11 | Olson and Morris | o | Aluminum Oxide (Rokide) on Type 446 stainless steel. Thickness or surface condition not given. | Normal spectral emittance. Furnace-heated specimen. Commercial sensing unit. Appropriate lenses and filters. Temperatures measured with thermocouples. | Measured in air. Data taken from curves. |

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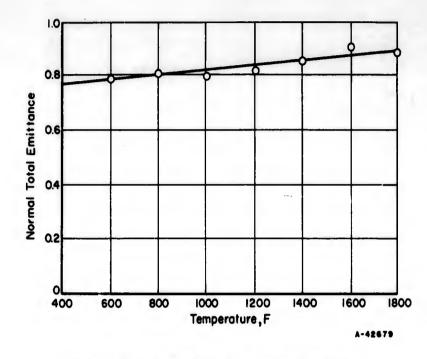
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SPECTRAL REFLECTANCE OF ALUMINUM OXIDE (ROKIDE) ON TYPE 446 STAINLESS STEEL--REFERENCE INFORMATION

| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|-----------|------------------|--------|--|--|---|
| 11 | Olson and Morris | 0 | Aluminum oʻde | Spectral reflectance | Measured in air at |
| | | , . | (Norton Cc., Rokide A) on Type · '6 stainless steel. Thickness o. surface condition not given. | at 9 degrees from normal (incident radiation). Recording spectro- photometer, inte- grating sphere re- flectometer, and lead sulphide detector. (Normal illumination hemispherical viewing) | room temperature. Data taken from curves. |



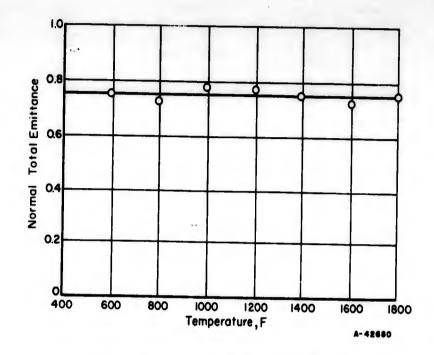
NORMAL TOTAL EMITTANCE OF CERAMCO B-682P ON A-286 STEEL

| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|-----------|------------------|--------|---|---|---|
| 13 | Gravina and Katz | | Ceramco B-682P, a proprietary black oxide. | Normal total emittance. Resistance-heated strip specimen. Thermistor-bolometer | Measured at atmospheric pressure. |
| | | | | detector. Reference blackbody. Temperatures measured with thermocouples. | Data taken from curves. |

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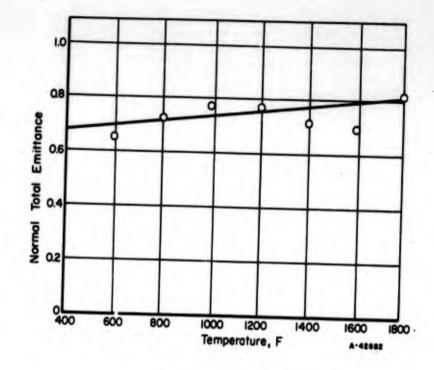
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NORMAL TOTAL EMITTANCE OF CERAMCO G-683P ON A-286 STEEL

NORMAL TOTAL EMITTANCE OF CERAMCO G-633P ON A-286 STEEL--REFERENCE INFORMATION

| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|-----------|------------------|--------|--|--|---|
| 13 | Gravina and Katz | | Ceramco G-683P, a proprietary green oxide. Composition or thickness not given. | Normal total emittance. Resistance-heated strip specimen. Thermistor-bolometer detector. Reference blackbody. Temperatures measured with thermocouples. | Measured at atmospheric pressure. Data taken from curves. |



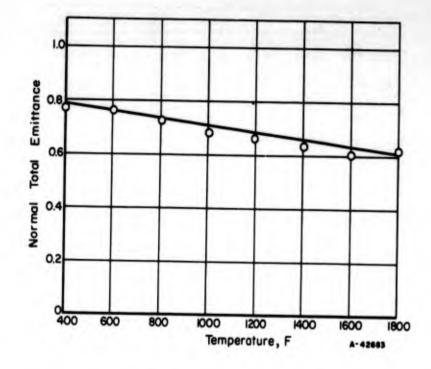
NORMAL TOTAL EMITTANCE OF CERAMCO G-684tc ON INCONEL X

NORMAL TOTAL EMITTANCE OF CERAMCO G-684tc ON INCONEL X-REFERENCE INFORMATION

| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|-----------|------------------|--------|--|--|---|
| 13 | Gravina and Katz | | Ceramco G-684tc, a proprietary green oxide. Composition on thickness not given. | Normal total emittance. Resistance-heated strip specimen. Thermistor-bolometer detector. Reference blackbody. Temperatures measured with thermocouples. | Measured at atmospheric pressure. Data taken from curves. |

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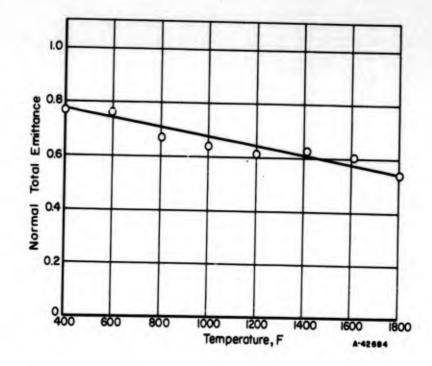


NORMAL TOTAL EMITTANCE OF CERAMCO W-683P ON A-286 STEEL

NORMAL TOTAL EMITTANCE OF CERAMCO W-683P ON A-286 STEEL--REFERENCE INFORMATION

| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|-----------|------------------|--------|---|--|---|
| 13 | Gravina and Katz | | Ceramco W-683P, a proprietary white oxide. | Normal total emittance. Resistance-heated strip specimen. Thermistor-bolometer detector. Reference blackbody. Temperatures measured with thermocouples. | Measured at atmospheric pressure. Data taken from curves. |

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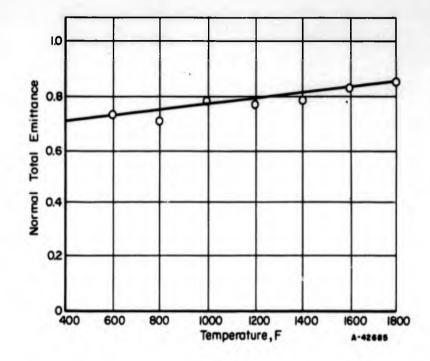
NORMAL TOTAL EMITTANCE OF CERAMCO W-683tc ON INCONEL X

NORMAL TOTAL EMITTANCE OF CERAMCO W-683tc ON INCONEL X--REFERENCE INFORMATION

| Reference | Investigator | Symbol | Composition and Surface Condition | . Test Method | Remarks |
|-----------|------------------|--------|--|--|---|
| 13 | Gravina and Katz | | Ceramco W-683tc, a proprietary white oxide. Composition or thickness not given. | Normal total emittance. Resistance-heated strip specimen. Thermistor-bolometer detector. Reference blackbody. Temperatures measured with thermocouples. | Measured at atmospheric pressure. Data taken from curves. |

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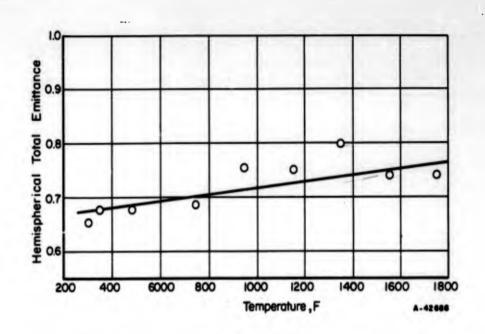
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NORMAL TOTAL EMITTANCE OF CERAMCO WB-6832 ON A-286 STEEL

NORMAL TOTAL EMITTANCE OF CERAMCO WB-6832 ON A-286 STEEL--REFERENCE INFORMATION

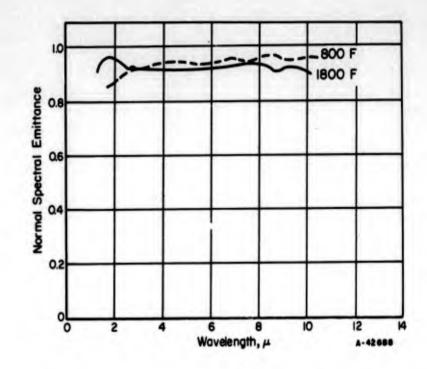
| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|---------------------|------------------|---|--|---|---|
| 13 Gravina and Katz | Gravina and Katz | | Ceramco WB-6832, a pro- prietary brown oxide. | Normal total emittance. Resistance-heated strip specimen. Thermistor-bolometer | Measured at atmospheric pressure. |
| | | detector. Reference blackbody. Temperatures measured with thermocouples. | Data taken from curves. | | |



HEMISPHERICAL TOTAL EMITTANCE OF CERIC OXIDE ON TYPE 310 STAINLESS STEEL

HEMISPHERICAL TOTAL EMITTANCE OF CERIC OXIDE ON TYPE 310 STAINLESS STEEL -- REFERENCE INFORMATION

| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|-----------|-----------------------------|--------|---|--|----------------------------|
| 16 | Pratt & Whitney Aircraft | | Metco plasma flame spray powder XP-111. | Hemispherical total emittance. | Measured in vacuum. |
| | | | | Resistance-heated strip specimen. Power dissipated in measured area. Temperatures measured | Data taken from curves. |
| | | | | with thermocouples. | |



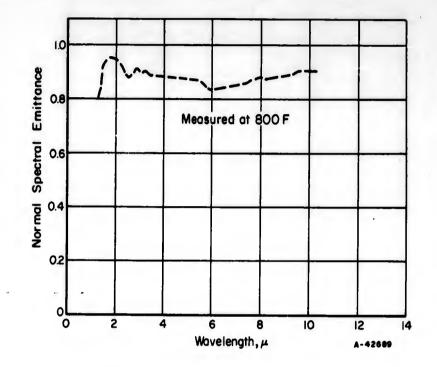
NORMAL SPECTRAL EMITTANCE OF NORTON LN 9594 ON INCONEL X

| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|-----------|------------------|--------|--|---|--|
| 13 | Gravina and Katz | | Norton LN9684, a very dark nickel oxide. Melting point about 3500 F. Porosity about 2 per cent. Flame sprayed on cleaned, grit-blasted surface coated with 12-mil-thick Nichrome V undercoat. Coating thickness not given. Measured at: 800 F 1800 F | Normal spectral emittance. Resistance-heated strip specimen. Thermistor-bolometer detector. Monochromator. Reference blackbody. Temperatures measured with thermocouples. | Measured in air. Data taken from curves. |

NORMAL SPECTRAL EMITTANCE OF NORTON LN9684 ON INCONEL X--REFERENCE INFORMATION

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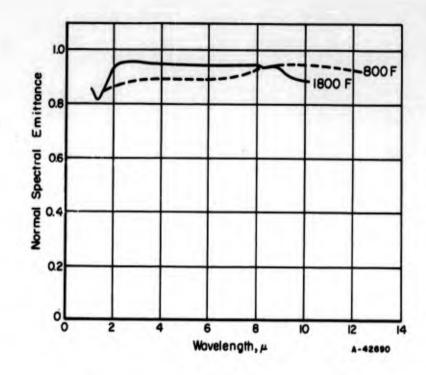
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NORMAL SPECTRAL EMITTANCE OF NORTON LN 9684 ON 6A1-4V TITANIUM

NORMAL SPECTRAL EMITTANCE OF NORTON LN9684 CERAMIC COATING ON 6A1-4V TITANIUM-REFERENCE INFORMATION

| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|-----------|------------------|--------|--|---|----------------------------|
| 13 | Gravina and Katz | | Norton LN9684, a very dark nickel oxide. Melting | Normal spectral emittance. | Measured in air. |
| · | | | point about 3500 F. Porosity about 2 per cent. Flame sprayed on cleaned, grit-blasted surface coated with 12-mil-thick Nichrome V undercoat. Coating thickness not given. | Resistance-heated strip specimen. Thermistor-bolometer detector. Monochromator. Reference blackbody. Temperatures measured with thermocouples. | Data taken from curves. |
| | | | Measured at 800 F | with theimocouples. | |



NORMAL SPECTRAL EMITTANCE OF NORTON LN 9684 ON A-286 STEEL

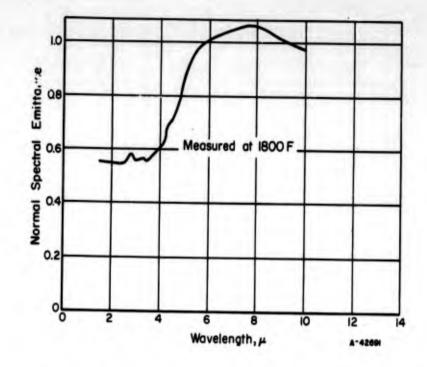
| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|-----------|------------------|--------|---|---|---|
| 13 | Gravina and Katz | | Norton LN9684, a very dark nickel oxide. Melting point about 3500 F. Porosity about 2 per cent. Flame sprayed on cleaned, grit-blasted surface coated with 12-mil-thick Nichrome V undercoat. Coating thickness not given. Measured at: 800 F 1800 F | Normal spectral emittance. Resistance-heated strip specimen. Thermistor-bolometer detector. Monochromator. Reference blackbody. Temperatures measured with thermocouples. | Measured in air Data taken from curves. |

NORMAL SPECTRAL EMITTANCE OF NORTON LN9684 CERAMIC COATING ON A-286 STEEL-REFERENCE INFORMATION

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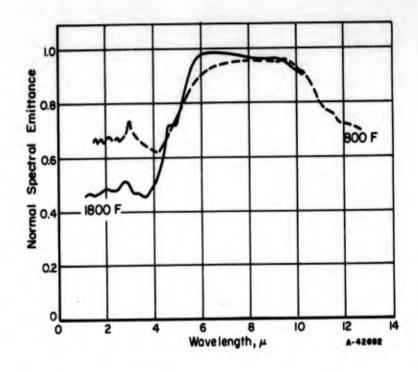
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NORMAL SPECTRAL EMITTANCE OF NORION LA 9696 ON INCONEL X

| NORMAL SPECTRAL EMI | TTANCE OF NORTON | LA-9696 ON INCONEL | XREFERENCE INFORMATION |
|---------------------|------------------|--------------------|------------------------|
|---------------------|------------------|--------------------|------------------------|

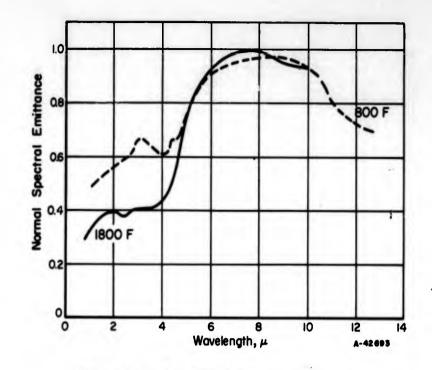
| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|-----------|------------------|--------|--|---|--|
| 13 | Gravina and Katz | | Norton ceramic coating LA-9696, a tan alundum, 92 per cent Al ₂ O ₃ . Melting point about 3500 F. Porosity about 5 per cent. Flame sprayed on cleaned, grit-blasted surface coated with 12-mil-thick Nichrome V undercoat. Coating thickness not given. Measured at 1800 F | Normal spectral emittance. Resistance-heated strip specimen. Thermistor-bolometer detector. Monochromator. Reference blackbody. Temperatures measured with thermocouples. | Measured in air. Data taken from curves. |
| | | | | | |



NORMAL SPECTRAL EMITTANCE OF NORTON LA 9683 ON TITANIUM

| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|-----------|------------------|--------|--|---|---|
| 13 | Gravina and Katz | | Norton ceramic coating LA-9696, a tan alundum, 92 per cent Al ₂ O ₃ . Melting point about 3500 F. Porosity about 5 per cent. Flame sprayed on cleaned, grit-blasted surface coated with 12-mil-thick Nichrome V undercoat. Coating thickness not given. Measured at: 800 F 1800 F | Normal spectral emittance. Resistance-heated strip specimen. Thermistor-bolometer detector. Monochromator. Reference blackbody. Temperatures measured with thermocouples. | Measured in air Data taken from curves. |

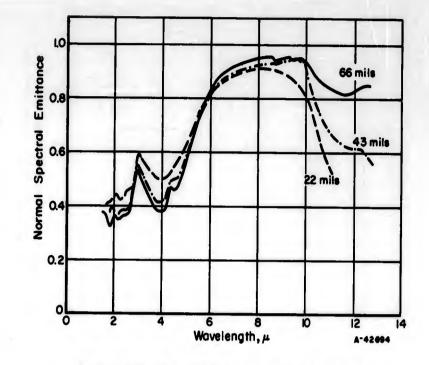
NORMAL SPECTRAL EMITTANCE OF NORTON LA-9696 ON 6A1-4V TITANIUM--REFERENCE INFORMATION



NORMAL SPECTRAL EMITTANCE OF NORTON LA 9696 ON A-286 STEEL

| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|-----------|------------------|--------|---|---|--|
| 13 | Gravina and Katz | | Norton ceramic coating LA-9696, a tan alundum, 92 per cent Al ₂ O ₃ . Melting point about 3500 F. Porosity about 5 per cent. Flame sprayed on cleaned, grit-blasted surface coated with 12-mil- thick Nichrome V undercoat. Coating thickness not given. Measured at: 800 F 1800 F | Normal spectral emittance. Resistance-heated strip specimen. Thermistor-bolometer detector. Monochromator. Reference blackbody. Temperatures measured with thermocouples. | Measured in air. Data taken from curves. |

NORMAL SPECTRAL EMITTANCE OF NORTON LA-9696 ON A-286 STEEL-REFERENCE INFORMATION

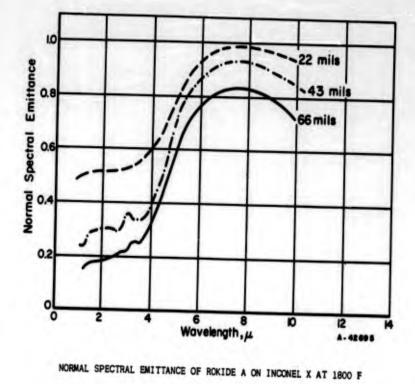


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NORMAL SPECTRAL EMITTANCE OF ROKIDE A ON INCONEL X AT 800 F

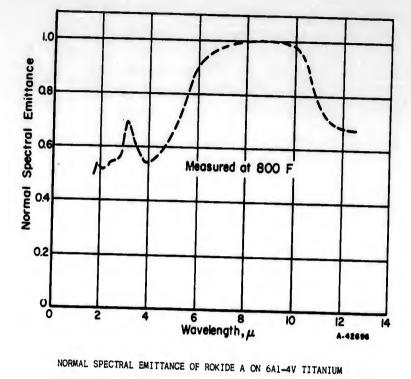
| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|-----------|------------------|--------|--|--|--|
| 13 | Gravina and Katz | | Norton Rokide A, white 98.5 per cent alumina. Melting point about 3600 F. Porosity about 4 to 8 per cent. Flame sprayed on degreased, grit-blasted surface coated with 12-mil-thick Nichrome V undercoat. Coating thicknesss 66 mils 43 mils 22 mils | Normal total emittance. Resistance-heated strip specimen. Thermistor-bolometer detector. Reference blackbody. Temperatures measured with thermocouples. | Measured in air. Data taken from curves. |

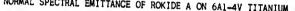
NORMAL SPECTRAL EMITTANCE OF ROKIDE A ON INCONEL X AT 800 F--REFERENCE INFORMATION



| NORMAL SPECTRAL EMITTANCE OF ROKIDE A ON I | NCONEL X AT 1800 F-REFERENCE INFORMATION |
|--|--|
|--|--|

| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|-----------|------------------|--------|--|--|---|
| 13 | Gravina and Katz | | Norton Rokide A, white 98.5 per cent alumina. Melting point about 3600 F. Porosity about 4 to 8 per cent. Flame sprayed on degreased, grit-blasted surface coated with 12-mil-thick Nichrome V undercoat. Coating thickness: 66 mils 43 mils 22 mils | Normal total emittance. Resistance-heated strip specimen. Thermistor-bolometer detector. Reference blackbody. Temperatures measured with thermocouples. | Measured in air Data taken from curves. |

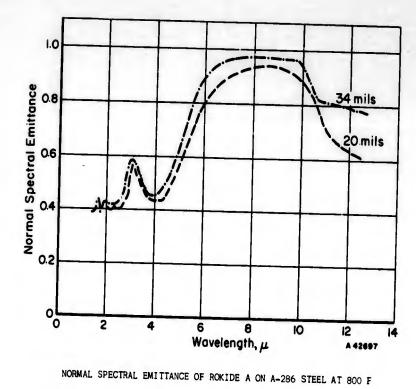




NORMAL SPECTRAL EMITTANCE OF ROKIDE A ON 6A1-4V TITANIUM-REFERENCE INFORMATION

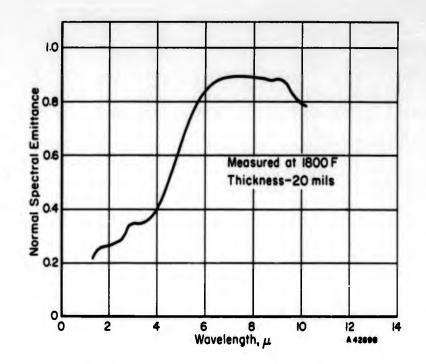
| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|-----------|------------------|--------|---|---|--|
| 13 | Gravina and Katz | | Norton Rokide A, white 98.5 per cent alumina. Melting point about 3600 F. Porosity about 4 to 8 per cent. Flame sprayed on degreased, grit-blasted surface coated with 12-mil-thick Nichrome V undercoat. Coating thickness not given. Measured at 800 F | Normal spectral emittance. Resistance-heated strip specimen. Thermistor-bolometer detector. Monochromator. Reference blackbody. Temperatures measured with thermocouples. | Measured in air. Data taken from curves. |

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NORMAL SPECTRAL EMITTANCE OF ROKIDE A ON A-286 STEEL AT 800 F--REFERENCE INFORMATION

| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|-----------|------------------|--------|---|---|---|
| 13 | Gravina and Katz | | Norton Rokide A, white 98.5 per cent alumina. Melting point about 3600 F. Porosity about 4 to 8 per cent. Flame sprayed on degreased, grit-blasted surface coated with 12-mil-thick Nichrome V undercoat. Coating thickness: 34 mils 20 mils | Normal spectral emittance. Resistance-heated strip specimen. Thermistor-bolometer detector. Monochromator. Reference blackbody. Temperatures measured with thermocouples. | Measured in air Data taken from curves. |



NORMAL SPECTRAL EMITTANCE OF ROKIDE A ON A-286 STEEL AT 1800 F

NORMAL SPECTRAL EMITTANCE OF ROKIDE A ON A-286 STEEL AT 1800 F--REFERENCE INFORMATION

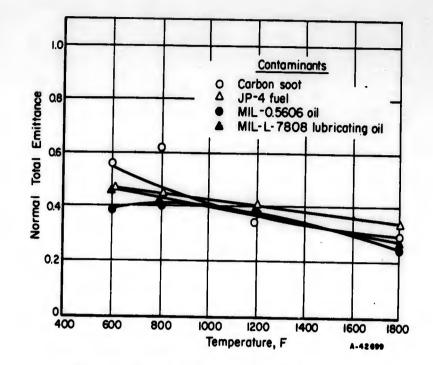
| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|-----------|------------------|--------|---|--|----------------------------|
| 13 | Gravina and Katz | | Norton Rokide A, white 98.5 per cent alumina. | Normal total emittance. Resistance-heated strip | Measured in air. |
| | | | Melting point about 3600 F. Porosity about | specimen. Thermistor-bolometer | Data taken from curves. |
| | | | 4 to 8 per cent. | detector. | |
| | | | Flame sprayed on degreased, | Reference blackbody. | |
| | | | grit-blasted surface coated with l2-mil-thick Nichrome V undercoat. | Temperatures measured with thermocouples. | |
| | | | Coating thickness 20 mils. | | |

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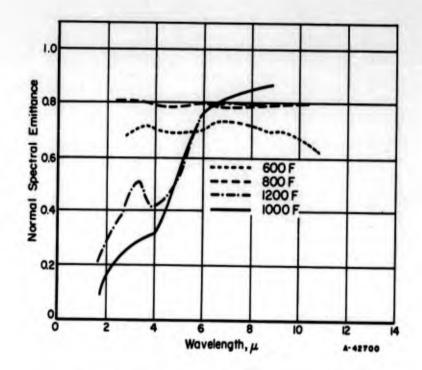


NORMAL TOTAL EMITTANCE OF ROKIDE A (CONTAMINATED) ON A-286 STEEL

| NORMAL IUTAL EMIT | TANCE OF ROKIDE | A (CONTAMINATED) | ON A-286 | STEELREFERENCE | INFORMATION |
|-------------------|-----------------|------------------|----------|----------------|-------------|
|-------------------|-----------------|------------------|----------|----------------|-------------|

| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|-----------|------------------|--------|---|--|---|
| 13 | Gravina and Katz | , | Rokide A (Norton, 98.5 per cent alumina). Contaminated with carbon soot Contaminated with JP-4 fuel Contaminated with MIL-0- 5606 oil Contaminated with MIL-L- 7808 lubricating oil. | Normal total emittance. Resistance-heated strip specimen. Thermistor-bolometer detector. Reference blackbody. Temperatures measured with thermocouples. | Measured at atmospheric pressure. Data taken from curves. |

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NORMAL SPECTRAL EMITTANCE OF ROKIDE A (CONTAMINATED) ON A-286 STEEL

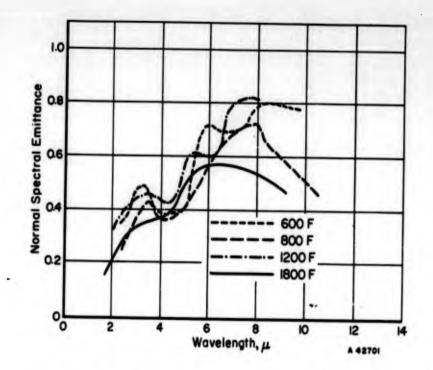
| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|-----------|------------------|--------|---|---|--|
| 13 | Gravina and Katz | | Rokide A, Norton 98.5 per cent alumina. Flame sprayed onto 12- mil-thick Nichrome V undercoat. Contaminated with carbon deposits. Measured at: 600 F 800 F 1200 F | Normal spectral emittance. Resistance-heated strip specimen. Thermistor-bolometer detector. Monochromator. Reference blackbody. Temperatures measured with thermocouples. | Measured in air. Data taken from curves. |

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NORMAL SPECTRAL EMITTANCE OF ROKIDE A (CONTAMINATED) ON A-286 STEEL-REFERENCE INFORMATION

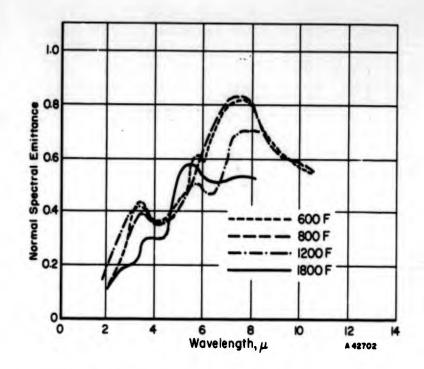


NORMAL SPECTRAL EMITTANCE OF ROKIDE A (CONTAMINATED) ON A-286 STEEL

| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|-----------|------------------|--------|--|---|-------------------------|
| 13 | Gravina and Katz | | Rokide A, Norton 98.5 per cent alumina. Flame | Normal spectral emittance. Resistance-heated strip | Measured in air. |
| | | | sprayed onto 12-mil- thick Nichrome V under- | specimen. Thermistor-bolometer | Data taken from curves. |
| | | | coat. Contaminated with JP-4 | detector. Monochromator. | |
| | | | fuel. | Reference blackbody. | |
| | | | Measured at: 600 F | Temperatures measured with thermocouples. | ٠ |
| | | | 800 F | with theimocouples. | |
| • • | | | 1200 F 1800 F | | |

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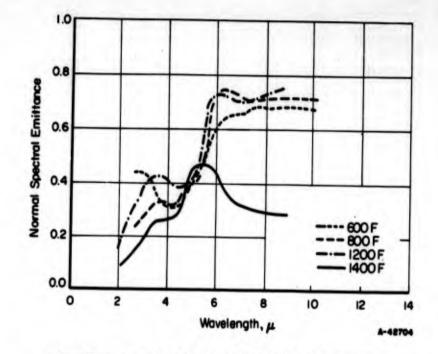
NORMAL SPECTRAL EMITTANCE OF ROKIDE & (CONTAMINATED) ON A-286 STEEL-REFERENCE INFORMATION



NORMAL SPECTRAL EMITTANCE OF ROKIDE A (CONTAMINATED) ON A-286 STEEL

NORMAL SPECTRAL EMITTANCE OF ROKIDE A (CONTAMINATED) ON TYPE A-286 STEEL--REFERENCE INFORMATION

| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|-----------|------------------|--------|---|---|---|
| 13 | Gravina and Katz | | Rokide A, Norton 98.5 per cent alumina. Flame sprayed onto 12- mil-thick Nichrome V undercoat. Contaminated with MIL-L- 7808. Measured at: 600 F 800 F 1200 F 1800 F | Normal spectral emittance. Resistance-heated strip specimen. Thermistor-bolometer detector. Monochromator. Reference blackbody. Temperatures measured with thermocouples. | Measured in air Data taken from curves. |

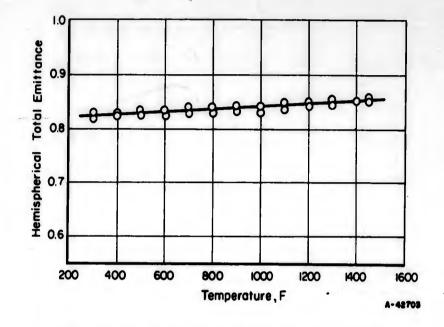


NORMAL SPECTRAL EMITTANCE OF ROKIDE A (CONTAMINATED) ON A-286 STEEL

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NORMAL SPECTRAL EMITTANCE OF ROKIDE A (CONTAMINATED) ON TYPE A-286 STEEL-REFERENCE INFORMATION

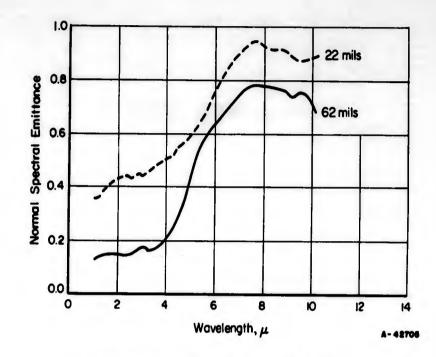
| Reference | Investigator | "Symbol | Composition and Surface Condition | Test Method | Remarks |
|-----------|------------------|---------|---|---|---|
| 13 | Gravina and Katz | | Rokide A, Norton 98.5 per cent alumina. Flame sprayed onto 12-mil- thick Nichrome V under- coat. Contaminated with MIL-O- 5606. Measured at: 600 F 800 F 1200 F 1800 F | Normal spectral emittance. Resistance-heated strip specimen. Thermistor-bolometer detector. Monochromator. Reference blackbody. Temperatures measured with thermocouples. | Measured in air Data taken from curves. |



HEMISPHERICAL TOTAL EMITTANCE OF ROKIDE C ON TYPE 310 STAINLESS STEEL

| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|-----------|-----------------------------|--------|---|---|----------------------------|
| 16 | Pratt & Whitney Aircraft | | Rokide C applied to Type 310 stainless steel. | Hemispherical total emittance. | Measured in vacuum. |
| | | | | Resistance-heated strip specimen. Power dissipated in measured area. Temperatures measured with thermocouples. | Data taken from curves. |

HEMISPHERICAL TOTAL EMITTANCE OF ROKIDE C ON TYPE 310 STAINLESS STEEL -- REFERENCE INFORMATION

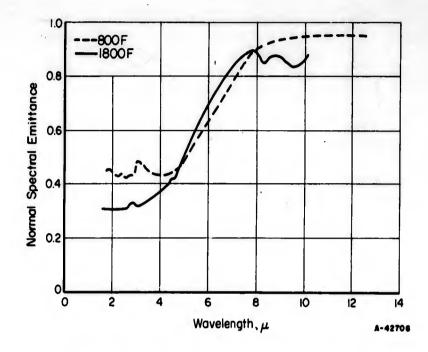


NORMAL SPECTRAL EMITTANCE OF ROKIDE Z ON INCONEL X

| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|-----------|------------------|--------|--|---|--|
| 13 | Gravina and Katz | | Norton Rokide Z, stabi- lized ZrO ₂ . Melting point about 4500 F. Porosity- about 8 per cent total pores. Coating thickness: 62 mils 22 mils | Normal spectral emittance. Resistance-heated strip specimen. Thermistor-bolometer detector. Monochromator. Reference blackbody. Temperatures measured with thermocouples. | Measured in air. Data taken from curves. |

NORMAL SPECTRAL EMITTANCE OF ROKIDE Z ON INCONEL X--REFERENCE INFORMATION

336

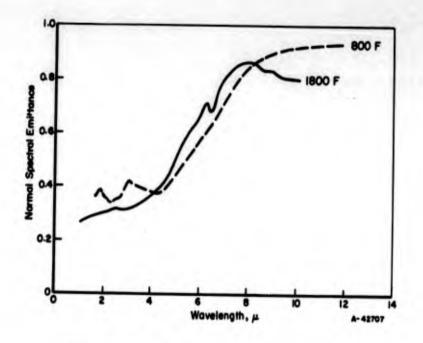


NORMAL SPECTRAL EMITTANCE OF ROKIDE Z ON 6A1-4V TITANIUM

NORMAL SPECTRAL EMITTANCE OF ROKIDE Z ON 6A1-4V TITANIUM--REFERENCE INFORMATION

| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|-----------|------------------|--------|---|--|----------------------------|
| 13 | Gravina and Katz | | Norton Rokide Z, stabi- lized ZrO2. Melting | Normal spectral emittance. Resistance-heated strip | Measured in air. |
| | | | point about 4500 F. Porosity about 8 per cent total pores. Measured at: 800 F 1800 F | specimen. Thermistor-bolometer detector. Monochromator. Reference blackbody. Temperatures measured with thermocouples. | Data taken from curves. |

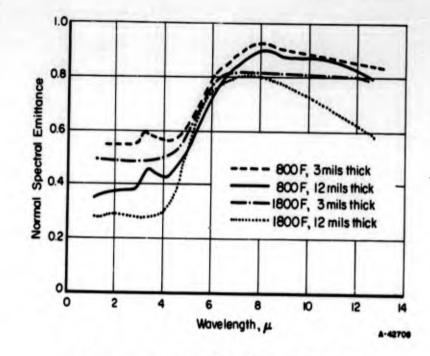
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NORMAL SPECTRAL EMITTANCE OF ROKIDE Z ON A-286 STEEL

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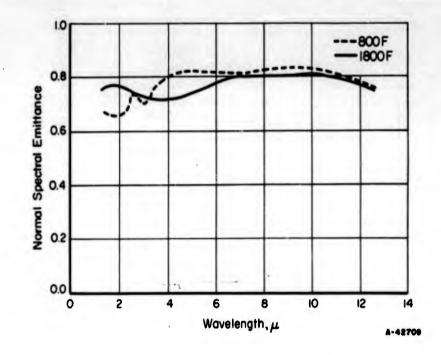
| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|-----------|------------------|--------|--|---|--|
| 13 | Gravina and Katz | | Norton Rokide Z, stabi- lized ZrO ₂ . Melting point about 4500 F. Porosity about 8 per cent total pores. Measured at: 800 F 1800 F | Normal spectral emittance. Resistance-heated strip specimen. Thermistor-bolometer detector. Monochromator. Reference blackbody. Temperatures measured with thermocouples. | Measured in air. Data taken from curves. |



NORMAL SPECTRAL EMITTANCE OF SYLVESTER FOM-10 ON INCONEL X

| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|-----------|------------------|--------|--|---|---|
| 13 | Gravina and Katz | | Sylvester ceramic coating FCM-10, a dark gray mullite. Flame sprayed on degreased, sand blasted, preheated Inconel X. Surface roughness approximately 180 to 200 microinches. Measured at: 800 F, 3 mils thick 1800 F, 3 mils thick 1800 F, 12 mils thick 1800 F, 12 mils thick | Normal spectral emittance. Resistance-heated strip specimen. Thermistor-bolometer detector. Monochromator. Reference blackbody. Temperatures measured with thermocouples. | Measured in air Data taken from curves. |

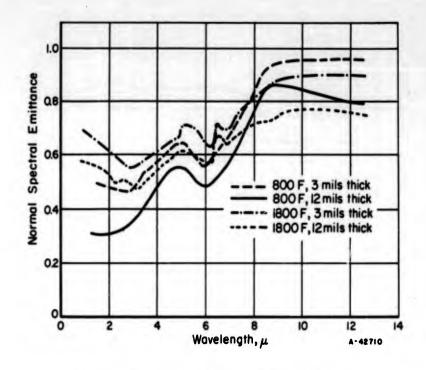
NORMAL SPECTRAL EMITTANCE OF SYLVESTER FCM-10 ON INCONEL X-REFERENCE INFORMATION



NORMAL SPECTRAL EMITTANCE OF SYLVESTER FCT-10 ON INCONEL X

NORMAL SPECTRAL EMITTANCE OF SYLVESTER FCT-10 ON INCONEL X--REFERENCE INFORMATION

| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|-----------|------------------|--------|---|---|---|
| 13 | Gravina and Katz | | Sylvester ceramic coating FCT-10, a light gray titanium dioxide. Flame sprayed on degreased, sand blasted, preheated Inconel X. Surface roughness approxi- mately 180 to 200 micro- inches. Coating thickness not given. Measured at: 800 F 1800 F | Normal spectral emittance. Resistance-heated strip specimen. Thermistor-bolometer detector. Monochromator. Reference blackbody. Temperatures measured with thermocouples. | Measured in air Data taken from curves. |



NORMAL SPECTRAL EMITTANCE OF SYLVESTER FCR-11 ON INCONEL X

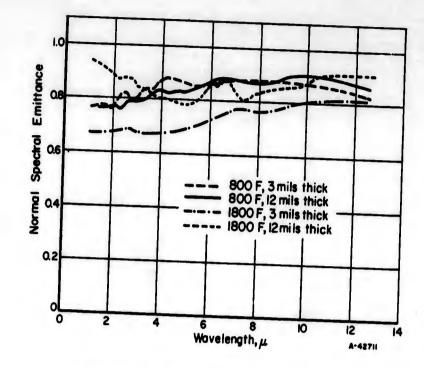
NORMAL SPECTRAL EMITTANCE OF SYLVESTER FCR-11 ON INCONEL X--REFERENCE INFORMATION

| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|-----------|------------------|--------|---|---|---|
| 13 | Gravina and Katz | | Sylvester ceramic coating FCR-11, a dark gray rare- earth oxide mixture, (50 per cent cerium). Flame sprayed on degreased, sand blasted, preheated Inconel X. Surface roughness approxi- mately 180 to 200 micro- inches. Measured at: 800 F, 3 mils thick 1800 F, 3 mils thick 1800 F, 12 mils thick 1800 F, 12 mils thick | Normal spectral emittance. Resistance-heated strip specimen. Thermistor-bolometer detector. Monochromator. Reference blackbody. Temperatures measured with thermocouples. | Measured in air Data taken from curves. |

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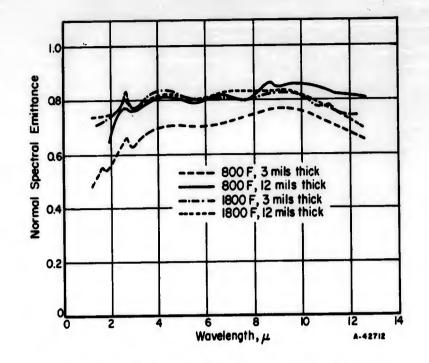
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NORMAL SPECTRAL EMITTANCE OF SYLVESTER FCT-11 ON INCONEL X

| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|-----------|------------------|--------|---|---|----------------------------|
| 13 | Gravina and Katz | | Sylvester ceramic coating FCT-11, a dark gray sillimanite. | Normal spectral emittance. | Measured in air. |
| | | | Flame sprayed on degreased, sand blasted, preheated Inconel X. Surface roughness approxi- mately 180 to 200 micro- inches. Measured at: 800 F, 3 mils thick 800 F, 12 mils thick 1800 F, 12 mils thick | Resistance-heated strip specimen. Thermistor-bolometer detector. Monochromator. Reference blackbody. Temperatures measured with thermocouples. | Data taken from curves. |

SPECTRAL EMITTANCE OF SYLVESTER FCT-11 CERAMIC COATING ON INCONEL X-REFERENCE INFORMATION



NORMAL SPECTRAL EMITTANCE OF SYLVESTER FCT-12 ON A-286 STEEL

NORMAL SPECTRAL EMITTANCE OF SYLVESTER FCT-12 ON A-286 STEEL-REFERENCE INFORMATION

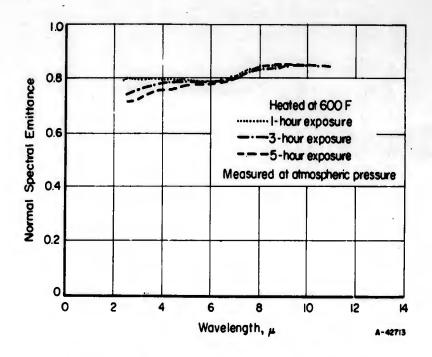
| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|-----------|------------------|--------|--|---|---|
| 13 | Gravina and Katz | | Sylvester ceramic coating FCT-12, a black sillimanite. Flame sprayed on de- greased, sand blasted, preheated material. Surface roughness approxi- mately 180 to 200 micro- inches. Measured at: 800 F, 3 mils thick 800 F, 12 mils thick 1800 F, 12 mils thick | Normal spectral emittance. Resistance-heated strip specimen. Thermistor-bolometer detector. Monochromator. Reference blackbody. Temperatures measured with thermocouples. | Measured in air Data taken from curves. |

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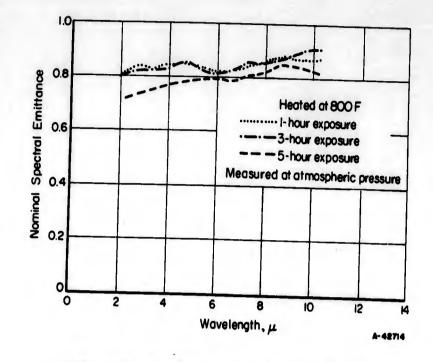


| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|-----------|------------------|--------|--|---|---|
| 13 | Gravina and Katz | | Sylvester ceramic coating FCT-12, a black sillimanite. Flame sprayed on de- greased, sand blasted, preheated material. Surface roughness approxi- mately 180 to 200 micro- inches. Heated at 600 F: 1 hour 3 hours 5 hours | Normal spectral emittance. Resistance-heated strip specimen. Thermistor-bolometer detector. Monochromator. Reference blackbody. Temperatures measured with thermocouples. | Measured in air Data taken from curves. |

NORMAL SPECTRAL EMITTANCE OF SYLVESTER FCT-12 ON A-286 STEEL AT 600 F--REFERENCE INFORMATION

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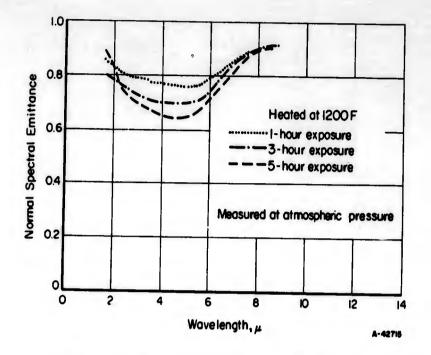


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NORMAL SPECTRAL EMITTANCE OF SYLVESTER FCT-12 CERAMIC COATING ON A-286 STEEL AT 800 F-REFERENCE INFORMATION

| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|-----------|------------------|--------|--|---|---|
| 13 | Gravina and Katz | | Sylvester ceramic coating FCT-12, a black sillimanite. Flame sprayed on de- greased, sand blasted, preheated material. Surface roughness approxi- mately 180 to 200 micro- inches. Heated at 800 F: 1 hour 3 hours 5 hours | Normal spectral emittance. Resistance-heated strip specimen. Thermistor-bolometer detector. Monochromator. Reference blackbody. Temperatures measured with thermocouples. | Measured in air Data taken from curves. |



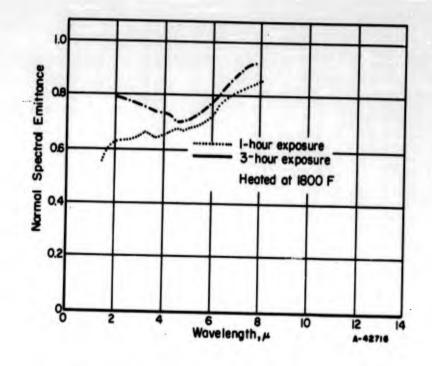
NORMAL SPECTRAL EMITTANCE OF SYLVESTER FCT-12 ON A-286 STEEL AT 1200 F-REFERENCE INFORMATION

| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|-----------|------------------|--------|---|--|---|
| 13 | Gravina and Katz | | Sylvester ceramic coating FCT-12, a black sillimanite. Flame sprayed on degreased, sand blasted, preheated material. Surface roughness approxi- mately 180 to 200 micro- inches. Heated at 1200 F: 1 hour 3 hours 5 hours | Normal spectral emittance. Resistance-heated strip specimen. Thermistor-bolometer detector. Monochromator. Reference blackbody. Temperatures measured with thermocouples. | Measured in air Data taken from curves. |

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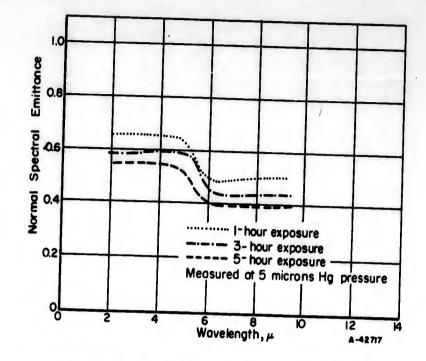
NORMAL SPECTRAL EMITTANCE OF SYLVESTER FCT-12 CERAMIC COATING ON A-286 STEEL AT 1800 F-REFERENCE INFORMATION

| leference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|-----------|------------------|--------|--|--|--|
| 13 | Gravina and Katz | | Sylvester ceramic coating FCT-12, a black sillimanite. Flame sprayed on degreased, sand blasted, preheated material. Surface roughness approxi- mately 180 to 200 micro- inches. Heated at 1800 F: 1 hour 3 hours | Normal spectral emittance. Resistance-heated strip specimen. Thermistor-bolometer detector. Monochromator. Reference blackbody. Temperatures measured with thermocouples. | Measured in air. Data taken from curves. |

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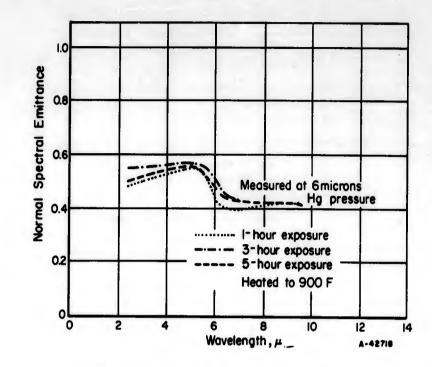
NORMAL SPECTRAL EMITTANCE OF SYLVESTER FCT-12 ON A-286 STEEL

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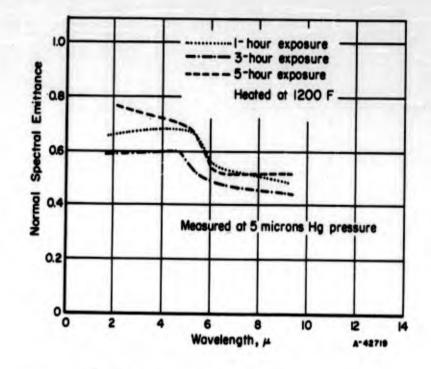
| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|-----------|------------------|--------|--|---|--|
| 13 | Gravina and Katz | | Sylvester ceramic coating FCT-12, a black sillimanite. Flame sprayed on degreased, sand blasted, preheated material. Surface roughness approxi- mately 180 to 200 micro- inches. Heated at 600 F: 1 hour 3 hours 5 hours | Normal spectral emittance. Resistance-heated strip specimen. Thermistor-bolometer detector. Monochromator. Reference blackbody. Temperatures measured with thermocouples. | Measured in 5 microns Hg pressure. Data taken from curves. |

NORMAL SPECTRAL EMITTANCE OF SYLVESTER FCT-12 ON A-286 STEEL AT 600 F---REFERENCE INFORMATION



| NORMAL SPECTRAL EMITTANCE OF SYLVESTER FCT-12 ON A-286 STEEL AT 800 F-REFERENCE INFORMATIC | NORMAL | SPECTRAL | EMITTANCE OF | SYLVESTER | FCT-12 | ON | A-286 | STEEL AT | 800 | FREFERENCE | INFORMATIC |
|--|--------|----------|--------------|-----------|--------|----|-------|----------|-----|------------|------------|
|--|--------|----------|--------------|-----------|--------|----|-------|----------|-----|------------|------------|

| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|-----------|------------------|--------|---|---|---|
| 13 | Gravina and Katz | | Sylvester ceramic coating FC-12, a black sillimanite. Flame sprayed on degreased, sand blasted, preheated material. Surface roughness approxi- mately 180 to 2CO micro- inches. Heated at 800 F: 1 hour 3 hours 5 hours | Normal spectral emittance. Resistance-heated strip specimen. Thermistor-bolometer detector. Monochromator. Reference blackbody. Temperatures measured with thermocouples. | Measured in 6 microns Hg pressure Data taken from curves. |

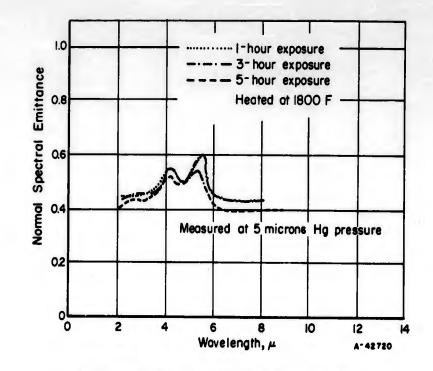


NORMAL SPECTRAL EMITTANCE OF SYLVESTER FCT-12 ON A-286 STEEL

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NORMAL SPECTRAL EMITTANCE OF SYLVESTER FCT-12 ON A-286 STEEL AT 1200 F-REFERENCE INFORMATION

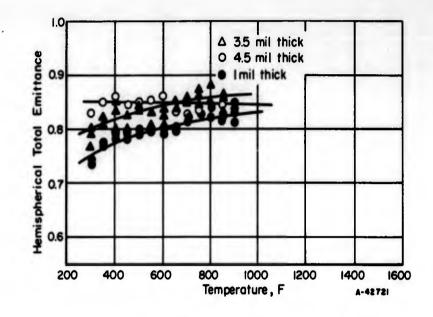
| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|-----------|------------------|--------|---|---|--|
| 13 | Gravina and Katz | | Sylvester ceramic coating FCT-12, a black sillimanite. Flame sprayed on degreased, sand blasted, preheated material. Surface roughness approxi- mately 180 to 200 micro- inches. Heated at 1200 F: 1 hour 3 hours 5 hours | Normal spectral emittance. Resistance-heated strip specimen. Thermistor-bolometer detector. Monochromator. Reference blackbody. Temperatures measured with thermocouples. | Measured in 5 microns Hg pressure. Data taken from curves. |



| NORMAL SPECTRAL EMITTANC | E OF SYLVESTER | R FCT-12 ON A-286 | STEEL AT 18 | 00 FREFERENCE | INFORMATION |
|--------------------------|----------------|-------------------|-------------|---------------|-------------|
|--------------------------|----------------|-------------------|-------------|---------------|-------------|

| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|-----------|------------------|--------|--|---|--|
| 13 | Gravina and Katz | | Sylvester ceramic coating FCT-12, a black sillimanite. Flame sprayed on degreased, sand blasted, preheated material. Surface roughness approxi- mately 180 to 200 micro- inches. Heated at 1800 F: 1 hour 3 hours 5, hours | Normal spectral emittance. Resistance-heated strip specimen. Thermistor-bolometer detector. Monochromator. Reference blackbody. Temperatures measured with thermocouples. | Measured in 5 microns Hg pressure. Data taken from curves. |

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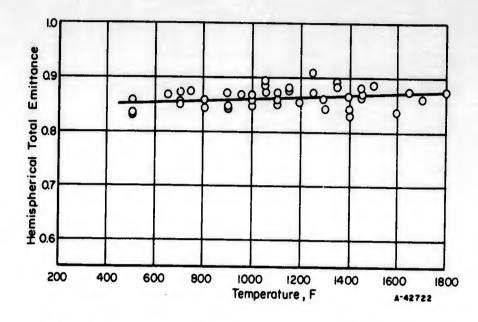


HEMISPHERICAL TOTAL EMITTANCE OF TITANIUM OXIDE ON ALUMINUM

| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|-----------|-----------------------------|--------|--|---|----------------------------|
| 16 | Pratt & Whitney Aircraft | | Metco plasma flame spray powder XP-1114. | Hemispherical total emittance. | Measured in vacuum. |
| | | | Flame sprayed on aluminum strip. | Resistance-heated strip specimen. | Data taken from curves. |
| | | | Coating thickness: 1 mil | Power dissipated in measured area. | |
| | | | 4.5 mils 3.5 mils | Temperatures measured with thermocouples. | |

HEMISPHERICAL TOTAL EMITTANCE OF TITANIUM OXIDE ON ALUMINUM--REFERENCE INFORMATION.

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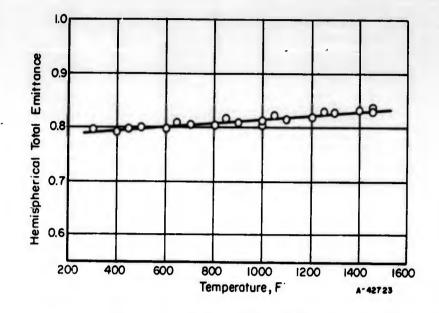


HEMISPHERICAL TOTAL EMITTANCE OF "TITANIA BASE" POWDER ON TYPE 310 STAINLESS STEEL

| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|-----------|-----------------------------|-----------------------------------|---|---|---------------------|
| 16 | Pratt & Whitney Aircraft | | Plasmadyne powder. Flame sprayed on Type 310 | Hemispherical total emittance. | Measured in vacuum. |
| | stainless steel | Resistance-heated strip specimen. | Data taken from curve. | | |
| | | | | Power dissipated in measured area. | |
| | · | | | Temperatures measured with thermocouples. | |

HEMISPHERICAL TOTAL EMITTANCE OF TITANIA BASE POWDER ON TYPE 310 STAINLESS STEEL -- REFERENCE INFORMATION

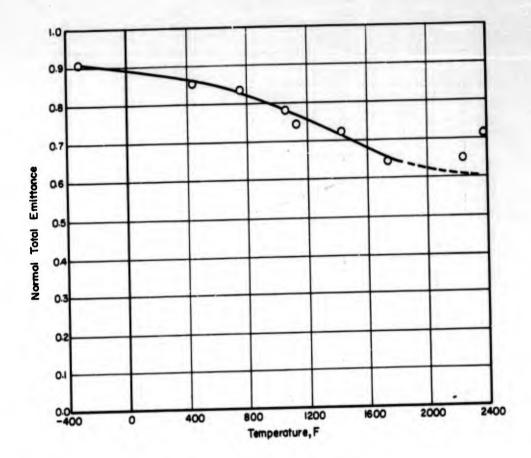
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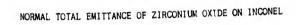


HEMISPHERICAL TOTAL EMITTANCE OF 50% TITANIUM OXIDE-50% ALUMINUM OXIDE ON TYPE 310 STAINLESS STEEL

| HEMISPHERICAL | TOTAL | EMITTANCE | OF | 50% | TITANIUM | OXIDE-50% | ALUMINUM | OXIDE (| ON |
|---------------|--------|------------|------|-------|----------|-------------|----------|---------|----|
| | TYPE 3 | O STAINLES | 5S 3 | STEEL | REFERE | NCE INFORMA | TION | | |

| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|-----------|-----------------------------|--------|---|---|---------------------------|
| 16 | Pratt & Whitney Aircraft | | Metco plasma flame spray powder XP-1121. | Hemispherical total emittance. | Measured in vacuum |
| | | | | Resistance-heated strip specimen. Power dissipated in measured area. Temperatures measured with thermocouples. | Data taken from curve. |

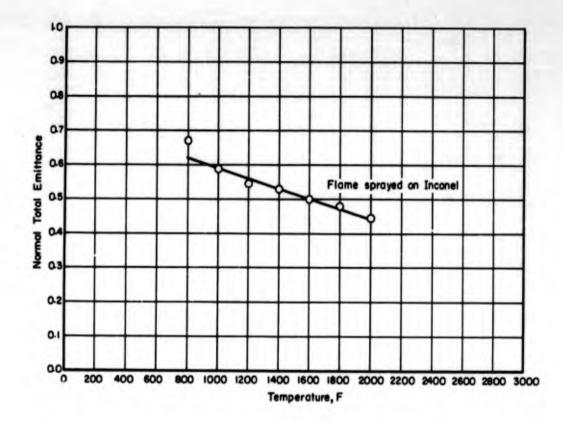


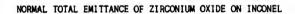


NORMAL TOTAL EMITTANCE OF ZIRCONIUM OXIDE ON INCONEL -- REFERENCE INFORMATION

| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|-----------|----------------------------------|--------|---|---|---|
| 11 | Investigator Olson and Morris | o | Zirconium oxide on Inconel. Thickness or surface condition not given. (Coating burned off probably near 2000 F.) | Normal total emittance. Comparison blackbody. Furnace heated speci- mens. Temperatures measured with thermocouples. Thermistor-bolometer detector. | Measured in air. Data taken from curve. |

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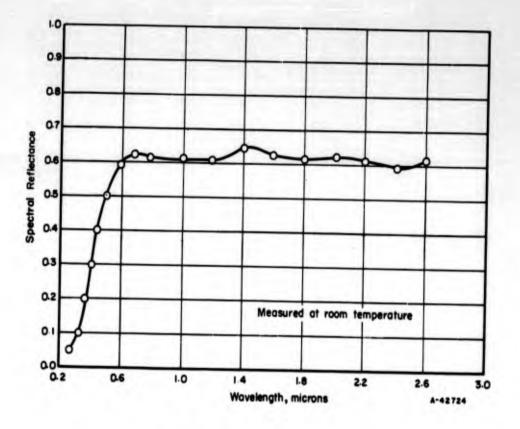


NORMAL TOTAL EMITTANCE OF ZIRCONIUM OXIDE ON INCONEL--REFERENCE INFORMATION

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| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|-----------|--------------|--------|---|---|---|
| 10 | Wade, W. R. | 0 | Flame-sprayed zirconia on Inconel heater strip. Coating thickness not given. | Normal total emittance. Thermopile detector. Resistance-heated Inconel strip with test material flame sprayed to "opaque" thickness. Comparison blackbody. Temperatures measured with thermocouples. | Measured in air. Temperatures given are those of Inconel heater strip. Data taken from curve. |



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SPECTRAL REFLECTANCE OF ZIRCONIUM OXIDE ON INCONEL

SPECTRAL REFLECTANCE OF ZIRCONIUM OXIDE ON INCONEL--REFERENCE INFORMATION

| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|-----------|------------------|--------|--|--|--|
| 11 | Olson and Morris | 0 | Zirconium oxide flame sprayed on Inconel. Thickness or surface condition not given. | Spectral reflectance at 9 degrees from normal (incident radiation). Recording spectro- photometer. Integrating sphere. Lead sulphide de- tector. (Normal illumination hemispherical viewing.) | Measured in air a room temperature Data taken from curve. |

1.0 0.9 0.8 Spectral Emittance 0.7 .7 0.6 0.5 IDULION 0.3 -Untreated ----Preheated in air ----Preheated in vacuum Measured at 480 F 0.2 0.1 ob 2 3 4 5 5 7 8 ю 12 13 14 9 II 15 16 17 ı Wavelength , μ A-42725

NORMAL SPECTRAL EMITTANCE OF ZIRCONIA ON INCONEL X AT 480 F

NORMAL SPECTRAL EMITTANCE OF ZIRCONIA ON INCONEL X AT 480 F--REFERENCE INFORMATION

| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|-----------|--------------|--------|---|---|------------------|
| 14 | Adams, J. G. | | Flame sprayed on Inconel X (untreated). Heated 30 minutes in air at 1500 F. Heated 30 minutes in 6.2 x 10 ⁻⁵ mm Hg pressure at 1500 F. | Normal spectral emittance. Furnace-heated disk specimen. Comparison blackbody (Hohlraun). Spectrometer-mono- chromator with photo- multiplier, lead sulphide, and thermo- couple detectors. Temperatures measured with thermocouples. | Measured in air. |

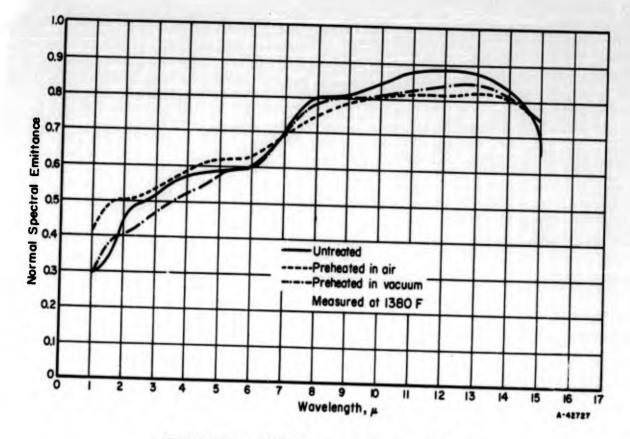
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1.0 0.9 Normal Spectral Emittance 40 20 90 20 80 80 -Untreated ---- Preheated in air -----Preheated in vacuum Measured at 930 F 02 0.1 0 0 2 3 4 ı 5 6 7 8 9 10 Ш 12 13 4 15 16 17 Wovelength, # A-42726

NORMAL SPECTRAL EMITTANCE OF ZIRCONIA ON INCONEL X AT 930 F

NORMAL SPECTRAL EMITTANCE OF ZIRCONIA ON INCONEL X AT 930 F--REFERENCE INFORMATION

| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|-----------|--------------|--------|---|--|-----------------|
| 14 | Adams, J. G. | | Flame sprayed on Inconel X. Untreated Heated 30 minutes in air at 1500 F Heated 30 minutes in 6.2 x 10 ⁻⁵ mm Hg pressure at 1500 F | Normal spectral emittance. Furnace-heated disk specimen. Comparison blackbody (Hohlraun). Spectrometer-mono- chromator with photo- multiplier, lead sulphide, and thermo- couple detectors. Temperatures measured with thermocouples. | Measured in air |

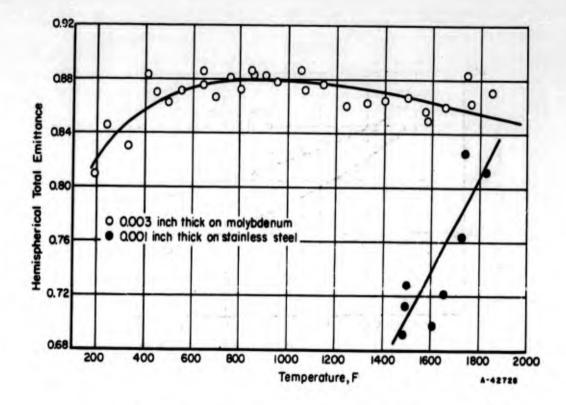


NORMAL SPECTRAL EMITTANCE OF ZIRCONIA ON INCONEL X AT 1380 F

NORMAL SPECTRAL EMITTANCE OF ZIRCONIA ON INCONEL X AT 1390 F--REFERENCE INFORMATION

| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|-----------|--------------|--------|--|---|-----------------|
| 14 | Adams, J. G. | | Flame sprayed on Inconel X. Untreated Heated 30 minutes in air at 1500 F Heated 30 minutes in 6.2 x 10 ⁻⁵ mm Hg pressure at 1500 F | Normal spectral emittance. Furnace-heated disk specimen. Comparison blackbody (Hohlraun). Spectrometer-mono- chromator with plan- multiplier, lead sulphide, and thermo- couple detectors. Temperatures measured with thermocouples. | Measured in air |

360



HEMISPHERICAL TOTAL EMITTANCE OF TWO ZIRCONIUM OXIDE COATED SPECIMENS

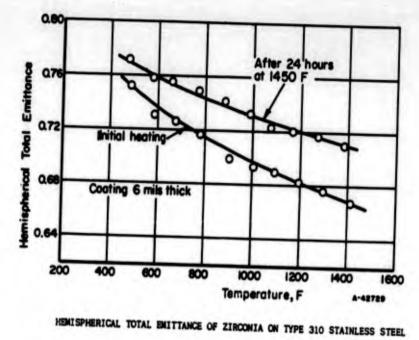
HEMISPHERICAL TOTAL EMITTANCE OF ZIRCONIUM OXIDE ON MOLYBDENUM AND TYPE 310 STAINLESS STEEL--REFERENCE INFORMATION

| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks | |
|--------------------------------|--------------|---|---|--|------------------------|--|
| 15 Pratt & Whitney Aircraft | | | 2-mil-thick coating applied by Linde Plasmarc process | Hemispherical total emittance. | al Measured in vacuum. | |
| | | to molybdenum strip. Resistance-heated 1-mil-thick coating flame strip specimen. | | Data taken from curves. | | |
| | | | <pre>sprayed by.Metco process on Type 310 stainless steel</pre> | Power dissipated in measured area. | | |
| | | | strip. | Temperatures measured with thermocouples. | | |

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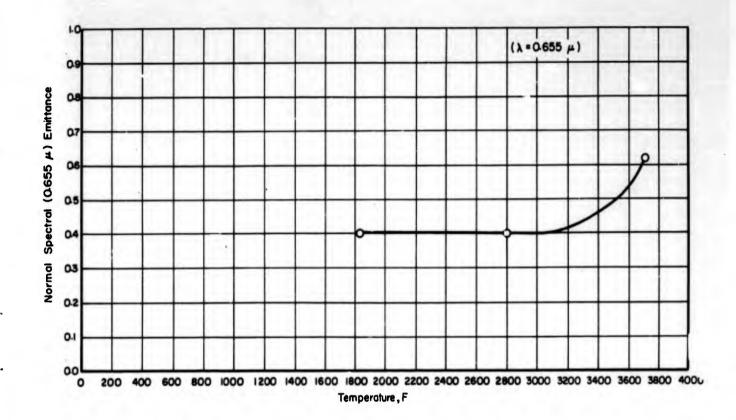




| HEMISPHERICAL IOIAL EMITTANCE OF ZI | IRCONIA ON TYPE 3 | BIO STAINLESS | STEEL-REFERENCE INFORMATION | |
|-------------------------------------|-------------------|---------------|-----------------------------|--|
|-------------------------------------|-------------------|---------------|-----------------------------|--|

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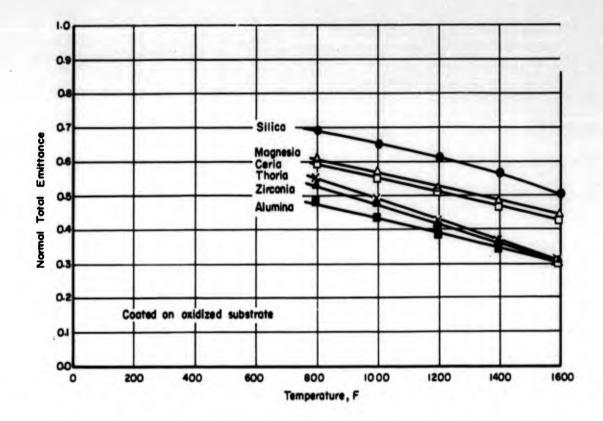
| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|-----------|-----------------------------|--------|--|---|--|
| 18 | Pratt & Whitney Aircraft | | 6-mil-thick coating applied by Metco plasma flame spray process on Type 310 stainless steel tube. Initial heating After 24 hours at 1450 F (cooling and heating show change to be permanent) | Hemispherical total emittance. Resistance-heated tube specimen. Power dissipated in measured area. Temperatures measured with thermocouples. | Measured in vacuum Data taken from curves. |



| NORMAL | SPECTRAL | EMITTANCE | OF | THORIUM | OXIDE | ON | TUNGSTEN | AND | MOLYBDENUM | |
|--------|----------|-----------|----|---------|-------|----|----------|-----|------------|--|
|--------|----------|-----------|----|---------|-------|----|----------|-----|------------|--|

| NORMAL | SPECTRAL | EMITTANCE | OF | THORTUM | OXIDE | ON | TUNGSTEN | AND | MOLYBDENUMREFERENCE INFORMATION |
|--------|----------|-----------|----|---------|-------|------|----------|-----|---------------------------------|
| | | | | | | - 60 | | | |

| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|-----------|---------------|--------|--|---|--|
| 6 | Morgan, F. H. | 0 | Purity or coating thick- ness not given. Thoria cataphoretically coated on tungsten (or molybdenum) ribbon previously flashed in hydrogen. | Resistance-heated, coated ribbon. Temperatures measured with thermocouples. Brightness temper- ature measured with optical pyrometer. | Measured in vacuum Coatings on tungsten and molybdenum gave identical results Data taken from curve and discussion. |



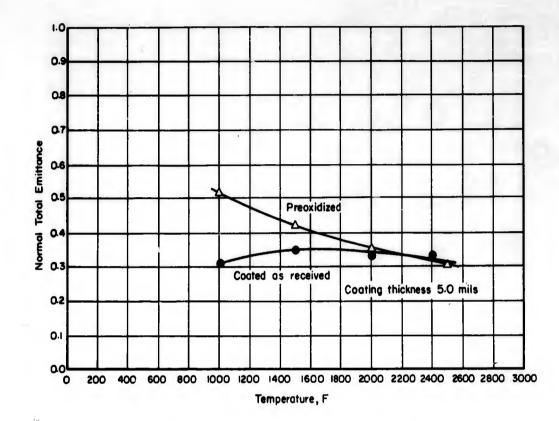
NORMAL TOTAL EMITTANCE OF VARIOUS REFRACTORY OXIDES ON NIMONIC 75

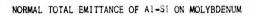
NORMAL TOTAL EMITTANCE OF VARIOUS REFRACTORY OXIDES ON NIMONIC 75--REFERENCE INFORMATION

•

| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|-----------|-----------------------------------|-----------------------|---|---|--|
| 12 | Sully, Brandes, and Waterhouse | • • • • • | Purest commercially avail- able materials. Applied to oxidized Nimonic 75 strip as water sus- pension. Coating thickness not given. Silica Magnesia Ceria Thoria Zirconia Alumina | Normal total emittance. Resistance-heated metal-strip specimens with ceramic coated surface. Comparison blackbody. Temperatures measured with thermocouples. Thermopile detector. | Measured in air. Data taken from curves. Hemispherical total emittance found to equal normal total emittance for th alumina coated specimen. (Should hold true for the others also.) |

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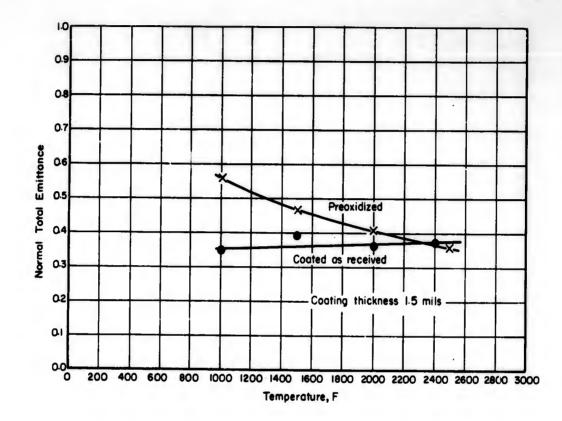


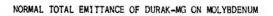


| NORMAL TOTAL EMIT | TANCE OF | Al-Si | ON MOLYBDENUM | REFERENCE | INFORMATION |
|-------------------|----------|-------|---------------|-----------|-------------|
|-------------------|----------|-------|---------------|-----------|-------------|

| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|-----------|-------------------|--------|--|--|---|
| 7 | Anthony and Pearl | • | N.R.C. Al-Si on molybdenum. Coated as received. Preoxidized, then coated. Coating thickness 5 mils. | Normal total emittance. Induction heated specimen. Thermopile detector. Comparison blackbody. Temperatures measured with thermocouples and optical pyrometer. | Measured in continuous purge of helium gas. |

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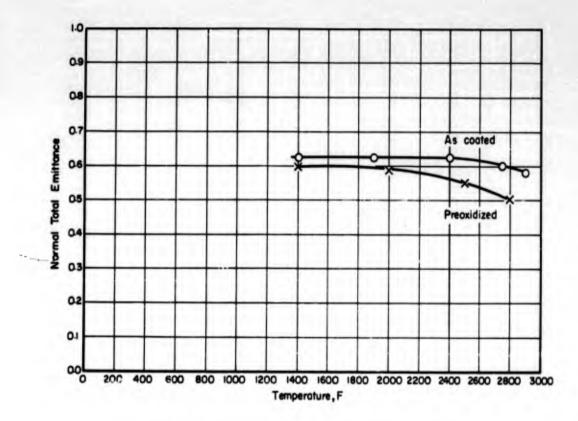




NORMAL TOTAL EMITTANCE OF DURAK-MG ON MOLYBDENUM--REFERENCE INFORMATION

| Reference | Investigator | Symbol | Composition and Surface Condition | . Test Method | Remarks |
|-----------|-------------------|--------|--|--|---|
| 7 | Anthony and Pearl | • × | Durak-MG coating on molybdenum. Coated as received. Preoxidized, then coated. Coating thickness 1.5 mils, nominal. | Normal total emittance. Induction-heated specimen. Thermopile detector. Comparison blackbody. Temperatures measured with thermocouples and optical pyrometer. | Measured in continuous purge of helium gas. Data taken from tables. |

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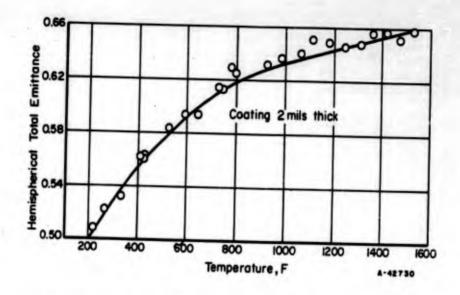


NORMAL TOTAL EMITTANCE OF DURAK-MG ON MOLYBDENUM-0.5 TITANIUM ALLOY

| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|-----------|-------------------------------|--------|--|---|--|
| 8 | Fieldhouse, Lang, and Blau | | Durak-MG coating on molybdenum-0.5 per cent titanium alloy. | Normal and angular total emittance. Induction heated specimen. | Measured in 90 per cent argon, 10 per cent H ₂ gas. Measurements made a |
| | | o x | As coated. Preoxidized at 2000 F for 1 hour. Specimens "flat and smooth" (coating thickness not given). | Spectrometer with prism replaced by plane mirror. Thermocouple detector. Blackbody hole in specimen. Temperature cali- bration with black- body and optical pyrometer. | angles of 0, 30, 45, and 60 degrees with normal to specimen surface. Normal total emittance equals hemispherical total emittance within reported ex- perimental error or ± 5 per cent. Data taken from curves. |

NORMAL TOTAL EMITTANCE OF DURAK-MG ON MOLYBDENUM-0.5 TITANIUM ALLOY--REFERENCE INFORMATION

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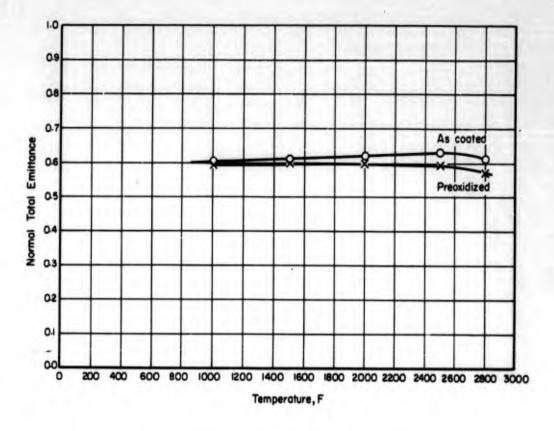


HEMISPHERICAL TOTAL EMITTANCE OF MOLYBDENUM DISILICIDE ON MOLYBDENUM

| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|-----------|-------------------------------|--------|---|--|--|
| 15 | Pratt and Whitney Aircraft | | 2-mil-thick coating of McSi ₂ applied by the Linde Plasmarc process to both sides of a molybdenum strip. | Hemispherical total emittance. Resistance-heated strip specimen. Power dissipated in measured area. Temperatures measured with thermocouples. | Measured in vacuum. Data taken from curve. |

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HEMISPHERICAL TOTAL EMITTANCE OF MOLYBDENUM DISILICIDE ON MOLYBDENUM-REFERENCE INFORMATION

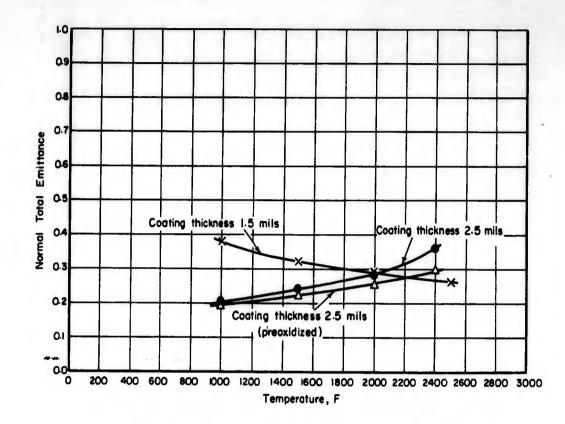


NORMAL TOTAL EMITTANCE OF W-2 ON MOLYBDENUM-0.5 TITANIUM ALLOY

NORMAL TOTAL EMITTANCE OF W-2 ON MOLYBDENUM-0.5 TITANIUM ALLOY--REFERENCE INFORMATION

| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|-----------|-------------------------------|--------|---|---|---|
| 8 | Fieldhouse, Lang, and Blau | | Chromalloy W-2 coating on molybdenum-0.5 per cent titanium alloy. | Normal and angular total emittance. Induction heated specimen. | Measured in 90 per cent argon, 10 per cent H2 atmosphere Measurements made |
| | | 0 | As coated. | Spectrometer with | at angles of 0, 30 |
| | | × | Preoxidized, at 2000 F for 1 hour. Coating thickness not given. Specimen "flat and smooth". (W-2 coating thought to be molybdenum disilicide.) | prism replaced by plane mirror. Thermocouple de- tector. Blackbody hole in specimen. Temperature cali- bration with black- body and optical pyrometer. | 45, and 60 degrees with the normal to the specimen surface. Normal total emittance equals hemispherical total emittance within reported experi- mental error of ± 5 per cent. Data taken from curves. |

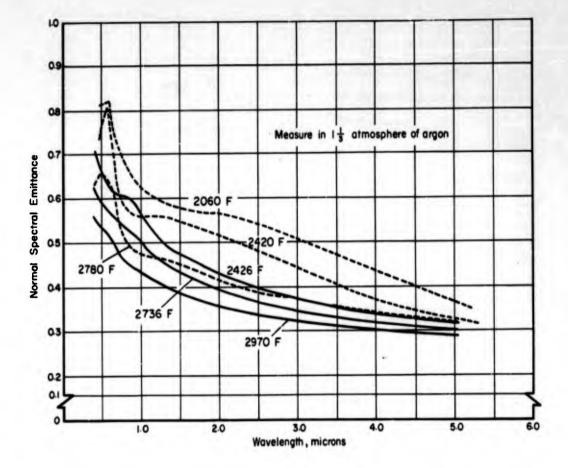
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NORMAL TOTAL EMITTANCE OF W-2 ON MOLYBDENUM-0.5 TITANIUM ALLOY

| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|-----------|-------------------|-------------|---|--|---|
| 7 | Anthony and Pearl | ∆ ● X | Molybdenum-0.5 per cent titanium alloy coated with W-2. Coating thickness 1.5 mils. Coating thickness 2.5 mils. Preoxidized, then 2.5-mil thick coating applied. (Alloy not defined.) (W-2 coating thought to be molybdenum disilicide.) | Normal total emittance. Induction-heated speci- men. Thermopile detector. Comparison blackbody. Temperatures measured with thermocouples and optical pyrometer. | Measured in continuous purge of helium gas. |

NORMAL TOTAL EMITTANCE OF W-2 ON MOLYBDENUM-0.5 TITANIUM ALLOY--REFERENCE INFORMATION



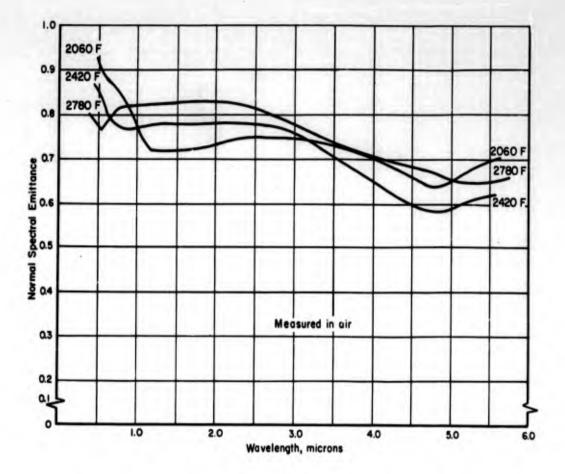
NORMAL SPECTRAL EMITIANCE OF W-2 ON MOLYBDENUM-0.5 TITANIUM ALLOY

| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|-----------|---------------------------------|--------|---|---|--|
| 9 | Coffman, Kibler, and Riethof | | Surface condition: as received. Coating thickness not given. Specimen No. 4 - measured at 2426, 2736, and 2970 F. | Normal spectral emittance. Induction-heated specimen. Spectrometer-mono- chromator. Comparison blackbody. | Measured in 1-1/3 atmosphere of argon. Results not repro- ducible at lower temperatures afte heating to higher temperature. |
| | | | Specimen No. 5 - measured at 2060, 2420, and 2730 F. | | |
| | | | (W-2 coating thought to be molybdenum disilicide.) | | |

NORMAL SPECTRAL EMITTANCE OF W-2 ON MOLYBDENUM-0.5 TITANIUM ALLOY--REFERENCE INFORMATION

371

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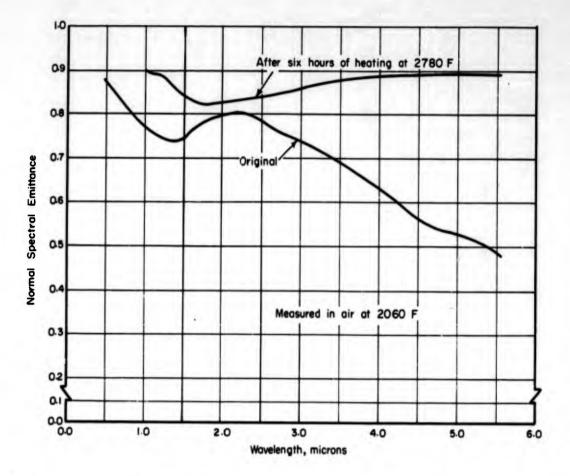
NORMAL SPECTRAL EMITTANCE OF W-2 ON MOLYBDENUM-0.5 TITANIUM ALLOY

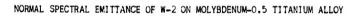
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| Reference | Composition and Investigator Symbol Surface Condition | | Test Method | Remarks | |
|-----------|--|--|--|---|---|
| 9 | Coffman, Kibler, and Riethof | | Surface conditionas received. Coating thickness not given. (W-2 coating thought to be molybdenum disilicide.) | Normal spectral emittance. Induction-heated speci- mens. Spectrometer-mono- chromator. Comparison blackbody. | Measured in air. Data taken from curves. Note: Specimens run at 2060 F, held for 2 hours and rerun; run at 2420 F, held for 2 hours and rerur run at 2780 F, held for 2 hours and rerun. First run at each temperature is shown. The final run at 2780 F showed no further change. |

NORMAL SPECTRAL EMITTANCE OF W-2 ON MOLYBDENUM-0.5 TITANIUM ALLOY-REFERENCE INFORMATION

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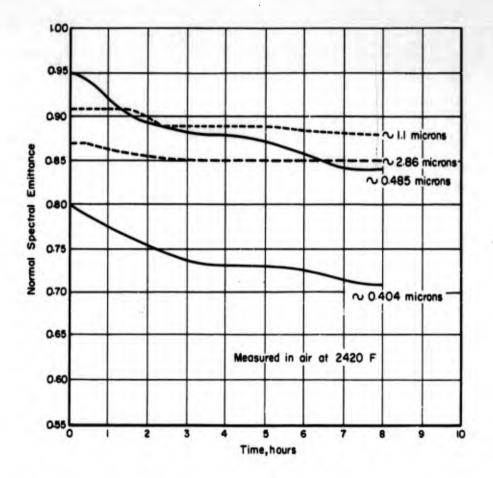




| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|-----------|---------------------------------|--------|--|---|---|
| 9 | Coffman, Kibler, and Riethof | | Surface conditionas received. Coating thickness not given. (W-2 coating thought to be molybdenum disilicide.) | Normal spectral emittance. Inductively heated specimen. Spectrometer-mono- chromator. Comparison blackbody. | Measured in air. Variation with thermal treatment Data taken from curves. |

NORMAL SPECTRAL EMITTANCE OF W-2 ON MOLYBDENUM-0.5 TITANIUM ALLOY--REFERENCE INFORMATION

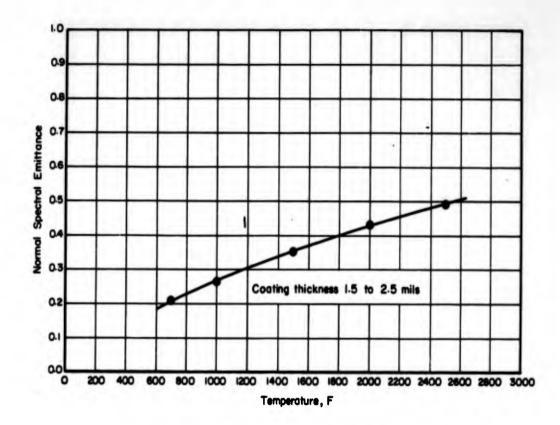
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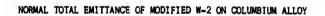


VARIATION OF NORMAL SPECTRAL EMITTANCE OF W-2 ON MOLYBDENUM-0.5 TITANIUM ALLOY WITH HEATING TIME IN AIR

| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|-----------|---------------------------------|--------|--|--|---|
| 9 | Coffman, Kibler, and Riethof | | Surface conditionas received. Coating thickness not given. (W-2 coating thought to be molybdenum disilicide.) | Normal spectral emittance. Inductively heated spec- imen. Spectrometer-mono- chromator. Comparison blackbody. | Measured in air at 2420 F. Data taken from curves. Measured at wave- lengths of 0.404 0.485, 1.1 and 2.86 microns. |

VARIATION OF NORMAL SPECTRAL EMITTANCE OF W-2 ON MOLYBDENUM-0.5 TITANIUM ALLOY WITH HEATING TIME IN AIR--REFERENCE INFORMATION



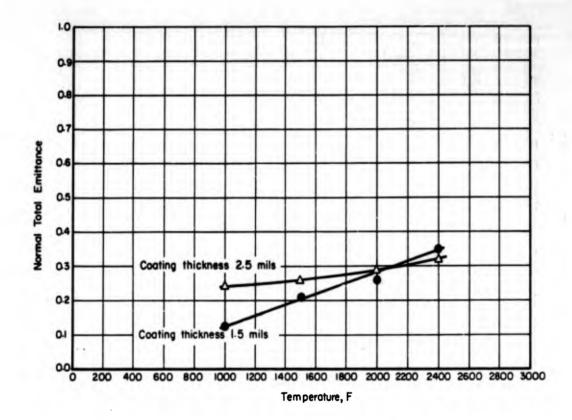


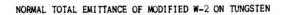
| NORMAL T | TOTAL | EMI TTANCE | OF | MODIFIED | W-2 | ON | COLUMBIUM | ALLOYREFERENCE | INFORMATION |
|----------|-------|------------|----|----------|-----|----|-----------|----------------|-------------|
|----------|-------|------------|----|----------|-----|----|-----------|----------------|-------------|

| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|-----------|-------------------|--------|---|--|---|
| 7 | Anthony and Pearl | • | Columbium-10Ti - 10Mo. As received. Coating: T-1 modified W-2, 1.5 to 2.5 mils nominal thickness. | Normal total emittance. Induction-heated speci- men. Thermopile detector. Comparison blackbody. Temperatures measured with thermocouples and optical pyrometer. | Measured in continuous purge of helium gas. |

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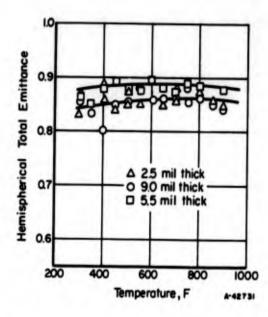
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| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|-----------|-------------------|--------|--|--|---|
| 7 | Anthony and Pearl | • 4 | Modified W-2 coating on tungsten. Coating thickness 1.5 mils. Coating thickness 2.5 mils. | Normal total emittance. Induction-heated speci- men. Thermopile detector. Comparison blackbody. Temperatures measured with thermocouples and optical pyrometer. | Measured in continuous purge of helium gas. |

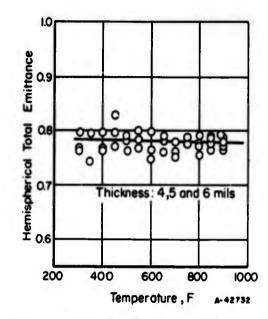
NORMAL TOTAL EMITTANCE OF MODIFIED W-2 ON TUNGSTEN--REFERENCE INFORMATION



HEMISPHERICAL TOTAL EMITTANCE OF ALUMINUM PHOSPHATE BONDED COATING ON ALUMINUM

| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|-----------|-----------------------------|--------|--|--|--|
| 16 | Pratt & Whitney Aircraft | | Silicon carbide and silicon dioxide filler. 2.5 mils thick 9.0 mils thick 5.5 mils thick | Hemispherical total emittance. Resistance-heated strip specimen. Power dissipated in measured area. Temperatures measured with thermocouples. | Measured in vacuum Data taken from curves. |

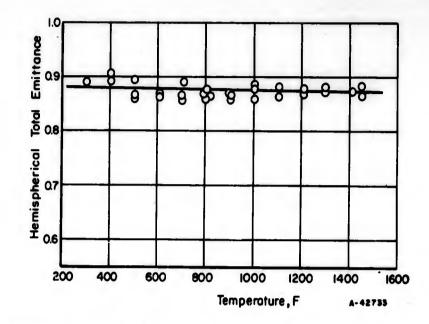
HEMISPHERICAL TOTAL EMITTANCE OF ALUMINUM PHOSPHATE BONDED COATING ON ALUMINUM--REFERENCE INFORMATION



HEMISPHERICAL TOTAL EMITTANCE OF ALUMINUM PHOSPHATE BONDED COATING ON ALUMINUM

| HEMISPHERICAL | TOTAL | EMITTANCE C |)F / | ALUMINUM | PHOSPHATE | COATING | ON | ALUMINUM- | -REFERENCE | INFORMATION | |
|---------------|-------|-------------|------|----------|-----------|---------|----|-----------|------------|-------------|--|
|---------------|-------|-------------|------|----------|-----------|---------|----|-----------|------------|-------------|--|

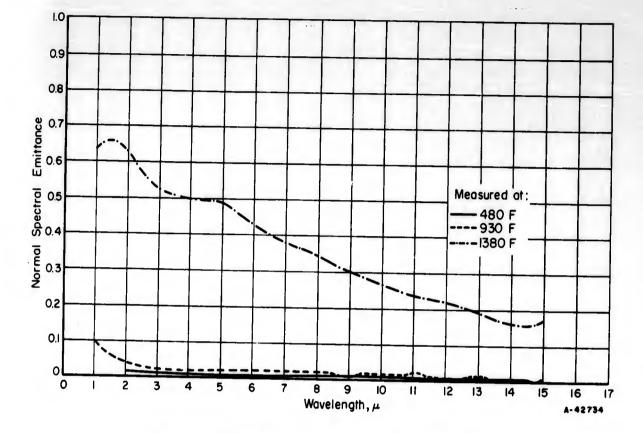
| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|-----------|-----------------------------|--------|---|---|----------------------------|
| 16 | Pratt & Whitney Aircraft | | Boron and silicon dioxide filler applied to | Hemispherical total emittance. | Measured in vacuum |
| | | | aluminum strip. | Resistance-heated strip specimer. Power dissipated in measured area. Temperatures measured with thermocouples. | Data taken from curves. |



HEMISPHERICAL TOTAL EMITTANCE OF ALUMINUM PHOSPHATE COATING ON TYPE 310 STAINLESS STEEL

| eference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|----------|-----------------------------|--------|--|--|------------------------|
| 17 | Pratt & Whitney Aircraft | | Aluminum phosphate with nickel chrome spinel | Hemispherical total emittance. | Measured in vacuum |
| | | | and silicon dioxide filler. Coated both sides. | Resistance-heated strip and tube specimens. | Data taken from curve. |
| | | | | Power dissipated in measured area. | |
| | | | | Temperatures measured with thermocouples. | |

HEMISPHERICAL TOTAL EMITTANCE OF ALUMINUM PHOSPHATE COATING ON TYPE 310 STAINLESS STEEL-REFERENCE INFORMATION

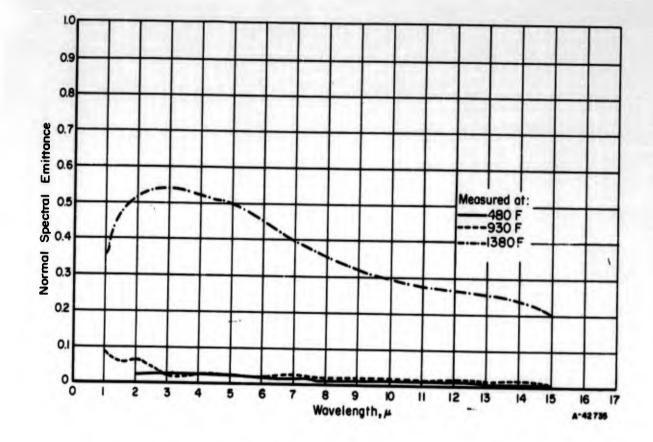


NORMAL SPECTRAL EMITTANCE OF CERAMIC GOLD ON TITANIUM (SHINY FINISH)

| NORMAL | SPECTRAL | EMITTANCE | OF | CERAMIC | GOLD | ON | TITANIUMREFERENCE | INFORMATION |
|--------|----------|-----------|----|---------|------|----|-------------------|-------------|
|--------|----------|-----------|----|---------|------|----|-------------------|-------------|

| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|-----------|--------------|--------|---|---|------------------|
| 14 | Adams, J. G. | | As received - shiny finish. Engelhard Industries Bright Gold No. 6854. Applied by spray and fired at 600 C for 5 minutes. Measured at: 480 F 930 F 1330 F | Normal spectral emittance. Furnace-heated disk specimen. Comparison blackbody (Hohlraun). Spectrometer-mono- chromator with photo- multiplier, lead sulphide, and thermo- couple detectors. Temperatures measured with thermocouples. | Measured in air. |

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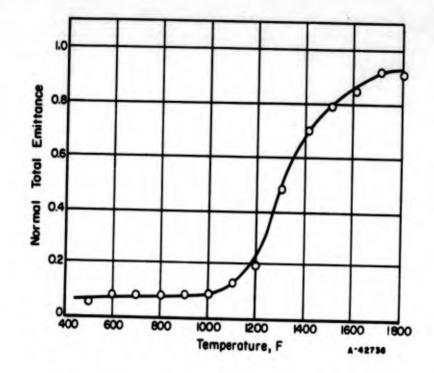


NORMAL SPECTRAL EMITTANCE OF CERAMIC GOLD ON TITANIUM (MATTE FINISH)

NORMAL SPECTRAL EMITTANCE OF CERAMIC GOLD ON TITANIUM (MATTE FINISH) -- REFERENCE INFORMATION

| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|-----------|--------------|--------|---|--|------------------|
| 14 | Adams, J. G. | | As received - matte finish. Engelhard Industries Bright Gold No. 6854. Applied by spray and fired at 600 C for 5 minutes. Measured at: 480 F 930 F 1380 F | Normal spectral emittance. Furnace-heated disk specimen. Comparison blackbody (Hohlraun). Spectrometer-mono- chromator with photo- multiplier, lead sulphide, and thermo- couple detectors. Temperatures measured with thermocouples. | Measured in air. |

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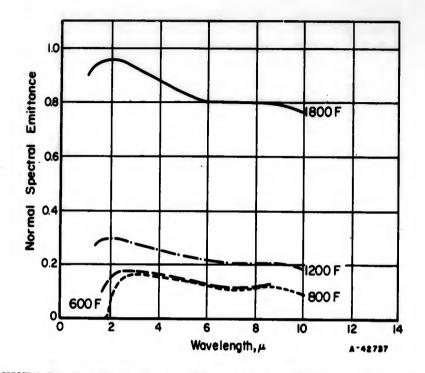


NORMAL TOTAL EMITTANCE OF HANOVIA LIQUID GOLD NO. 6896 ON A-286 STEEL

NORMAL TOTAL EMITTANCE OF HANOVIA LIQUID GOLD NO. 6896 ON A-286 STEEL--REFERENCE INFORMATION

| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|-----------|------------------|--------|---|--|--|
| 13 | Gravina and Katz | | Hanovia Liquid Gold No. 6896, resinous gold compound dissolved in essential oils. Coating thickness not given. | Normal total emittance. Resistance-heated strip specimen. Thermistor-bolometer detector. Reference blackbody. Temperatures measured with thermocouples. | Measured in air. Data taken from curves. |

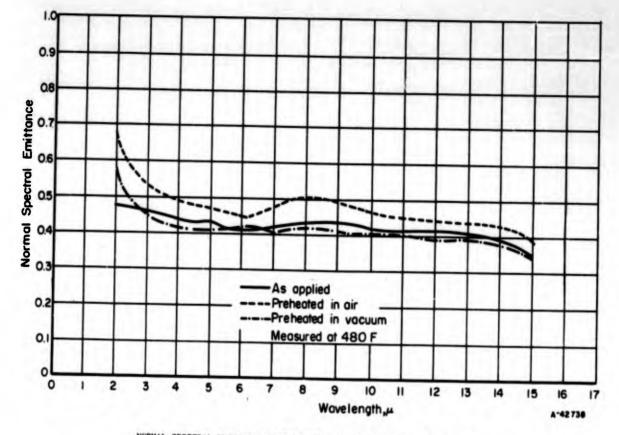
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NORMAL SPECTRAL EMITTANCE OF HANOVIA LIQUID GOLD NO. 6896 ON A-286 STEEL AT 600, 800, 1200 AND 1800

| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|-----------|------------------|--------|---|--|--|
| 13 | Gravina and Katz | | Hanovia Liquid Bright Gold No. 6896, a resinous gold compound dissolved in essential oils. Gold content 8 to 20 per cent. Coating thickness not given. Measured ats 600 F 800 F 1200 F | Normal spectral emittance. Resistance-heated strip specimen. Thermistor-bolometer detector. Monochromator. Reference blackbody. Temperatures measured with thermocouples. | Measured in air. Data taken from curves. |

NORMAL SPECTRAL EMITTANCE OF HANOVIA LIQUID GOLD NO. 6896 ON A-286 STEEL--REFERENCE INFORMATION



NORMAL SPECTRAL EMITTANCE OF CHROMIUM NICKEL ON INCONEL X AT 480 F

| NORMAL SPECTRAL EMITTANCE C | F CHROMIUM-NICKEL O | N INCONEL X AT 480 | FREFERENCE | INFORMATION |
|-----------------------------|---------------------|--------------------|------------|-------------|
|-----------------------------|---------------------|--------------------|------------|-------------|

| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|-----------|--------------|--------|--|--|-----------------|
| 14 | Adams, J. G. | | 20 per cent chromium - 80 per cent nickel. Flame sprayed on Inconel X. As applied - untreated Heated 30 minutes in air at 1500 F Heated 30 minutes in 6.8 x 10 ⁻⁵ mm Hg pressure at 1500 F | Normal spectral emittance. Furnace-heated disk specimen. Comparison blackbody (Hohlraun). Spectrometer-mono- chromator with photo- multiplier, lead sulphide, and thermo- couple detectors. Temperatures measured with thermocouples. | Measured in air |

1.0 0.9 0.8 Normal Spectral Emittance 90 20 90 20 90 20 ---Measured at 930F As applied ---Preheated in air ---Preheated in vacuum 02 0.1 0 3 2 5 4 6 8 9 ю 1 12 13 14 15 16 17 Wavelength, µ A-42730

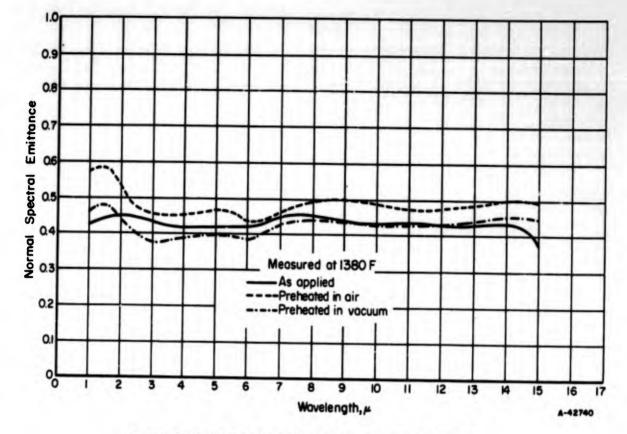
NORMAL SPECTRAL EMITTANCE OF CHROMIUM-NICKEL AT 930 F

NORMAL SPECIFICAL EMITTANCE OF CHROMIUM-NICKEL ON INCONEL X AT 930 F--REFERENCE INFORMATION

| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|-----------|--------------|--------|---|--|------------------|
| 14 | Adams, J. G. | | 20 per cent chromium - 80 per cent nickel. Flame sprayed on Inconel X. As applied - untreated Heated 30 minutes in air at 1500 F Heated 30 minutes in 6.8 \times 10 ⁻⁵ mm Hg pressure at 1500 F | Normal spectral emittance. Furnace-heated disk specimen. Comparison blackbody (Hohlraun). Spectrometer-mono- chrömator with photo- multiplier, lead sulphide, and thermo- couple detectors. Temperatures measured with thermocouples. | Measured in air. |

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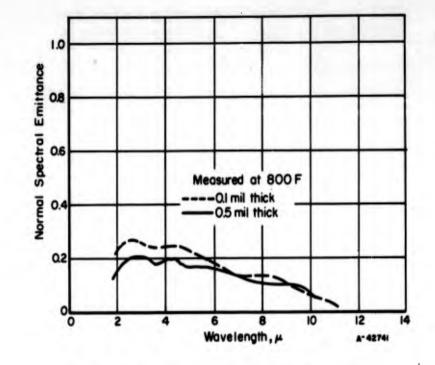
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NORMAL SPECTRAL EMITTANCE OF CHROMIUM-NICKEL ON INCONEL X AT 1380 F

NORMAL SPECTRAL EMITTANCE OF CHROMIUM-NICKEL ON INCONEL X AT 1380 F--REFERENCE INFORMATION

| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|-----------|--------------|--------|--|--|------------------|
| 14 | Adams, J. G. | | 20 per cent chromium - 80 per cent nickel. Flame sprayed on Inconel X. As applied - untreated Heated 30 minutes in air at 1500 F Heated 30 minutes in 6.8 x 10 ⁻⁵ mm Hg pressure at 1500 F | Normal spectral emittance. Furnace-heated disk specimen. Comparison blackbody (Hohlraun). Spectrometer-mono- chromator with photo- multiplier, lead sulphide, and thermo- couple detectors. Temperatures measured with thermocouples. | Measured in air. |



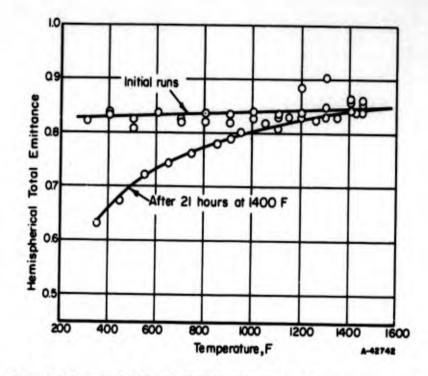
NORMAL SPECTRAL EMITTANCE OF KANIGEN NICKEL COATING ON A-286 STEEL

NORMAL SPECTRAL EMITTANCE OF KANIGEN NICKEL COATING ON A-286 STEEL--REFERENCE INFORMATION

| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|---|-----------------------|--------|---|---|--|
| 13 Composition. | Gravina and Katz | | Chemically deposited nickel alloy. Composition given below. Coating thickness: 0.1 mil 0.5 mil | Normal spectral emittance. Resistance-heated strip specimen. Thermistor-bolometer detector. Monochromator. Reference blackbody. Temperatures measured with thermocouples. | Measured in air. Data taken from curves. |
| Ni 90-92 P 8-10 C .0400 O ₂ .0023 N ₂ .C047 H ₂ .0016 | | | | | |
| Trace impuri | ties of: | | | | |
| Co, Al, Cu | , Mn, Fe, Pb, and Si. | | | | |

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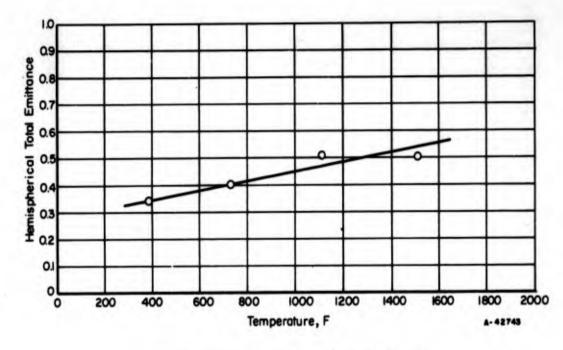
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HEMISPHERICAL TOTAL EMITTANCE OF SINTERED NICKEL "C" ON TYPE 310 STAINLESS STEEL

| HEMISPHERICAL IDIAL EMILIANCE OF | SINTERED NICKEL | "C" ON TYPE 310 | STAINLESS STEEL REFERENCE INFORMATION |
|----------------------------------|-----------------|-----------------|---------------------------------------|
|----------------------------------|-----------------|-----------------|---------------------------------------|

| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|-----------|-----------------------------|--------|--|--|--|
| 17 | Pratt & Whitney Aircraft | 6 ga | Sintered Nickel "C", lithiated and oxidized. Nickel "C" slurry sprayed on Type 310 stainless steel, sintered in H ₂ , lithiated, and oxidized. Initial runs After 21 hours at 1450 F | Hemispherical total emittance. Resistance-heated strip specimen. Power dissipated in measured area. Temperatures measured with thermocouples. | Measured in vacuum Data taken from curves. |



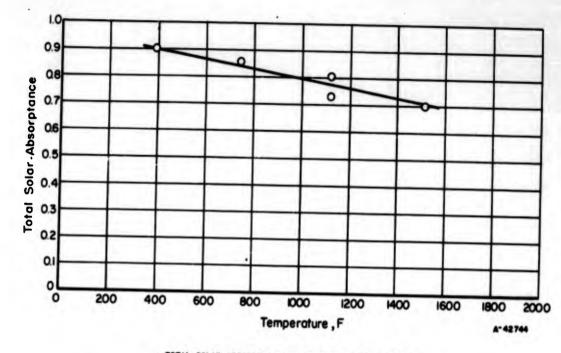
HEMISPHERICAL TOTAL EMITTANCE OF TUNGSTEN ON ARMCO IRON

HEMISPHERICAL TOTAL EMITTANCE OF TUNGSTEN ON ARMCO IRON-REFERENCE INFORMATION

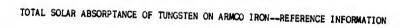
| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|-----------|---------------------------------|--------|--|--|---------------------------|
| 6 | Butler, Jenkins, Rudkin, and | | Metco XP-1106 crystalline tungsten (-200 mesh + 30 | Hemispherical total emittance. | Measured in vacuum. |
| | Laughr i dge | | micron) plasma flame sprayed on Armco iron. Surface uniformity judged by eye only. Coating thickness not given. | Disk specimen. Temperature measured with thermocouples. Emittance calculated from mass, specific heat, and rate of change of temperature of the specimen. | Data taken from curve. |

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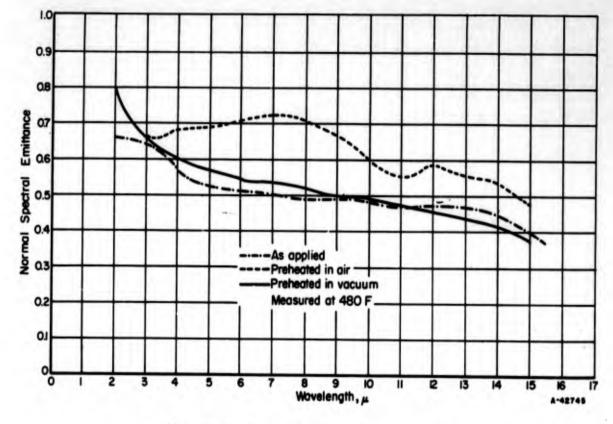
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TOTAL SOLAR ABSORPTANCE OF TUNGSTEN ON ARMOO IRON



| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|-----------|---|--------|---|--|--|
| 6 | Butler, Jenkins, Rudkin, and Laughridge | | Metco XP-1106 crystalline tungsten (-200 mesh + 30 micron). Plasma flame sprayed on Armco iron. Surface uniformity judged by eye only. Coating thickness not given. | Total solar absorptance. Carbon-arc-image furnace. Disk specimen. Temperatures measured with thermocouples. Absorptance calculated from mass, specific heat, rate of change of temperature, and known irradiance of the surface. (Solar spectrum simulated by carbon arc) | Measured in vacuum. Data taken from curves. |



NORMAL SPECTRAL EMITTANCE OF TUNGSTEN ON INCONEL X AT 480 F

| NORMAL SPECTRAL EMITTANCE | OF | TUNGSTEN ON | INCONEL | Х | AT | 480 | FREFERENCE INFORMATION |
|---------------------------|----|-------------|---------|---|----|-----|------------------------|
|---------------------------|----|-------------|---------|---|----|-----|------------------------|

| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|-----------|--------------|--------|---|---|------------------|
| 14 | Adams, J. G. | | Flame sprayed on Inconel X. Heated 30 minutes in 6.8 x 10 ⁻⁵ mm Hg pressure at 1500 F Heated 30 minutes in air at 1500 F As applied - untreated | Normal spectral emittance. Furnace-heated disk specimen. Comparison blackbody (Hohlraun). Spectrometer-mono- chromator with photo- multiplier, lead sulphide, and thermo- couple detectors. Temperatures measured with thermocouples. | Measured in air. |

1.0 0.9 0.8 Normal Spectral Emittance --- As applied --- Preheated in air Preheated in vacuum Measured at 930 F. 02 0.1 -0 8 9 Wavelength, µ 2 3 Δ 6 10 2 11 13 14 15 16 17 A-42746

NORMAL SPECTRAL EMITTANCE OF TUNGSTEN ON INCONEL X AT 930 F

NORMAL SPECTRAL EMITTANCE OF TUNGSTEN ON INCONEL X AT 930 F--REFERENCE INFORMATION

| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|-----------|--------------|--------|--|--|------------------|
| 14 | Adams, J. G. | | Flame sprayed on Inconel X. Heated 30 minutes in air at 1500 F Heated 30 minutes in 6.8 x 10^{-5} mm Hg pressure at 1500 F As applied - untreated | Normal spectral emittance. Furnace-heated disk specimen. Comparison blackbody (Hohlraun). Spectrometer-mono- chromator with photo- multiplier, lead sulphide, and thermo- couple detectors. Temperatures measured with thermocouples. | Measured in air. |

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1.0 0.9 0.8 Normal Spectral Emittance 0.7 --0.6 0.5 0.4 0.3 --- As applied --- Preheated in air Preheated in vacuum 0.2 ---Measured at 1380 F 0.1 0b 2 1 3 4 5 6 8 9 ю 11 12 13 14 15 16 17 Wavelength, µ A-42747

NORMAL SPECTRAL EMITTANCE OF TUNGSTEN ON INCONEL X AT 1380 F

NORMAL SPECTRAL EMITTANCE OF TUNGSTEN ON INCONEL X AT 1380 F--REFERENCE INFORMATION

| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|-----------|--------------|--------|---|--|------------------|
| 14 | Adams, J. G. | | Flame sprayed on Inconel X. As applied - untreated Heated 30 minutes in air at 1500 F Heated 30 minutes in 6.8 x 10 ⁻⁵ mm Hg pressure at 1500 F | Normal spectral emittance. Furnace-heated disk specimen. Comparison blackbody (Hohlraun). Spectrometer-mono- chromator with photo- multiplier, lead sulphide, and thermo- couple detectors. Temperatures measured with thermocouples. | Measured in air. |

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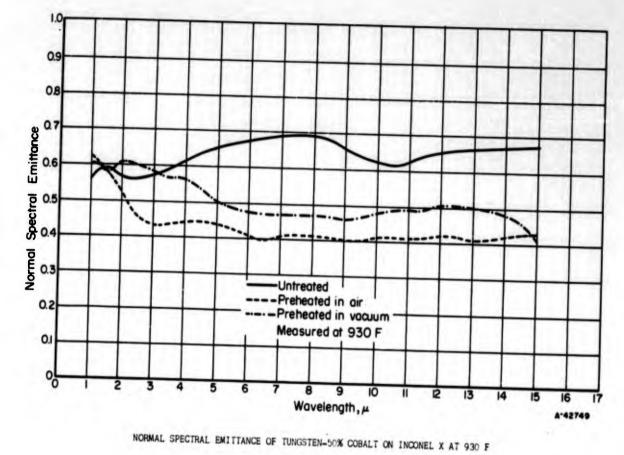
1.0 0.9 0.8 Emittance Normal Spectral ----Preheated in vacuum ----Preheated in air _____ Untreated 0.2 Measured at 480 F a 0 8 9 10 Wavelength, μ 2 5 6 10 П 12 13 14 15 16 17 A-42748

NORMAL SPECTRAL EMITTANCE OF TUNGSTEN-50 PER CENT COBALT ON INCONEL X AT 480 F

| NORMAL SPECTRAL EMITTANCE OF TUNGSTEN | 50 PER CENT COBALT ON INCONEL X AT 480 F REFERENCE | INFORMATION |
|---------------------------------------|--|-------------|
|---------------------------------------|--|-------------|

| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|-----------|--------------|--------|---|--|-----------------|
| 14 | Adams, J. G. | | 50 per cent tungsten - 50 per cent cobalt. Flame sprayed on Inconel X. Untreated Heated 30 minutes in air at 1500 F Heated 30 minutes in 6.8 x 10-5 mm Hg pressure at 1500 F | Normal spectral emittance. Furnace-heated disk specimen. Comparison blackbody (Hohlraun). Spectrometer-mono- chromator with photo- multiplier, lead sulphide, and thermo- couple detectors. Temperatures measured with thermocouples. | Measured in air |

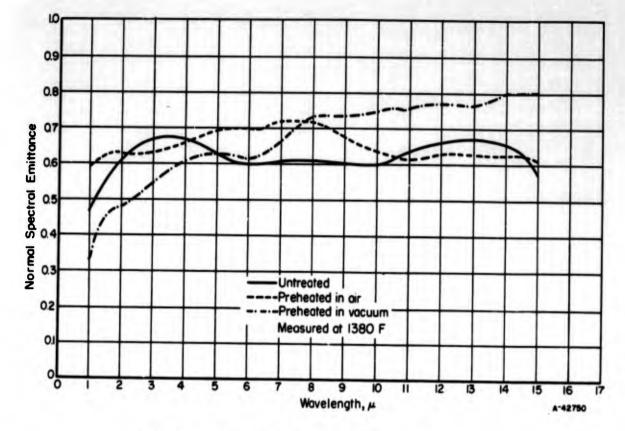
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NORMAL SPECTRAL EMITTANCE OF TUNGSTEN - 50 PER CENT COBALT ON INCONEL X AT 930 F-REFERENCE INFORMATION

| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|-----------|--------------|--------|---|---|------------------|
| 14 | Adams, J. G. | | 50 per cent tungsten - 50 per cent cobalt. Flame sprayed on Inconel X. Untreated - as sprayed Heated 30 minutes in air at 1500 F Heated 30 minutes in 6.8 x 10^{-5} mm Hg pressure at 1500 F | Normal spectral emittance. Furnace-heated disk specimen. Comparison blackbody" (Hohlraun). Spectrometer-mono- chromator with photo- multiplier, lead sulphide, and thermo- couple detectors. Temperatures measured with thermocouples. | Measured in air. |

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NORMAL SPECTRAL EMITTANCE OF TUNGSTEN-50% COBALT ON INCONEL X AT 1380 F

NORMAL SPECTRAL EMITTANCE OF TUNGSTEN - 50 PER CENT COBALT ON INCONEL X AT 1380 F--REFERENCE INFORMATION

| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|-----------|--------------|--------|--|--|------------------|
| 14 | Adams, J. G. | | 50 per cent tungsten - 50 per cent cobalt. Flame sprayed on Inconel X. As sprayed - untreated Heated 30 minutes in air at 1500 F Heated 30 minutes in 6.8 x 10-5 mm Hg pressure at 1500 F | Normal spectral emittance. Furnace-heated disk specimen. Comparison blackbody (Hohlraun). Spectrometer-mono- chromator with photo- multiplier, lead sulphide, and thermo- couple detectors. Temperatures measured with thermocouples. | Measured in air. |

| Material | Coating | Coating Thickness, mils | <u>Normal Total</u> 1200 F | Emittance 1500 F |
|--|--|-------------------------------|-------------------------------|---------------------|
| 25-52 base with | | | - 1 | |
| 200-mesh overspray coatings of: | Ferrosilicon | 2 | 0.93 | 0.95 |
| | Chrome oxide | 1 1/2 | 0.95 | 0.95 |
| | Mild steel scale | 2 1/2 | 0.97 | 0.98 |
| | Chromite ore No. 1 | 1 1/2 | 0.86 | 0.88 |
| | Chromite ore No. 2 (high Cr ₂ 0 ₃) | 1 1/2 | 0.85 | 0.89 |
| | Manganese dioxide | 3/4 | 0.92 | 0.94 |
| | Iron manganate spinel | 1 1/2 | 0.88 | 0.95 |
| | Nickel oxide | 1 1/2 | 0.92 | 0.95 |
| 25-52 base with 200-mesh Chromite No. 1 as | | | | |
| a blend containing: | 20% Chromite No. 1 | 1 | 0.91 | 0.93 |
| | 30% Chromite No. 1 | 2 | 0.93 | 0.95 |
| | 30% Chromite No. 1 | 1 1/4 | 0.97 | 0.96 |
| | 40% Chromite No. 1 | 3 | 0.95 | 0.96 |
| | 40% Chromite No. 1 | 1 1/4 | 0.95 | 0.98 |
| | 50% Chromite No. 1 | 1 3/4 | 0.93 | 0.93 |
| verspray of nickel oxide on mild steel 25-52 base with | | | | |
| overspray of: | Minus 100 and 200-mesh Chromite No. 1 | 2 1/2 | 0.85 | 0,87 |
| | Minus 200 and 325-mesh Chromite No. 1 | 2 1/2 | C.89 | 0.91 |
| | Minus 325 mesh Chromite No. 1 | 2 1/2 | 0.92 | 0.93 |
| 25-52 base with 325-mesh: | | | | |
| 020-m62[]1 | Chromite No. 1 overspray | 1/2 | 0.90 | 0.94 |
| | Chromite No. 1 overspray | 3/4 | 0.96 | 0.96 |
| | Chromite No. 1 overspray | 1 1/2 | 0.86 | 0.88 |
| | Chromite No. 1 overspray | 2 | 0.73 | 0.79 |

NORMAL TOTAL EMITTANCE OF HIGH EMITTANCE COATINGS AT 1200 AND 1500 F

NORMAL TOTAL EMITTANCE OF HIGH EMITTANCE COATINGS -- REFERENCE INFORMATION

| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|-----------|-----------------|--------|--------------------------------------|---|--|
| 5 | Douglass, E. A. | | | Normal total emittance. Total radiation pyrometer. Coatings on rotating steel cylinder containing blackbody hole. Temperatures measured with thermocouples. | Measured in air Data taken from table. |

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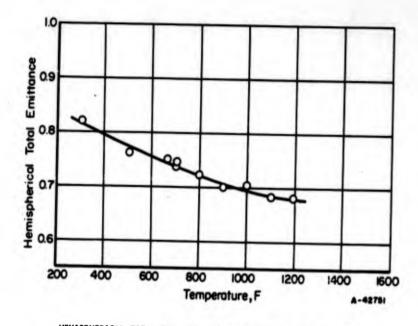
| | | Thicknes | s. mils | | Normal Tota | 1 Emlations |
|-----------------------|---------|----------|---------|-------|-----------------------|-------------|
| Top-Coat Oxide | Base(1) | Cover(2) | Тор | Total | Normal Tota 1200 F | 1500 F |
| *Feldspar | 5.0 | 13.0 | 2.0 | 20.0 | 0.32 | 0.27 |
| *Treopax | 5.0 | 11.0 | 3.0 | 19.0 | 0.27 | 0.23 |
| *Quartz | 4.0 | 15.0 | 2.0 | 21.0 | 0.49 | 0.34 |
| *Zirconium spinel | 4.5 | 13.0 | 3.0 | 20.5 | 0.23 | 0.22 |
| *Alumina | 5.0 | 12.5 | 2.0 | 19.5 | 0.42 | 0.35 |
| Black Label clay | 5.0 | 14.0 | 3.0 | 22.0 | 0.67 | 0.60 |
| *Uverite | 5.0 | 12.5 | 3.0 | 20.5 | 0.45 | 0.33 |
| Zircon | 4.0 | 15.0 | 2.0 | 21.0 | 0.61 | 0.52 |
| Antimony oxide | 5.0 | 11.0 | 4.0 | 20.0 | 0.62 | 0.57 |
| Calcium carbonate | 4.0 | 13.0 | 2.0 | 19.0 | 0.62 | 0.68 |
| *Fused magnesia | 5.0 | 11.5 | 2.0 | 18.5 | 0.57 | 0.63 |
| *Zinc oxide | 4.5 | 15.5 | 2.0 | 22.0 | 0.51 | 0,60 |
| *Tin oxide | 4.5 | 13.0 | 1.5 | 19.0 | 6.34 | 0.35 |
| Zirconia | 5.0 | 13.0 | 1.5 | 19.5 | 0.40 | 0.34 |
| Diaspore clay | 4.5 | 11.5 | 2.0 | 18.0 | 0.49 | 0.42 |
| Cerium oxide | 5.0 | 13.0 | 2.0 | 20.0 | 0.35 | 0.37 |
| Calcium metaphosphate | 4.5 | 13.5 | 2.0 | 20.0 | 0.42 | 0.65 |
| Vanadium pentoxide | 4.5 | 13.5 | 2.0 | 20.0 | 0.74 | 0.68 |
| Chrome oxide | 4.0 | 13.0 | 1.5 | 18.5 | 0.79 | 0.79 |
| XM-1 | 5.0 | 15.0 | - | 20.0 | 0.69 | 0.69 |

NORMAL TOTAL EMITTANCE OF VARIOUS COATINGS AT 1200 AND 1500 F

*Indicates oxides with 5 per cent water glass added as a binder.

NORMAL TOTAL EMITTANCE OF VARIOUS COATINGS--REFERENCE INFORMATION

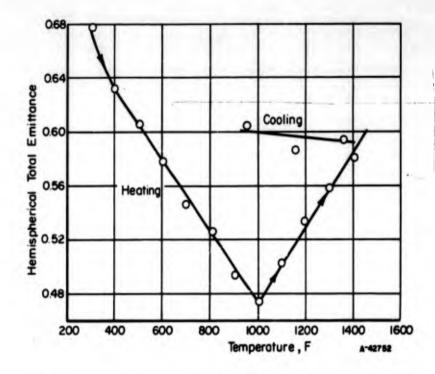
| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|-----------|-----------------|--------|--------------------------------------|---|---|
| 5 | Douglass, E. A. | | | Normal total emittance. Total radiation pyrometer. Coatings on rotating steel cylinder containing blackbody hole. Temperatures measured with thermocouples. | Measured in air. Data taken from table. |



HEMISPHERICAL TOTAL EMITTANCE OF BORON NITRIDE ON TANTALUM

| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|-----------|-----------------------------|--------|--|--|---|
| 17 | Pratt & Whitney Aircraft | | Boron nitride with Synar binder. Coated on both sides of tantalum strip | Hemispherical total emittance. Resistance-heated strip specimen. Power dissipated in measured area. Temperatures measured with thermocouples. | Measured in vacuum Data taken from curve. |

HEMISPHERICAL TOTAL EMITTANCE OF BORON NITRIDE ON TANTALUM-REFERENCE INFORMATION

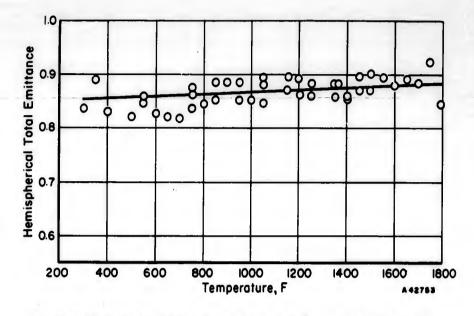




HEMISPHERICAL TOTAL EMITTANCE OF CALCIUM FLUORIDE ON TYPE 310 STAINLESS STEEL--REFERENCE INFORMATION

| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks _ |
|-----------|-----------------------------|---|---|--|------------------------|
| 18 | Pratt & Whitney Aircraft | | A dispersion of calcium fluoride (Acheson Colloid Co. DAG EC 1789). | Hemispherical total emittance. Resistance-heated | Measured in vacuum. |
| | | Coated on both sides of a Type 310 stainless strip. | strip specimen. Power dissipated in measured area. | Data taken from curves. | |
| | | | Note: cooling change shown after 20 hours at 1450 F. | Temperatures measured with thermocouples. | |

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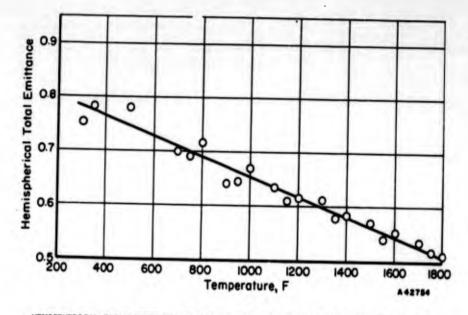


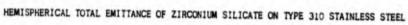
HEMISPHERICAL TOTAL EMITTANCE OF STRONTIUM TITANATE ON TYPE 310 STAINLESS STEEL

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| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|-----------|-----------------------------|--------|--------------------------------------|--|--|
| 16 | Pratt & Whitney Aircraft | | Metco plasma flame spray powder. | Hemispherical total emittance. Resistance-heated strip specimen. Power dissipated in measured area. Temperatures measured with thermocouples. | Measured in vacuum. Data taken from curve. |

HEMISPHERICAL TOTAL EMITTANCE OF STRONTIUM TITANATE ON TYPE 310 STAINLESS STEEL-REFERENCE INFORMATION

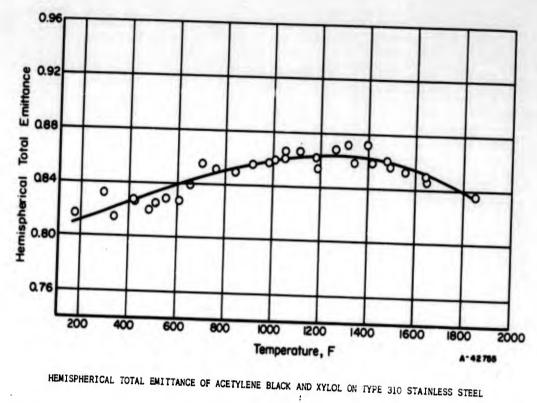




| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|-----------|-----------------------------|--------|--|--|---|
| 16 | Pratt & Whitney Aircraft | | Metco plasma flame spray powder XP-1116. Flame sprayed on Type 310 stainless steel strip. | Hemispherical total emittance. Resistance-heated strip specimen. Power dissipated in measured area. Temperatures measured with thermocouples. | Measured in vacuum. Data taken from curve. |

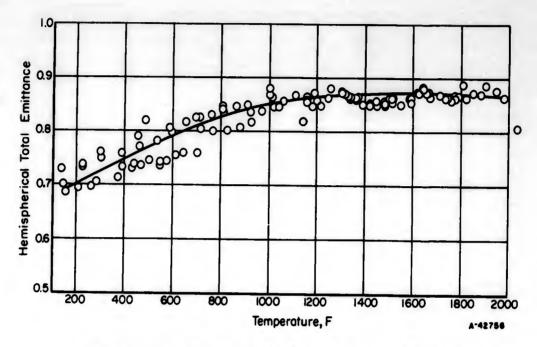
HEMISPHERICAL TOTAL EMITTANCE OF ZIRCONIUM SILICATE ON TYPE 310 STAINLESS STEEL --- REFERENCE INFORMATION

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HEMISPHERICAL TOTAL EMITTANCE OF ACETYLENE BLACK AND XYLOL ON TYPE 310 STAINLESS STEEL -- REFERENCE INFORMATION

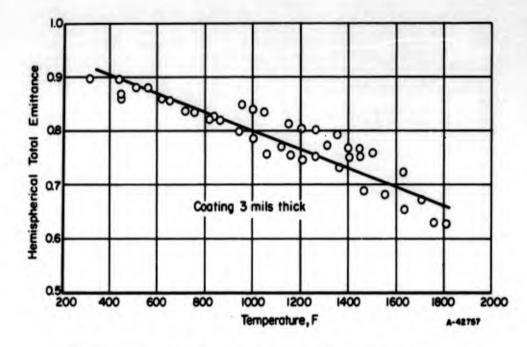
| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|-----------|-----------------------------|--------|--|--|--|
| 15 | Pratt & Whitney Aircraft | | Colloidal suspension of acetylene black in xylol (Acheson Colloid Co. DAG EC 1652) sprayed on Type 310 stainless steel strip. | Hemispherical total emittance. Resistance-heated strip specimen. Power dissipated in measured area. Temperatures measured with thermocouples. | Measured in vacuum. Data taken from curve. |



HEMISPHERICAL TOTAL EMITTANCE OF CHROMIUM BLACK ON TYPE 310 STAINLESS STEEL

| HEMISPHERICAL TOTAL EMITTANCE | F CHROMIUM | A BLACK ON TYPE 310 | STAINLESS | STEEL-REFERENCE INFORM | ATION |
|-------------------------------|------------|---------------------|-----------|------------------------|-------|
|-------------------------------|------------|---------------------|-----------|------------------------|-------|

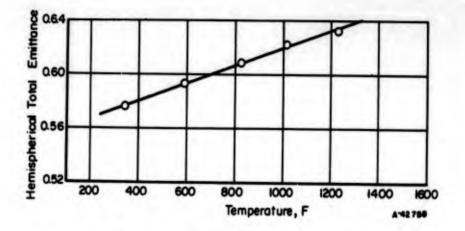
| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|-----------|-----------------------------|--------|--|--|--|
| 15 | Pratt & Whitney Aircraft | | Chromium black deposited by a variation of the Solvay process on Type 310 stainless steel strip. | Hemispherical total emittance. Resistance-heated strip specimen. Power dissipated in measured area. Temperatures measured with thermocouples. | Measured in vacuum. Data taken from curve. |



HEMISPHERICAL TOTAL EMITTANCE OF KRYLON BLACK ON TYPE 310 STAINLESS STEEL

HEMISPHERICAL TOTAL EMITTANCE OF KRYLON BLACK ON TYPE 310 STAINLESS STEEL -- REFERENCE INFORMATION

| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|-----------|-----------------------------|--------|---|---|---------------------------|
| 18 | Pratt & Whitney Aircraft | | Commercial Krylon Black, a mixture of carbon | Hemispherical total emittance. | Measured in vacuum. |
| | | | black and silicates in a lacquer carrier. | Resistance-heated strip specimen. Power dissipated in measured area. Temperatures measured with thermocouples. | Data taken from curve. |

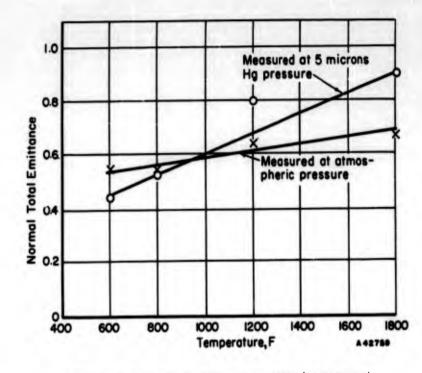


HEMISPHERICAL TOTAL EMITTANCE OF GRAPHITE VARNISH ON TYPE 310 STAINLESS STEEL

HEMISPHERICAL TOTAL EMITTANCE OF GRAPHITE VARNISH ON TYPE 310 STAINLESS STEEL-REFERENCE INFORMATION

| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|-----------|-----------------------------|--------|--|--|--|
| 15 | Pratt & Whitney Aircraft | | Spray coated graphite varnish on Type 310 stainless steel. Note: coating flaked off near 1500 F. | Hemispherical total emittance. Resistance-heated wedge specimen. Power dissipated in measured area. Temperatures measured with thermocouples. | Measured in vacuum. Data taken from curve. |

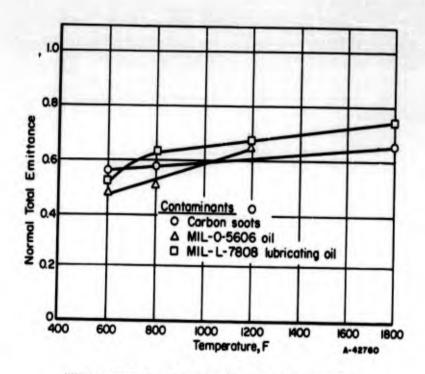
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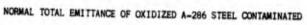


NORMAL TOTAL EMITTANCE OF OXIDIZED A-286 STEEL (CONTAMINATED)

| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|-----------|------------------|--------|--|---|--------------------------------|
| 13 | Gravina and Katz | | Surface oxidized and contaminated with JP-4 fuel. | Normal total emittance. Resistance-heated strip specimen. | Measured in air and vacuum. |
| | | | At 5 microns (Hg) pressure At atmospheric pressure | Thermistor-bolometer detector. Reference blackbody. | Data taken from curves. |
| | | | At atmospheric pressure | Temperatures measured with thermocouples. | |

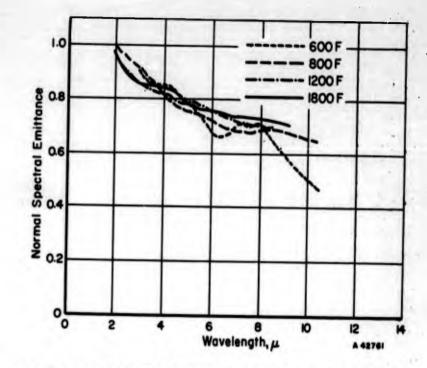
NORMAL TOTAL EMITTANCE OF OXIDIZED A-286 STEEL (CONTAMINATED) -- REFERENCE INFORMATION

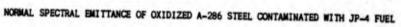




| NORMAL IDIAL EMITIANCE OF OXIDIZED TYPE A- | 86 STEEL | (CONTAMINATED) REFERENCE INFORMATION |
|--|----------|--------------------------------------|
|--|----------|--------------------------------------|

| Reference | Investigator | Composition and ' vestigator Symbol Surface Condition Test Method | | | Remarks |
|-----------|------------------|--|--|--|---|
| 13 | Gravina and Katz | | Type A-286 steel, oxidized and contaminated with: carbon soot MIL-O-5606 oil MIL-L-7808 lubricating oil | Normal total emittance. Resistance-heated strip specimen. Thermistor-bolometer detector. Reference blackbody. Temperatures measured with thermocouples. | Measured at atmospheric pressure. Data taken from curves. |





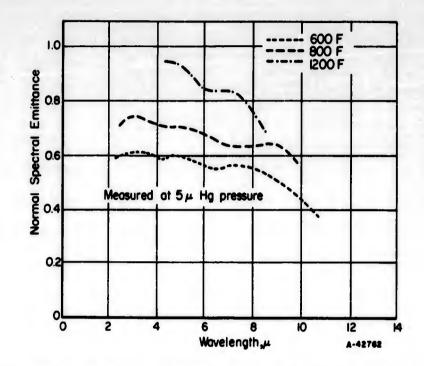
| Reference | Investigator | Composition and nvestigator Symbol Surface Condition Test Method | | | | |
|-----------|------------------|--|---|---|--|--|
| 13 | Gravina and Katz | | Air oxidized A-286 steel contaminated with JP-4 fuel. Measured at: 600 F 800 F 1200 F 1800 F | Normal spectral emittance. Resistance-heated strip specimen. Thermistor-bolometer detector. Monochromator. Reference blackbody. Temperatures measured with thermocouples. | Measured in air. Data taken from curves. | |

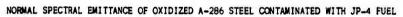
NORMAL SPECTRAL EMITTANCE OF OXIDIZED A-286 STEEL (CONTAMINATED) --- REFERENCE INFORMATION

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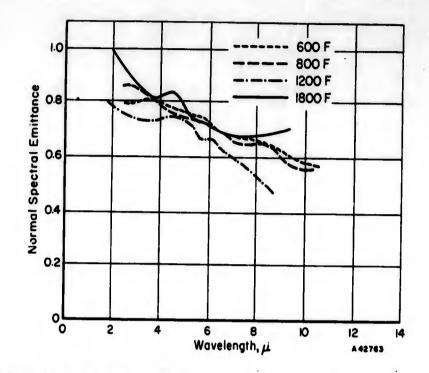
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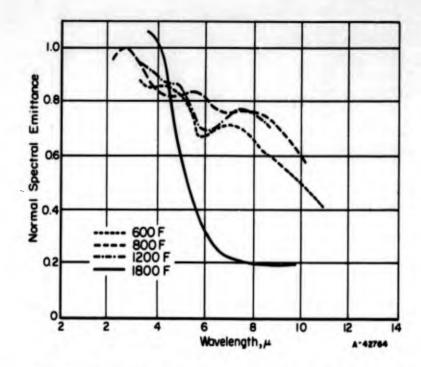
| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|-----------|------------------|--------|--|--|---|
| 13 | Gravina and Katz | | Air oxidized type A-286 steel contaminated with JP-4 fuel. Measured at: 600 F 800 F 1200 F | Normal spectral emittance. Resistance-heated strip specimen. Thermistor-bolometer detector. Monochromator. Reference blackbody. Temperatures measured | Measured in 5 micron Hg pressure. Data taken from curves. |



NORMAL SPECTRAL EMITTANCE OF OXIDIZED A-286 STEEL CONTAMINATED WITH CARBON DEPOSITS

NORMAL SPECTRAL EMITTANCE OF OXIDIZED A-286 STEEL (CONTAMINATED) -- REFERENCE INFORMATION

| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|-----------|------------------|--------|--|---|--|
| 13 | Gravina and Katz | | Air oxidized type A-286 steel contaminated with carbon deposits. Measured at: 600 F 800 F 1200 F 1800 F | Normal spectral emittance. Resistance-heated strip specimen. Thermistor-bolcmeter detector. Monochromator. Reference blackbody. Temperatures measured with thermocouples. | Measured in air. Data taken from curves. |

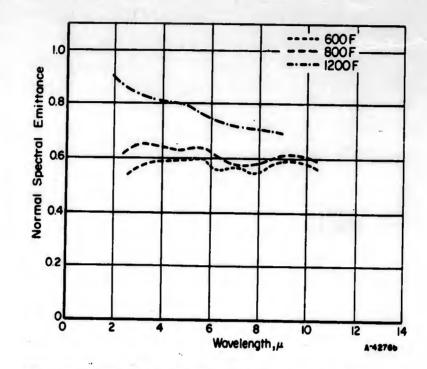


NORMAL SPECTRAL EMITTANCE OF OXIDIZED A-286 STEEL CONTAMINATED WITH MIL-L-7809

NORMAL SPECTRAL EMITTANCE OF OXIDIZED A-286 STEEL (CONTAMINATED) -- REFERENCE INFORMATION

| Reference | Investigator | Symbc1 | Composition and Surface Condition | Test Method | Remarks |
|-----------|------------------|--------|--|--|------------------|
| 13 | Gravina and Katz | | Air oxidized type A-286 steel contaminated with | Normal spectral emittance. Resistance-heated strip | Measured in air. |
| | | | MIL-L-7808. | specimen. | Data taken from |
| | | | Measured at: 600 F | Thermistor-bolometer detector. | CUIVES. |
| | | | 300 F | Monochromator. | |
| | | | 1200 F | Reference blackbody. | |
| | | | 1800 F | Temperatures measured with thermocouples. | |

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NORMAL SPECTRAL EMITTANCE OF OXIDIZED A-286 STEEL CONTAMINATED WITH MIL-0-5606

NORMAL SPECTRAL EMITTANCE OF OXIDIZED A-286 STEEL (CONTAMINATED) -- REFERENCE INFORMATION

| Reference | Composition and Investigator Symbol Surface Condition Test Method | | | | Remarks |
|-----------|--|--|---|---|--|
| 13 | Gravina and Katz | | Air oxidized type A-286 steel contaminated with MIL-O-5606. Tested at: 600 F 800 F 1200 F | Normal spectral emittance. Resistance-heated strip specimen. Thermistor-bolometer detector. Monochromator. Reference blackbody. Temperatures measured with thermocouples. | Measured in air. Data taken from curves. |

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- (17) Pratt and Whitney Aircraft, "Determination of the Emissivity of Materials", Report PWA-1994.
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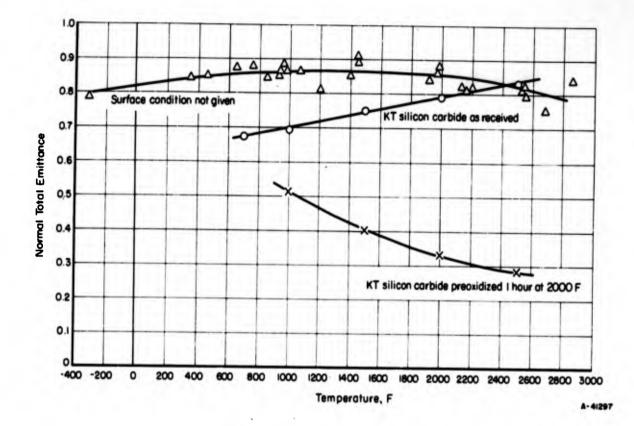
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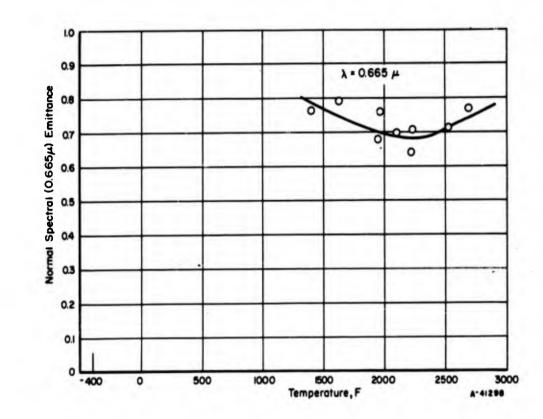
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NORMAL TOTAL EMITTANCE OF SILICON CARBIDE

| NORMAL TOTAL | . EMITTANCE OF | SILICON | CARBIDEREFERENCE | INFORMATION |
|--------------|----------------|---------|------------------|-------------|
|--------------|----------------|---------|------------------|-------------|

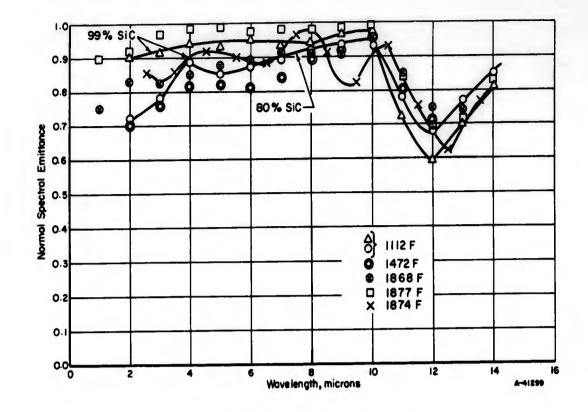
| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|-----------|-------------------|--------|--|---|---|
| 1 | Anthony and Pearl | o x | KT Silicon carbide As received Pre-oxidized in air 1 hour at 2000 F | Normal total emittance. Induction-heated specimen. Comparison blackbody. Thermopile detector. Temperatures measured with thermocouples. | Measured in purge of dry helium gas Data taken from table. |
| 2 | Olson and Morris | Δ | Silicon carbide Surface condition not given | Normal total emittance. Furnace-heated specimen. Comparison blackbody. Thermistor'detector. Temperatures measured with thermocouples. | Measured in air. Data taken from curves. |





| NORMAL SPECTRAL | EMITTANCE O |)F (| SILICON | CARBIDEREFERENCE | INFORMATION |
|-----------------|-------------|------|---------|------------------|-------------|
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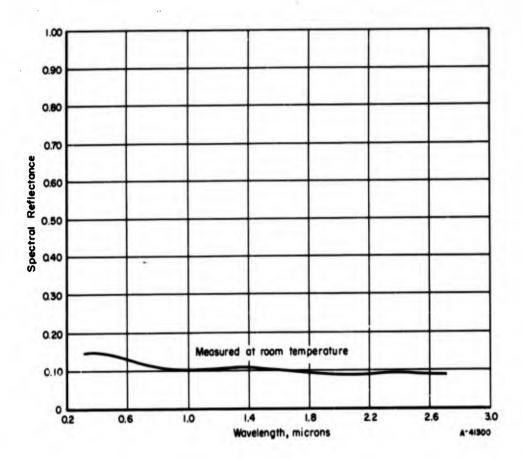
| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|-----------|------------------|--------|---|--|--|
| 2 | Olson and Morris | 0 | Silicon carbide Surface condition not given | Normal spectral emittance. Furnace-heated specimen. Comparison blackbody. Commercial detector and | Measured in air. Data taken from curves. |
| | | | | filter system for peak response at 0.665/4. Temperatures measured with thermocouples. | (入 = 0.665 <i>₽</i>) |

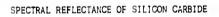


NORMAL SPECTRAL EMITTANCE OF SILIOON CARBIDE

NORMAL SPECTRAL EMITTANCE OF SILICON CARBIDE -- REFERENCE INFORMATION

| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks | | |
|---|--|---|---|--|---|--|--|
| 3 | Blau, Marsh, Martin, Jasperse, and Chaffee | | Silicon carbide Diamond wheel finish as supplied by manufacturer | Normal spectral emittance. Specimen mounted in wall of cylindrical Globar (SIC) heater. | Measured in air. Data taken from curves. (Curves are drawn | | |
| | | Crystolon R (Norton) 99% + pure | Comparison blackbody hole also in heater wall. | through the 1112 F points only.) | | | |
| | Measured at 1877 F With the Monochro | Δ | Measured at 1112 F | Temperatures measured | | | |
| | | Measured at 1877 F | with thermocouples. Monochromator and | | | | |
| | | thermocouple detector. | | | | | |
| | 0 | Measured at 1112 F | | | | | |
| | 0 | Measured at 1472 F | | | | | |
| | | 8 | Measured at 1868 F | | | | |
| 4 Blau, Chaffee, Jasperse, and Martin | × | 99 per cent silicon carbide (Norton Crystalon R) | Normal spectral emittance. Induction-heated specimen. | Measured in 90% argon, 10% hydrogen atmos- phere. | | | |
| | MOLOUN | Flat smooth surface from diamond wheel cutting. | Comparison blackbody. Monochromator and thermocouple detector. Temperatures measured with micro-optical | Data taken from curve. | | | |
| | | The minima at about 9 and 12 microns are attributed to a thin SiO ₂ surface film. Measured at 1874 F | pyrometer. | | | | |



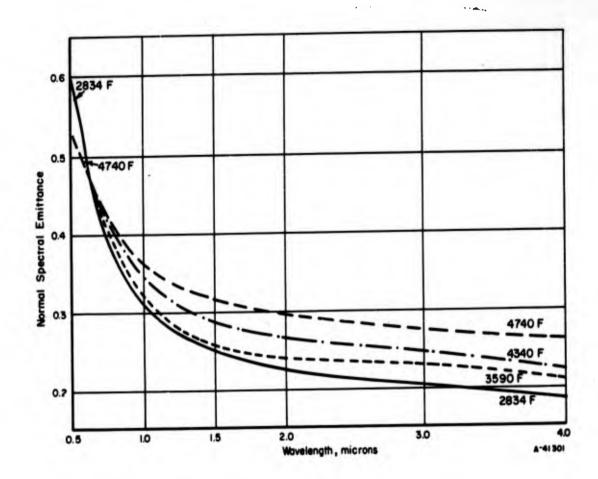


| SPECTRAL REFLECTANCE | OF | SILICON | CARBIDE-REFERENCE | INFORMATION |
|----------------------|----|---------|-------------------|-------------|
|----------------------|----|---------|-------------------|-------------|

| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|-----------|------------------|--------|---|--|---|
| 2 | Olson and Morris | | Silicon carbide, purity and surface condition not given | Spectral reflectance. Incident radiation 9 degrees from normal to specimen surface. | Measured in air a' room temperature. Data taken from curves. |
| | | | | Integrating sphere reflectometer. Monochromator and - lead sulphide detector. | |
| | | | | Normal (9 degrees) illumination Diffuse reflection. | |

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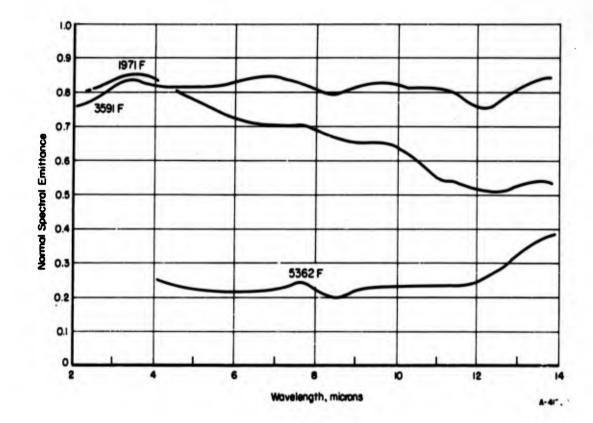
NORMAL SPECTRAL EMITTANCE OF TANTALUM CARBIDE (0.5 TO 4 MICRONS)

NORMAL SPECTRAL EMITTANCE OF TANTALUM CARBIDE (0.5 TO 4 MICRONS) --- REFERENCE INFORMATION

| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|-----------|--------------|--------|---|--|--|
| 6 | Riethof | | Tantalum carbide Composition or surface condition not given | Normal spectral emittance. Induction-heated specimen. Blackbody hole in specimen surface. | Measured in argon. Data taken from curves. |
| | | | Measured at 2834, 3590, 4340, and 4740 F | Thermocouple detector. Monochromator. Temperatures measured with optical pyrometer. | |

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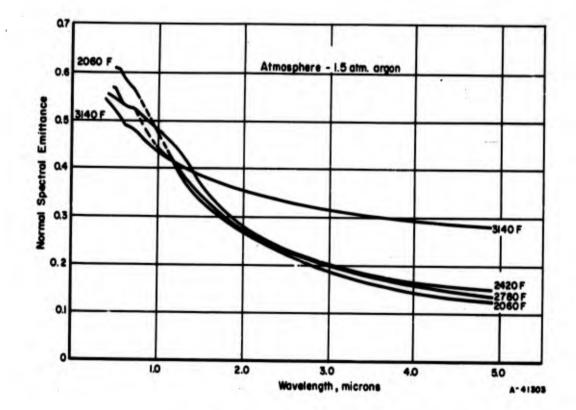


| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|--|--------------|---|--|--|---------|
| 4 Blau, Chaffee, Jasperse, and Martin | | Tantalum carbide Purity not given Surface flat and smooth but not polished | Normal spectral emittance. Induction-heated specimen. Comparison blackbody. Monochromator and thermo- couple detector. | Measured in 90% argon 10% hydrogen atmos- phere. Data taken from | |
| | | | (Note: Surface analysis after 3234 K (5362 F) run showed thin tantalum oxide film) | Temperatures measured with optical pyrometer. | curves. |

NORMAL SPECTRAL EMITTANCE OF TANTALUM CARBIDE (2 TO 14 MICRONS) --- REFERENCE INFORMATION

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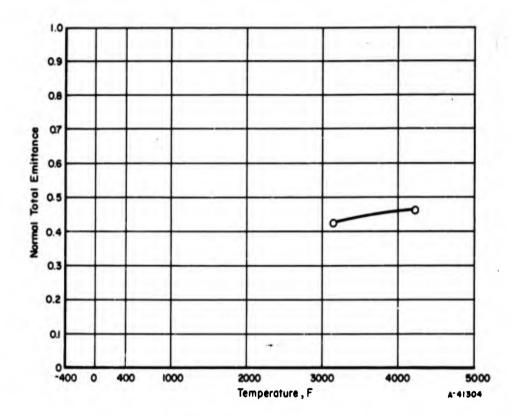
| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|-----------------------------------|--------------|--|--|---|---------|
| 5 Coffman, Coulson, and Kibler | | Tungsten carbide (WC) Surface condition or purity not given | Normal spectral emittance. Induction-heated specimen. Blackbody hole in specimen surface. | Measured in 1.5 atmosphere of argon. Data taken from | |
| | format | Note: Surface trans- formation from WC to W ₂ C at 3140 F | Thermocouple detector. Monochromator. Temperatures measured with optical pyrometer. | Curves. | |
| | | Measured at 2060, 2780, 2420, and 3140 F | | | |

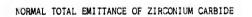
NORMAL SPECTRAL EMITTANCE OF TUNGSTEN CARBIDE--REFERENCE INFORMATION

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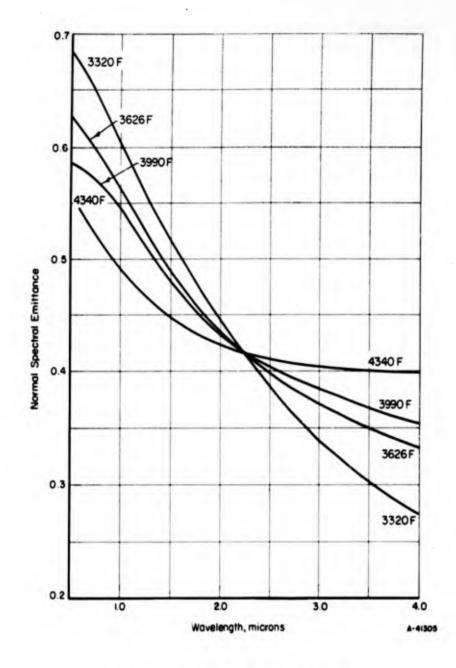
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| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|-----------|---------------------------------|--------|--|---|--|
| 5 | Coffman, Coulson, and Kibler | 0 | Formed into "toadstool" shaped specimen Composition and surface condition not given | Normal total emittance. Induction-heated specimen. Comparison blackbody. Temperatures measured with optical pyrometer. | Measured in 1.5 atmosphere of dry, pure, argon. Data taken from curve. |



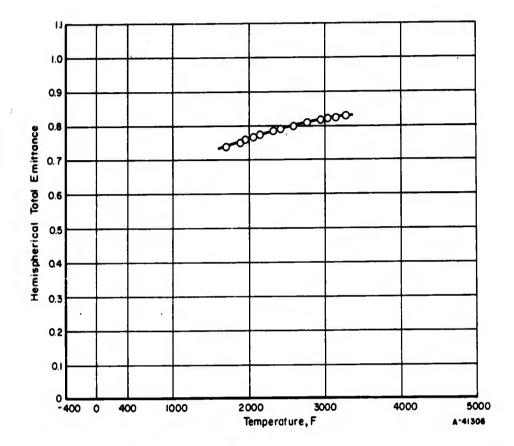
NORMAL SPECTRAL EMITTANCE OF ZIRCONIUM CARBIDE

| NORMAL SPE | CTRAL EMIITANCE | CF | ZIRCONIUM | CARBIDEREFERENCE | INFORMATION |
|------------|-----------------|----|-----------|------------------|-------------|
|------------|-----------------|----|-----------|------------------|-------------|

| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|------------|--------------|--------|--|--|---|
| <u>~</u> 6 | Riethof | | Zirconium carbide Composition or surface condition not given | Normal spectral emittance. Induction-heated specimen. Blackbody hole in specimen surface. | Measured in argon. Data taken from curves. |
| | | | Measured at 3320, 3626, 3990, and 4340 F | Thermocouple detector. Monochromator. Temperatures measured with optical pyrometer. | |

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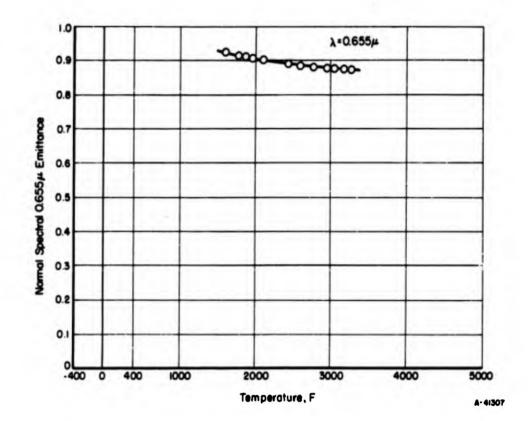
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| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|-----------|-------------------|--------|---|---|---|
| 9 | Jain and Krishnan | 0 | Acheson graphite Sample held at 2000 K for 1 hour in vacuum, until emittance became steady and reproducible | Hemispherical total emittance. Hole-in-tube method. Correction of inside blackbody temperature to surface temperature made using known thermal conductivity and wall thickness. Blackbody temperature measured with optical pyrometer. | Measured in vacuum. Data taken from curves. |

HEMISPHERICAL TOTAL EMITTANCE OF ACHESON GRAPHITE-REFERENCE INFORMATION

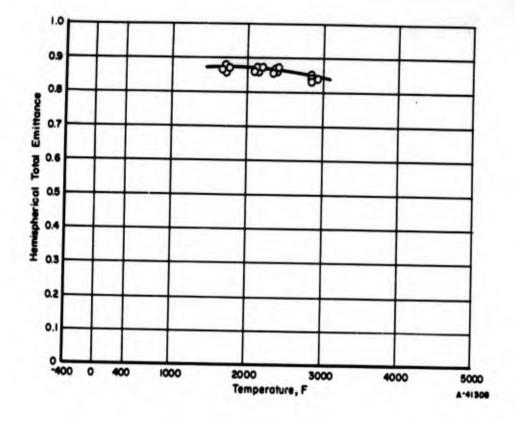




| NORMAL SPECTRAL EMITTANCE OF ACHESON GRAPHITEREFERENCE INFORMATI | L SPECTRAL EMITTANCE OF ACHESON GRAPHITE- | -REFERENCE INFORMATION | I |
|--|---|------------------------|---|
|--|---|------------------------|---|

| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|-----------|-------------------|--------|--|---|--|
| 9 | Jain and Krishnan | 0 | Acheson graphite Specimen held at 2000 K for 1 hour in vacuum until emittance became steady and reproducible | Normal spectral emittance. Hole-in-tube method. Temperatures measured with optical pyrometer. | Measured in vacuum. Data taken from curves. |
| | | | | | $(N = 0.665 \mu)$ |

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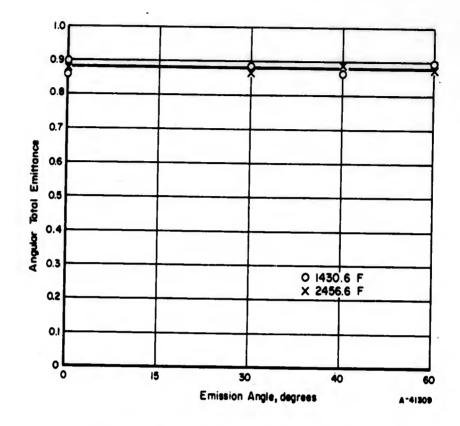
HEMISPHERICAL TOTAL EMITTANCE OF ATJ GRAPHITE

HEMISPHERICAL TOTAL EMITTANCE OF ATJ GRAPHITE--REFERENCE INFORMATION

| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|-----------|---|--------|--|---|---|
| 4 | Blau, Chaffee, Jasperse, and Martin | 0 | ATJ graphite Surface condition not given | Normal total emittance. (Hemispherical emittance equals normal emittance for this specimen.) Induction-heated specimen. Monochromator with prism replaced by plane mirror. Thermocouple detector. Blackbody hole drilled in specimen surface. Temperatures measured with micro-optical pyrometer. | Meusured in 90% argon - 10% hydrogen atmos- phere. Data taken from curves. |

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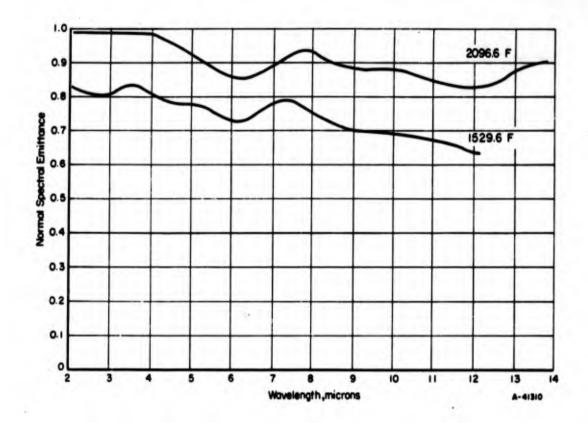


" TOTAL EMITTANCE VERSUS EMISSION ANGLE OF ATJ GRAPHITE

TOTAL EMITTANCE VERSUS EMISSION ANGLE OF ATJ GRAPHITE--REFERENCE INFORMATION

| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|-----------|---|--------|---|--|---|
| J | Blau, Chaffee, Jasperse, and Martin | | ATJ graphite Surface smooth and flat, but not polished. | Total emittance measured normally and at 30, 45, and 60 degrees from the | Measured in 90% argon - 10% hydrogen atmos- |
| | | 0 | Measured at 1431 F | normal. | phere. |
| | | × | Measured at 2457 F | Induction-heated specimen. Monochromator with | Data taken from curves. |
| | | | | prism replaced by plane mirror. | Normal emittance equals hemispher- |
| | | | | Thermocouple detector. Blackbody hole drilled in specimen surface. | ical emittance for this specimen |
| | | | | Temperatures measured with micro-optical pyrometer. | |

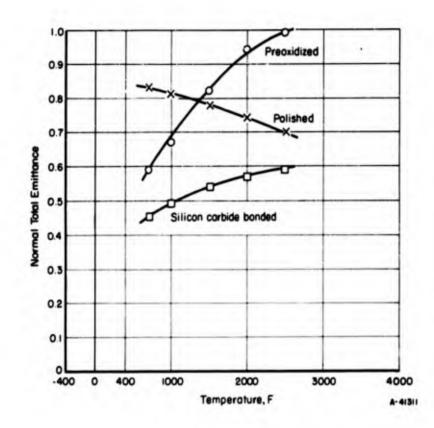
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NORMAL SPECIRAL EMITTANCE OF ATJ GRAPHITE

NORMAL SPECTRAL EMITTANCE OF ATJ GRAPHITE--REFERENCE INFORMATION

| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|-----------|---|--------|---|---|---|
| 4 | Blau, Chaffee, Jasperse, and Martin | | ATJ graphite Surface smooth and flat but not polished | Normal spectral emittance. Induction-heated specimen. Monochromator and thermo- couple detector. Blackbody hole drilled in specimen surface. Temperatures measured with micro-optical pyrometer. | Measured in 90% argon - 10% hydrogen atmos- phere. Data taken from curves. |



NORMAL TOTAL EMITTANCE OF ELECTRODE GRAPHITE

| NORMAL TOTAL EMITTANCE OF ELECTRODE GR | RAPHITEREFERENCE I | INFORMATION |
|--|--------------------|-------------|
|--|--------------------|-------------|

| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|-----------|-------------------|--------|--------------------------------------|---|---|
| 1 | Anthony and Pearl | | Electrode graphite | Normal total emittance. | Measured in purge |
| | | 0 | Preoxidized | Induction-heated specimen. | of helium gas. Data taken from table. |
| | | × | Polished | Comparison blackbody. Thermopile detector. Temperatures measured with thermocouples. | |
| | | ٥ | Silicon carbide bonded | | |

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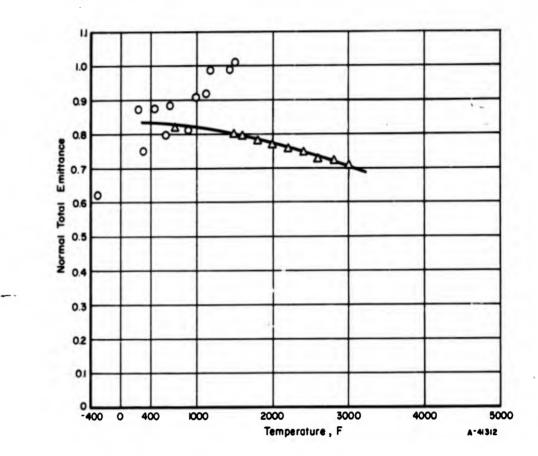
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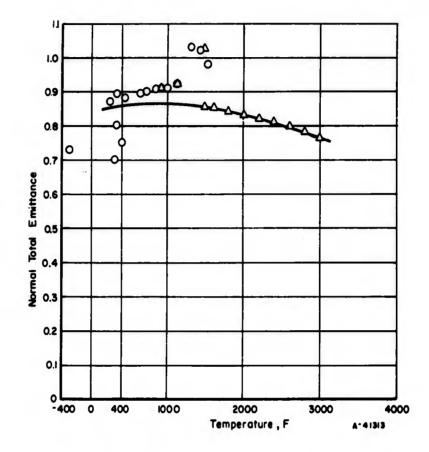
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| NORMAL | TOTAL | EMI TTANCE | OF | GBE | GRAPHI TEREFERENCE | INFORMATION |
|--------|-------|------------|----|-----|--------------------|-------------|
|--------|-------|------------|----|-----|--------------------|-------------|

| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|-----------|-------------------------------------|--------|---|--|--|
| 8 | Olson and Morris | 0 | National GBE graphite Surface condition not given | Normal total emittance. Resistance-heated strip specimen. Comparison blackbody. Temperatures measured with thermacouples. Thermistor detector. | Measured in vacuum. Data taken from curves. |
| 7 | Betz, Olson, Schurin, and Morris | Δ | Same as above | Same as above. | Same as above. |



NORMAL TOTAL EMITTANCE OF TYPE GBH GRAPHITE

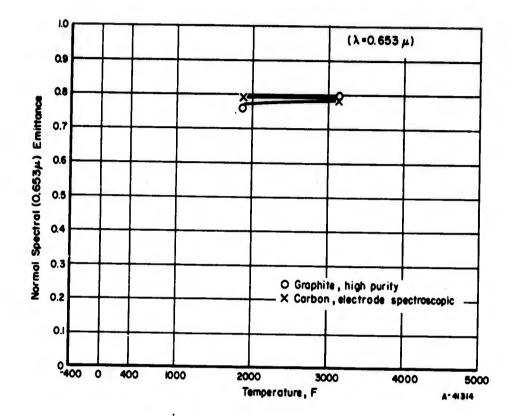
| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|--------------------|-------------------------------------|-------------------------------|---|--|--|
| 8 Olson and Morris | Olson and Morris | 0 | National GBH graphite Surface condition not given | Normal total emittance. Resistance-heated strip specimen. Compariscn blackbody. Thermistor detector. | Measured in vacuum Data taken from curves. |
| | | Note: Changed with cycling | Temperatures measured with thermocouples. | | |
| 7 | Betz, Olson, Schurin, and Morris | Δ | Surface condition not given | Same as above. | Measured in vacuum Data taken from table. |

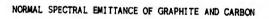
NORMAL TOTAL EMITTANCE OF TYPE GBH GRAPHITE--REFERENCE INFORMATION

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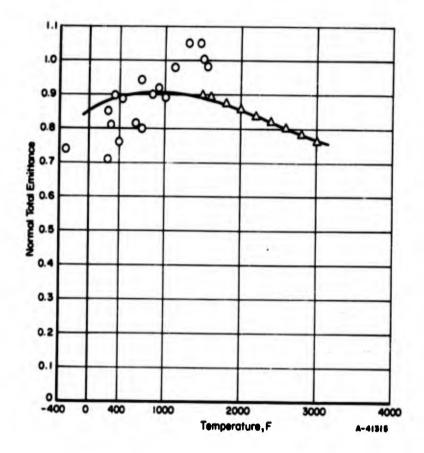
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| NORMAL SPEC | TRAL EMITTANCE | OF | GRAPHITE | AND | CARBONREFERENCE | INFORMATION |
|-------------|----------------|----|-----------------|-----|-----------------|-------------|
|-------------|----------------|----|-----------------|-----|-----------------|-------------|

| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|----------------------|--------------|--|--|---------------------------------------|----------------------------|
| 10 Thorn and Simpson | 0 | High-purity, medium- density graphite | Normal spectral emittance. Modified hole-in-tube method. | Measured in vacuum. | |
| | | × | Spectroscopic electrode carbon | Temperatures measured | Data taken from curves. |
| | | | Surface condition, polished and then heated to 1800 K in vacuum for 3 hours | with calibrated optical pyrometer. | (∕\= 0.653≁) |



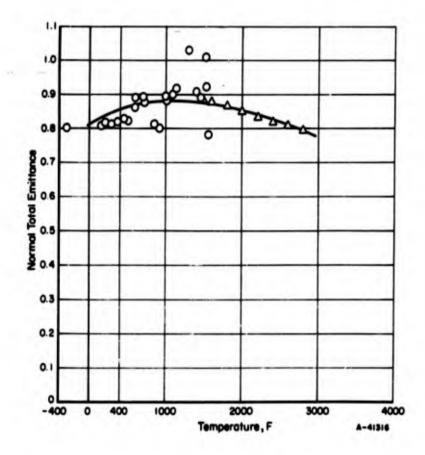
NORMAL TOTAL EMITTANCE OF TYPE 3474D GRAPHITE

| leference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|-----------|--|--------|---|--|--|
| 8 | Olson and Morris | 0 | Speer 3474D graphite Surface condition not given Note: Changed with cycling | Normal total emittance. Resistance-heated strip specimen. Comparison blackbody. Thermistor detector. Temperatures measured with thermocouples. | Measured in vacuum. Data taken from curves. |
| 7 | Betz, Olson, Schurin, and Morris | Δ | Surface condition not given | Same as above. | Measured in vacuum. Data taken from table. |

NORMAL TOTAL EMITTANCE OF TYPE 3474D GRAPHITE--REFERENCE INFORMATION

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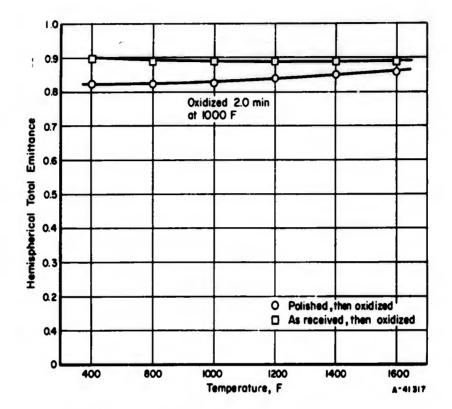
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NORMAL TOTAL EMITTANCE OF TYPE 7087 GRAPHITE

| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|-----------|--|--------|--|--|---|
| 8 | Olson and Morris | 0 | Speer 7087 graphite Surface condition not given Note: Changed with cycling | Normal total emittance. Resistance-heated strip specimen. Comparison blackbody. Thermistor detector. Temperatures measured with thermocouples. | Measured in vacuum Data taken from curves. |
| 7 | Betz, Olson, Schurin, and Morris | ۵ | Surface condition not given | Same as above. | Measured in vacuum. Data taken from table. |

NORMAL TOTAL EMITTANCE OF TYPE 7087 GRAPHITE -- REFERENCE INFORMATION



HEMISPHERICAL TOTAL EMITTANCE OF OXIDIZED KI50A NI-TIC HARD METAL

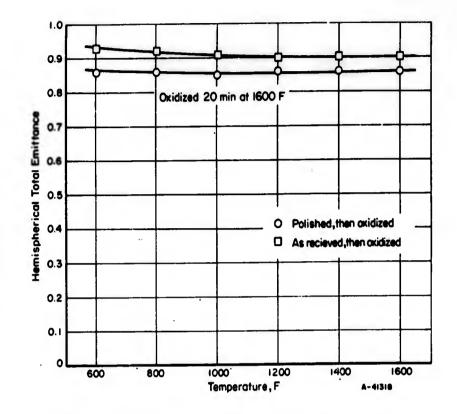
HEMISPHERICAL TOTAL EMITTANCE OF OXIDIZED K150A NI-TIC HARD METAL--REFERENCE INFORMATION

| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|-------------------|----------------|--------|--|---|--|
| 11 Wade and Cases | Wade and Casey | | Composition: 10Ni, 80TiC, 10CbC | Hemispherical total emittance. (Total emittance | Measured in air. Data taken from curves. |
| | | D | As received, then oxidized | measured normally and at various angles. Normal emittance | |
| | | 0 | Polished: Hand lapped with 3 micron and 1 micron diamond paste, then oxidized | equals hemispherical emittance.) Thermopile total ratiation detector. Resistance-heated specimen. Comparison blackbody. Temperatures measured with thermocouples. | |

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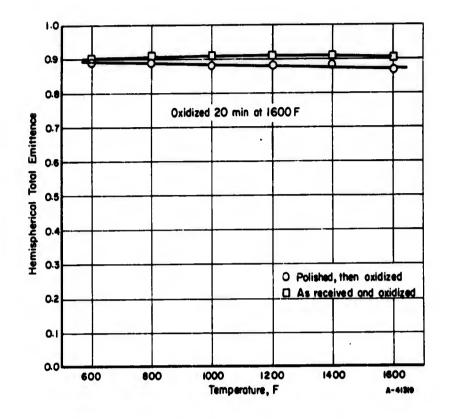
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HEMISPHERICAL TOTAL EMITTANCE OF OXIDIZED K151A NI-TIC HARD METAL

HEMISPHERICAL TOTAL EMITTANCE OF OXIDIZED K151A NI-TIC HARD METAL-REFERENCE INFORMATION

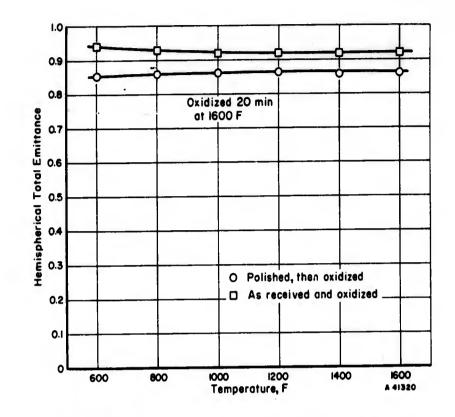
| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|-----------|----------------|-----------|--|--|--|
| 11 | Wade and Casey | D | Composition: 20Ni, 70TiC, 10CbC As received, then oxidized Polished; hand lapped with 3-micron and 1-micron diamond paste, then oxidized | Hemispherical total emittance. (Total emittance measured normally and at various angles. Normal emittance equals hemispherical emittance.) Thermopile total radiation detector. Resistance-heated specimen. Comparison blackbody. Temperatures measured with thermocouples. | Measured in air. Data taken from curves. |
| | Composition | 20Ni, 70T | iC, 10CbC | | |



HEMISPHERICAL TOTAL EMITTANCE OF OXIDIZED Y152B NI-TIC HARD METAL

HEMISPHERICAL TOTAL EMITTANCE OF OXIDIZED K152B NI-TIC HARD METAL--REFERENCE INFORMATION

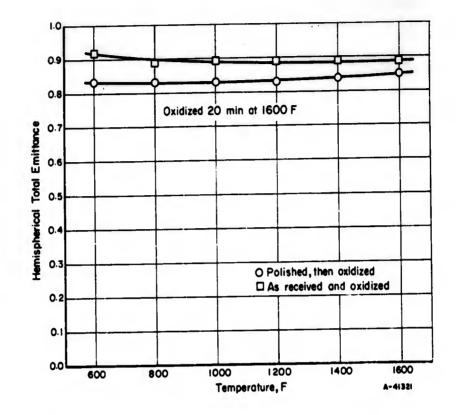
| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|-------------------|--|---|--|--|---------|
| 11 Wade and Casey | | Composition: 30Ni, 65TiC, 5CbC | Hemispherical total emittance. (Total emittance | Measured in air. Data taken from curves. | |
| | | DO | As received, then oxidized Polished; hand lapped with 3-micron and 1-micron diamond paste, then oxidized | measured normally and at various angles. Normal emittance equals hemispherical emittance.) Thermopile total | |
| | radiation de Resistance-he specimen. | radiation detector. Resistance-heated specimen. | ÷ | | |
| | | | | Comparison blackbody. Temperatures measured with thermocouples. | |



HEMISPHERICAL TOTAL EMITTANCE OF OXIDIZED K153B Ni-TIC HARD METAL

| | | | | | | | 11100 | METAL DECEDENCE | TNEODHATTON |
|------------------|------|-----------|------|-------------|-------|--------|-------|-----------------|-------------|
| HEMISPHERICAL TO | 1ATC | EMITTANCE | OF . | OX I DI ZED | K153B | N1-11C | HARD | MelalKerekenue | THEORMATION |

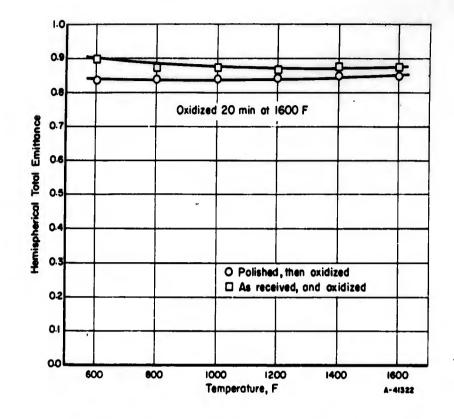
| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|-----------|----------------|--------|---|--|--|
| 11 | Wade and Casey | | Composition: 40Ni, 54TiC, 6CbC | Hemispherical total emittance. (Total emittance | Measured in air. Data taken from curves. |
| | | | As received, then oxidized 20 minutes at 1600 F | measured normally and at various | |
| | . <i>.</i> | 0 | Polished; lapped with 3-micron and 1-micron diamond paste, then oxidized 20 minutes at | angles. Normal emittance equals hemispherical emittance.) | |
| | | | 1600 F | Thermopile total radiation detector. | |
| | | | | Resistance-heated specimen. | |
| | | | | Comparison blackbody. | |
| | | ъ. | | Temperatures measured with thermocouples. | |



HEMISPHERICAL TOTAL EMITTANCE OF OXIDIZED K163B1 Ni-TIC HARD METAL

| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|-------------------|----------------|--------|--|---|--|
| 11 Wade and Casey | Wade and Casey | | Composition: 33.3Ni, 54TiC, 6.7Mo, 6CbC | Hemispherical total emittance. (Total emittance | Measured in air. Data taken from curves. |
| | | | As received, then oxidized 20 minutes at 1600 F | measured normally and at various | |
| | | 0 | Polished; lapped with 3- micron and 1-micron diamond paste, then oxidized 20 minutes at 1600 F | angles. Normal emittance equals hemispherical emittance.) Thermopile total radiation detector. | |
| | | | | Resistance-heated specimen. | |
| | | | £ | Comparison blackbody. Temperatures measured with thermocouples. | |

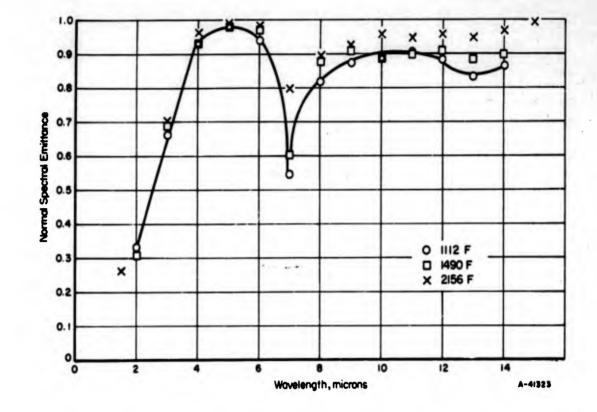
HEMISPHERICAL TOTAL EMITTANCE OF OXIDIZED K163B1 Ni-Tic HARD METAL--REFERENCE INFORMATION



HEMISPHERICAL TOTAL EMITTANCE OF OXIDIZED K184B NI-TIC HARD METAL

HEMISPHERICAL TOTAL EMITTANCE OF OXIDIZED K184B NI-TIC HARD METAL--REFERENCE INFORMATION

| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|-----------|----------------|--------|--|---|--|
| ll Wade | Wade and Casey | | Composition: 40Ni, 40TiC, 10CbC, 4Mo, 3Al, 3Cr | Hemispherical total emittance. (Total emittance | Measured in air. Data taken from curves. |
| | | D | As received, then oxidized 20 minutes at 1600 F | measured normally and at various angles. | |
| | | 0 | Polished; lapped with 3- micron and 1-micron diamond paste, then | Normal emittance equals hemispherical emittance.) | |
| | | | oxidized 20 minutes at 1600 F | Thermopile total radiation detector. | |
| | | • | | Resistance-heated specimen. | |
| | | | | Comparison blackbody. | |
| | | | | Temperatures measured with thermocouples. | |



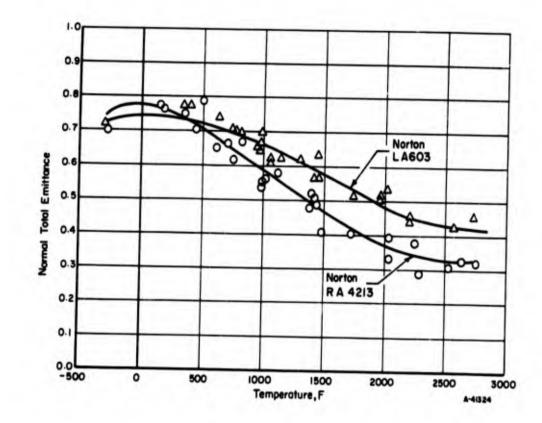
NORMAL SPECTRAL EMITTANCE OF BORON NITRIDE

NORMAL SPECTRAL EMITTANCE OF BORON NITRIDE-REFERENCE INFORMATION

| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|-----------|--|--------|--|--|--|
| 3 | Blau, Marsh, Martin, Jasperse, and Chaffee | | Boron nitride Purity and surface condition not given | Normal spectral emittance. Specimen mounted in wall of cylindrical | Measured in air. Data taken from curves. |
| | | 0 | Measured at 1112 F | Globar (SiC) heater. | (Curve drawn |
| | | D | Measured at 1490 F | Comparison blackbody hole in heater wall. | through 1112 F points only.) |
| | | × | Measured at 2156 F | Monochromator and thermocouple de- tector. Temperatures measured with thermocouples. | |

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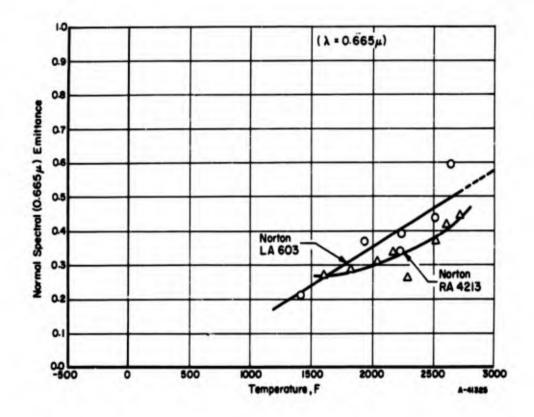




| | Olson and Morris | ^ | Norton 14603 | | |
|----|------------------|--------|---|-------------|-----|
| ce | Investigator | Symbol | Composition and Surface Condition | Test Method | Rem |
| | | | ويتحمدون ومحمولي والمترك والمترك والمراجع | | |

NORMAL TOTAL EMITTANCE OF ALUMINUM OXIDE -- REFERENCE INFORMATION

| Reference | Investigator | Symbol | Surface Condition | Test Method | Remarks |
|-----------|------------------|--------|---------------------------------|--|-------------------------------------|
| 2 | Olson and Morris | Δ | Norton LA603 Aluminum oxide | Normal total emittance. Furnace-heated specimen. | Measured in air. Data taken from |
| | | | Norton RA4213 Aluminum oxide | Comparison blackbody. Temperatures measured with thermocouples | curves. |
| | | | Surface condition not given | Thermistor detector. | |

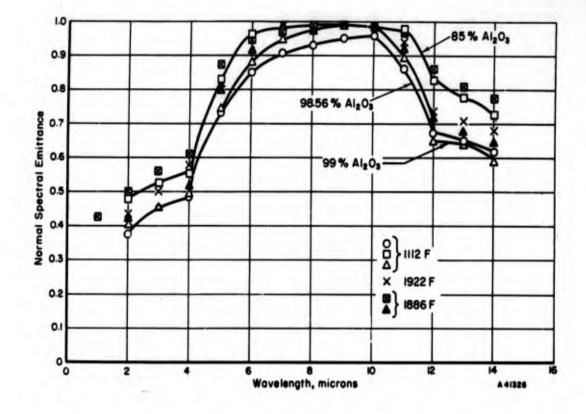




NORMAL SPECTRAL EMITTANCE OF ALUMINUM OXIDE--REFERENCE INFORMATION

| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|-----------|------------------|--------|--------------------------------------|---|--|
| 2 | Olson and Morris | 0 | Norton LA603 Aluminum oxide | Normal spectral emittance. Furnace-heated specimen. Comparison blackbody. | Measured in air. Data taken from curves. |
| | | Δ | Norton RA4213 Aluminum oxide | Commercial radiation detector and filter system for peak response at 0.665µ. Temperatures measured with thermocouples. | (A = 0.665µ) |

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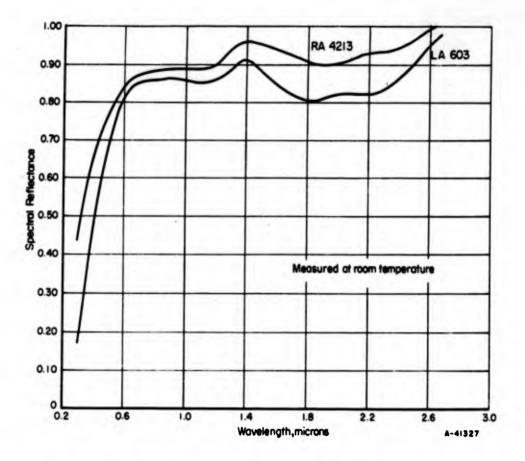
NORMAL SPECTRAL EMITTANCE OF ALUMINUM OXIDE

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NORMAL SPECTRAL EMITTANCE OF ALUMINUM OXIDE -- REFERENCE INFORMATION

a., .

| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|--|---------------|---------------------------------------|--|---|---|
| 3 Blau, Marsh, Martin, Jasperse, and Chaffee | Jasperse, and | | Aluminum oxide Diamond wheel finish as supplied by manufacturer TWA No. 2 (Norton A 402) | Normal spectral emittance. Specimen mounted in wall of cylindrical Globar (SiC) heater. Comparison blackbody hole also in heater. Temperatures measured | Measured in air Data taken from curves. (Curves are drawn through the 1112 F |
| | 0 | 98.56% Al ₂ 0 ₃ | with thermocouples. Monochromator and thermo- couple detector. | points only.) | |
| | | × | Measured at 1922 F | | |
| | | ^ | Coors AD85 85% A1203 | | |
| | | 0 | Measured at 1112 F | | |
| | | | Measured at 1886 F | | |
| | | | Coors AD99 99% Al ₂ O ₃ | | |
| | | Δ | Measured at 1112 F | | |
| | | A | Measured at 1886 F | | |



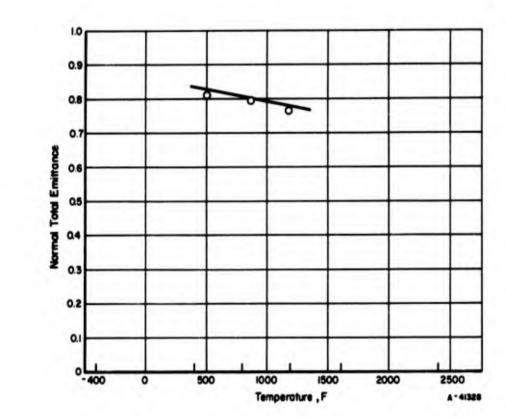


SPECTRAL REFLECTANCE OF ALUMINUM OXIDE--REFERENCE INFORMATION

| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|-----------|------------------|--------|---|---|--|
| 2 | Olson and Morris | | Aluminum oxide Norton RA4213 and LA603 Surface condition not given | Spectral reflectance. Incident radiation 9 degrees from normal to specimen surface. Integrating sphere reflectometer. Monochromator and lead sulphide detector. Normal (9 degrees) illumination diffuse reflection. | Measured in air a room temperature. Data taken from curves. |

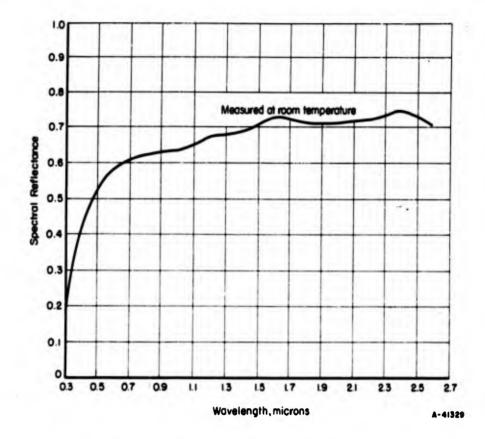
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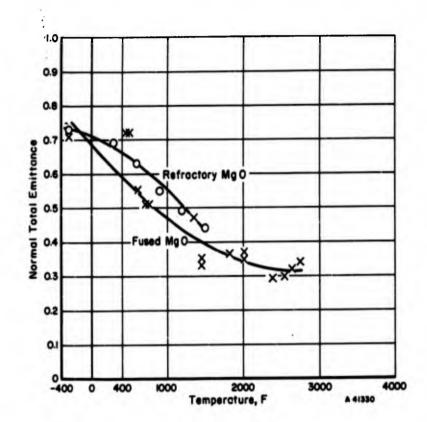
| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|-----------|------------------|--------|--------------------------------------|--|--|
| 2 | Olson and Morris | 0 | Beryllium oxide | Normal total emittance. Furnace-heated specimen. Comparison blackbody. Thermistor detector. Temperatures measured with thermocouples. | Measured in air, Data taken from curves. |



SPECTRAL REFLECTANCE OF BERYLLIUM OXIDE

| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|-----------|-------------------------------------|--------|--|---|---|
| 7 | Betz, Olson, Schurin, and Morris | | Beryllium oxide Purity not given As received condition | Spectral reflectance. Incident radiation 9 degrees from normal to specimen surface. Integrating sphere reflectrometer. Monochromator, and lead sulphide detector. Normal (9 degrees) illumination and diffuse reflection. | Measured in air a room temperature Data taken from curves. |

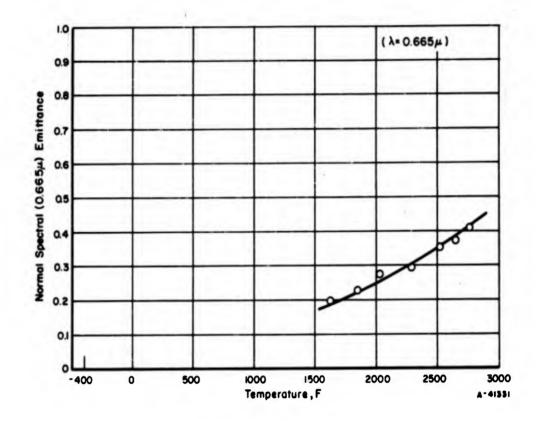
SPECTRAL REFLECTANCE OF BERYLLIUM OXIDE--REFERENCE INFORMATION





| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|-----------|------------------|--------|--|--|---|
| 2 | Olson and Morris | × | Fused magnesium oxide obtained from the National Bureau of Standards. Surface condition not given | Normal total emittance. Furnace-heated specimen. Thermistor detector. Comparison blackbody. Temperatures measured with thermocouples. | Measured in air. Data taken from curve. |
| 8 | Olson and Morris | 0 | Refractory magnesium oxide Composition and surface condition not given | (Same as above.) | (Same as above.) : |

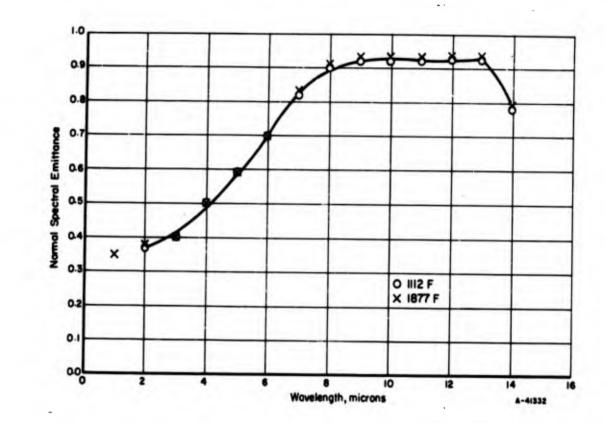
NORMAL TOTAL EMITTANCE OF MAGNESIUM OXIDE -- REFERENCE INFORMATION





| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|-----------|------------------|--------|--|---|---|
| 2 | Olson and Morris | 0 | Fused magnesium oxide obtained from National Bureau of Standards. Surface condition not given | Normal spectral emittance. Furnace-heated specimen. Comparison blackbody. Commercial detector and filter system for peak response at 0.665 μ . Temperatures measured with thermocouples. | Measured in air. Data taken from curves. (入= 0.665µ) |

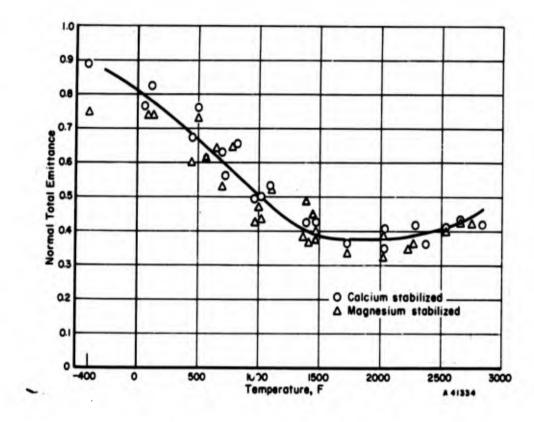
NORMAL SPECTRAL EMITTANCE OF MAGNESIUM OXIDE--REFERENCE INFORMATION





| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|-----------|---|--------|---|--|---|
| 3 | Blau, Marsh, Martin, Jasperse and Chaffee | | Magnesia (MgO) Norton RM4473 Purity: 97% MgO, 1.3-1.5% GaO | Normal spectral emittance. Specimen mounted in wall of cylindrical Globar (SiC) heater. | Measured in air. Data taken from curves. |
| | 1 - 1 | | Surface condition not given | Comparison blackbody hole in heater wall. Monochromator and | (Curve drawn through 1112 F points only.) |
| | •. | 0 | Measured at 1112 F | thermocouple detector. Temperatures measured | |
| | | X | Measured at 1877 F | with thermocouples. | |

NORMAL SPECTRAL EMITTANCE OF MAGNESIUM CXIDE--REFERENCE INFORMATION

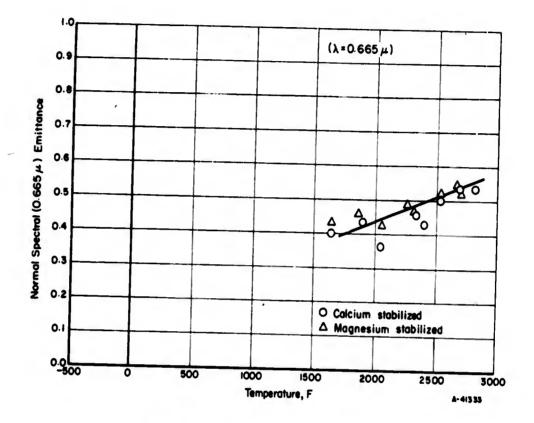




NORMAL TOTAL EMITTANCE OF ZIRCONIUM OXIDE -- REFERENCE INFORMATION

| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|-----------|------------------|--------|--------------------------------------|--|----------------------------|
| 2 | Olson and Morris | | Zirconium oxide | Normal total emittance. | Measured in air. |
| | | 0 | Calcium stabilized | Furnace-heated specimen. Comparison blackbody. | Data taken from curves. |
| | | Δ | Magnesium stabilized | Thermistor detector. Temperatures measured with thermocouples. | |

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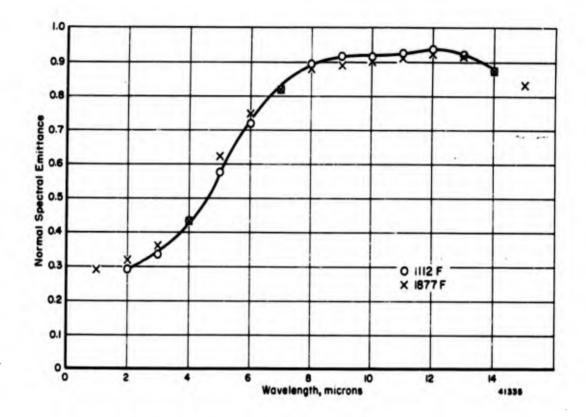


NORMAL SPECTRAL EMITTANCE OF ZIRCONIUM OXIDE -- REFERENCE INFORMATION

| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|-----------|------------------|--------|---|---|---|
| 2 | Olson and Morris | 0 4 | Zirconium oxide Calcium stabilized Magnesium stabilized | Normal spectral emittance. Furnace-heated specimen. Comparison blackbody. Commercial detector and filter system for peak response at 0.665µ. Temperatures measured with thermocouples. | Measured in air. Data taken from curves. (入≖ 0.665µ) |

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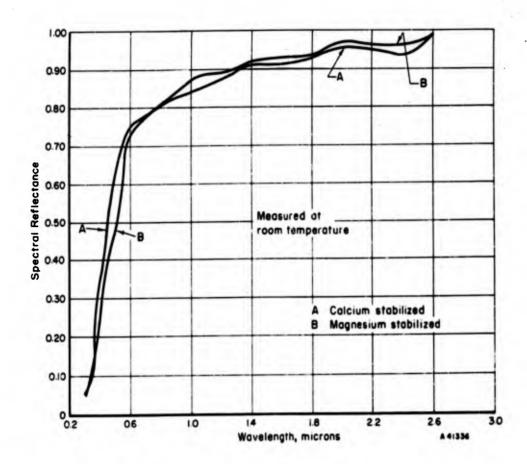
NORMAL SPECTRAL EMITTANCE OF ZIRCONIUM CXIDE

| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Pemarks |
|-----------|--|--------|--|--|--|
| 3 | Blau, Marsh, Martin, Jasperse, and Chaffee | | Zirconia (ZrO ₂) Norton RZ 5601 Purity: 92% ZrO ₂ , | Normal spectral emittance. Specimen mounted in wall of cylindrical Globar (SiC) heater. | Measured in air. Data taken from curves. |
| | | | 4.5% CaO Surface condition not given | Comparison blackbody hole in heater wall. Monochromator and | (Curves drawn through 1112 F points only.) |
| | | 0 | Measured at 1112 F | thermocouple detector. .emperatures measured | |
| | | X | Measured at 1877 F | with thermocouples. | |

NORMAL SPECTRAL EMITTANCE OF ZIRCONIUM OXIDE -- REFERENCE INFORMATION

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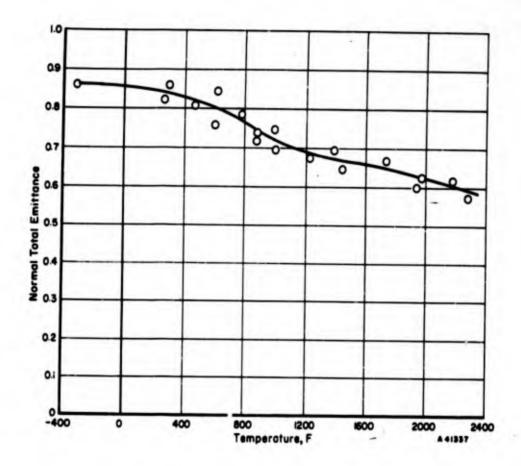
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SPECTRAL REFLECTANCE OF ZIRCONIUM OXIDE -- REFERENCE INFORMATION

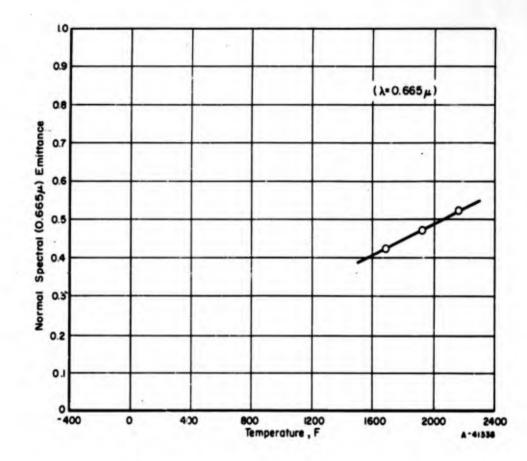
| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|-----------|------------------|--------|--|--|--|
| 2 | Olson and Morris | | Zirconium oxide Calcium stabilized and magnesium stabilized Purity and surface condition not given | Spectral reflectance. Incident radiation 9 degrees from normal to specimen surface. Integrating sphere reflectometer. Monochromator and lead sulphide detector. Normal (9 degrees) illumination. Diffuse reflection. | Measured in air at room temper- ature. Data taken from curves. |





| NORMAL TOTA | . EMITTANCE | OF | PYROCERAM | 9606REFERENCE | INFORMATION |
|-------------|-------------|----|-----------|---------------|-------------|
|-------------|-------------|----|-----------|---------------|-------------|

| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|-----------|------------------|--------|--|--|--|
| 2 | Olson and Morris | 0 | Pyroceram 9606, surface condition not given | Normal total emittance. Furnace-heated specimen. Comparison blackbody. Thermistor detector. Temperatures measured with thermocouples. | Measured in air. Data taken from curves. |



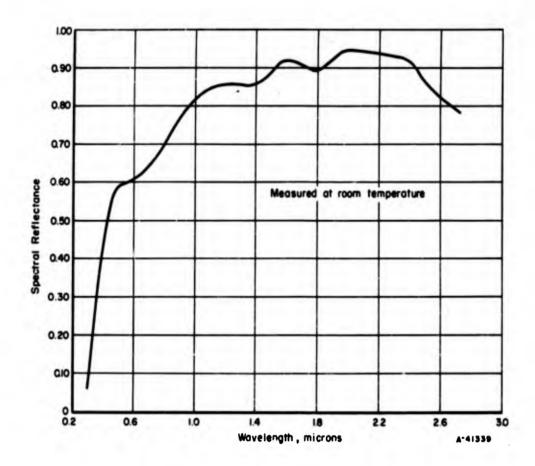
NORMAL SPECTRAL EMITIANCE OF PYROCERAM 9606

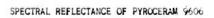
| HODHAL | SDECTDA! | ENTITANCE | OF | DVDOVEDAN | 9606REFERENCE | THEODMATION |
|-------------|----------|-----------|-----|-----------|---------------|-------------|
| INUTUR. ML. | SPECIRAL | ENILLANUE | ŲΓ. | PIRUGERAM | 9000REFERENCE | THECHMATION |

| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|-----------|------------------|--------|--|---|---|
| 2 | Olson and Morris | 0 | Pyroceram 9606 Surface condition not given | Normal spectral emittance. Furnace-heated specimens. Comparison blackbody. Commercial detector and | Measured in air Data taken from curves. |
| | | | | filter system for peak response at 0.665µ. Temperatures measured with thermocouples. | (入 = 0.665µ) |

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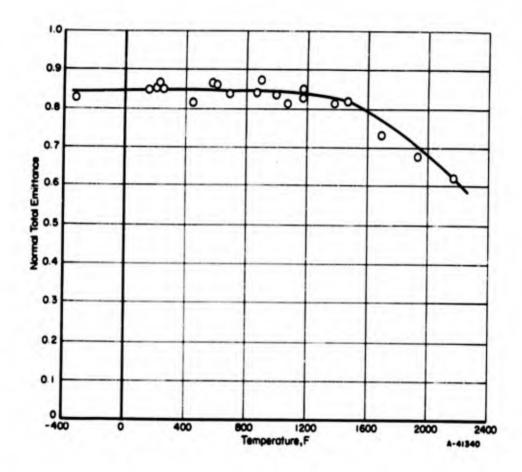
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| SPECTRAL REFLECTANCE OF PYROCERAM 9606REFERENCE INFORMATION | SPECTRAL | REFLECTANCE | OF | PYROCERAM | 9606REFERENCE | INFORMATION |
|---|----------|-------------|----|-----------|---------------|-------------|
|---|----------|-------------|----|-----------|---------------|-------------|

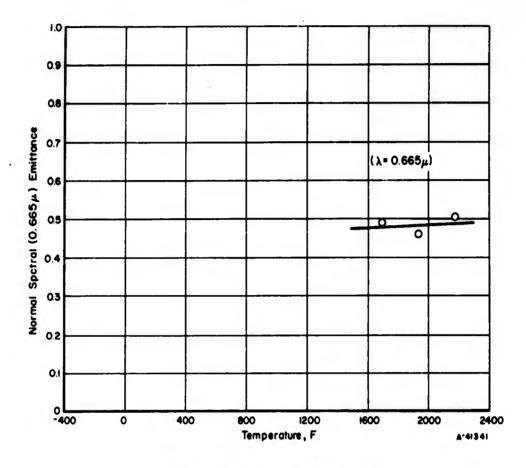
| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|-----------|------------------|--------|--|--|---|
| 2 | Olson and Morris | | Pÿroceram 9606 Surface condition not given | Spectral reflectance. Incident radiation 9 degrees from normal to specimen surface. Integrating sphere re- flectometer. Monochromator and lead sulphide detector. Normal (9 degrees) illumination. Diffuse reflection. | Measured in air at room temperature. Data taken from curves. |





NORMAL TOTAL EMITTANCE OF PYROCERAM 9608--REFERENCE INFORMATION

| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|-----------|------------------|--------|--|--|---|
| 2 | Olson and Morris | 0 | Pyroceram 9608 Surface condition not given | Normal total emittance. Furnace-heated specimen. Comparison blackbody. Thermistor detector. Temperatures measured with thermocouples. | Measured in air. Data taken from curve. |



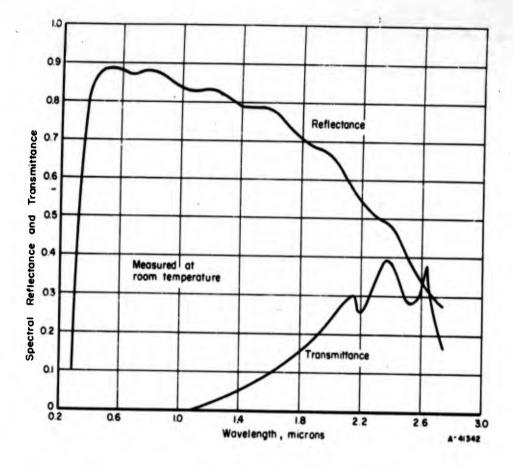
NORMAL SPECTRAL EMITTANCE OF PYROCERAM 9608

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NORMAL SPECTRAL EMITTANCE OF PYROCERAM 9608--REFERENCE INFORMATION

| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|-----------|------------------|--------|--|---|---|
| 2 | Olson and Morris | 0 | Pyroceram 9608 Surface condition not given | Normal spectral emittance. Furnace-heated specimen. Comparison blackbody. Commercial detector and filter system for peak response at 0.665 μ . Temperatures measured with thermocouples. | Measured in air. Data taken from curves. (入= 0.665µ) |

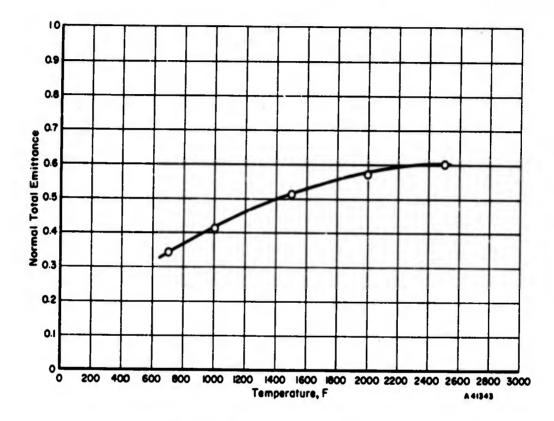
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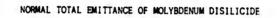


SPECIRAL REFLECTANCE AND TRANSMITTANCE OF PYROCERAM 9605

| SPECIHAL REFLECTANCE | AND | TRANSMITTANCE | OF | PYROCERAM | 9608REFERENCE | INFORMATION |
|----------------------|-----|---------------|----|-----------|---------------|-------------|
|----------------------|-----|---------------|----|-----------|---------------|-------------|

| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|-----------|------------------|--------|--|--|--|
| 2 | Olson and Morris | | Fyroceram 9603 Surfaces reasonably flat and parallel | Spectral reflectance. Incident radiation 9 degrees from normal to specimen surface. Integrating sphere re- flectometer. Monochromator and lead sulphide detector. Normal (9 degrees) illumination. Diffuse reflection. <u>Spectral Transmittance.</u> Normal specimen position filled by MgCO ₃ or MgO block. Specimen placed in entrance beam to sphere. Diffuse transmission. | Measured in air a room temperature. Data taken from curves. |

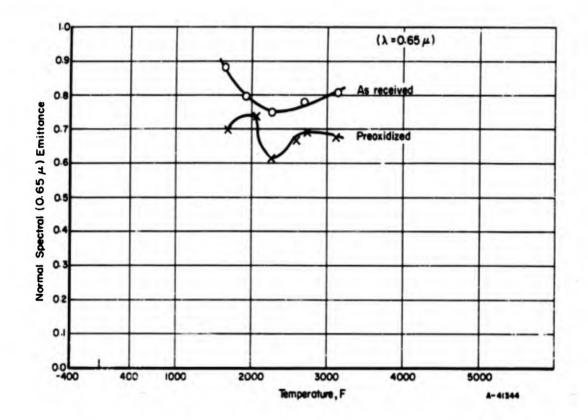


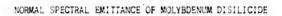


| NORMAL T | UTAL | EMITTANCE (| OF | MOLYBDENUM | DISILICIDE-REFERENCE | INFORMATION | |
|----------|------|-------------|----|------------|----------------------|-------------|--|
|----------|------|-------------|----|------------|----------------------|-------------|--|

| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|-----------|-------------------|--------|--------------------------------------|--|---|
| 1 | Anthony and Pearl | 0 | As received | Normal total emittance. Induction-heated specimen. Thermopile detector. Comparison blackbody. Temperatures measured with thermocouples and optical pyrometer. | Measured in continuous purge of helium gas. |

£.,





| Reference | Investigator | Symbol | Composition and Surface Condition | Test Method | Remarks |
|-----------|---|--------|---|---|---|
| 4 | Blau, Chaffee, Jasperse, and Martin | o x | Molybdenum disilicide Surface clean and smooth Preoxidized (Lower emittance for the preoxidized surface attributed to SiO ₂ surface layer) | Normal spectral emittance. Induction-heated specimen. Blackbody hole drilled in specimen surface. Temperatures measured with micro-optical pyrometer. | Measured in 90% argon - 10% hydrogen atmosphere. Data taken from curves. (N= C.654) |

NORMAL SPECTRAL EMITTANCE OF MOLYBDENUM DISILICIDE -- REFERENCE INFORMATION

| TOTAL SOLAR ABSORPTANCES AT SEA LEVEL AND ABOVE THE ATMOSPHE | OTAL | SOLAR A | BSORPTANCES | AT | SEA | LEVEL | AND | ABOVE | THE | ATMOSPHER | £ . |
|--|------|---------|-------------|----|-----|-------|-----|-------|-----|-----------|-----|
|--|------|---------|-------------|----|-----|-------|-----|-------|-----|-----------|-----|

| | " <u>Finisa</u> | Above Atmosphere | Sea Level |
|------------------------------|-----------------|------------------|-----------|
| Graphite-National GBE | (F) | 0.850 | 0.863 |
| Graphite-National GBE | (B) | 0.869 | 0.877 |
| Graphite-National GBH | (M) | 0.391 | 0.887 |
| Graphite-National GBH | (R) | 0.585 | 9.891 |
| Graphite-Speer 3474D | (M) | 0.653 | 0.358 |
| Graphite-Speer 3474D | (R) | 0.866 | 0.871 |
| Graphite-Speer 7087 | (M) | 0.908 | 0.911 |
| Graphite-Speer 7087 | (2) | 0.916 | 0.918 |
| Beryllium Oxide (Refractory) | (R) | 0.421 | 0.405 |
| Magnesium Oxide (Refractory) | (8) | C.168 | 0.14. |

TOTAL SOLAR ABSORPTANCE OF BERYLLIUM OXIDE, MAGNESIUM OXIDE AND THREE GRAPHITES -- REFERENCE INFORMATION

| Reference | Investigator | Symbol | | Composition and Surface Condition | Test Method | Remarks |
|-----------|-------------------------------------|--------|---------------------------|---|---|---|
| | Betz, Olson, Schurin, and Morris | | Sur B• F• M R | face finishes: back front fine milling machine cut as received from supplier. | Solar absorptance calculated by method of truncated weighted ordinate integration using spectral re- flectance vs wavelength curves and solar energy distribution curves over the limits of 0.3 to 2.4 microns. Above atmosphere values corrected for 3 per cent of energy lying outside these limits. | Calculated. Data obtained from table. |
| | | | • | back and front surfaces arbitrarily assigned to graphite sample. Sides appeared different to the eye. | | |

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| 46F | Department of Defense Titanium Sheet-Rolling Program Status Report No. 4, March 20, 1959 (PB 151065 \$2.25) |
| 46G | Department of Defense Titanium Sheet-Rolling Program - Time-Temperature-Transformation Diagrams of the Titanium Sheet-Rolling Program Alloys. October 19, 1959 (PB 151075 \$2.25) |
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