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DETERMINATION OF MIXED VIRIAL COEFFICIENTS

by

Jerome Brewer

December 1967

Contract No. AF 49(638)-1620
Project-Task No. 9750-01

Air Force Office of Scientific Research
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Arlington, Virginia 22209

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FOREWORD

This report was prepared by Midwest Research Institute for the Air Force Office of Scientific Research under AFOSR Contract No. 49(638)-1620, which is monitored by Dr. Joseph F. Masi, Chief, Propulsion Division. This is the final report on a five-year program which summarizes the experimental and theoretical phases concerned with the evaluation and correlation of mixed or interaction second virial coefficients. The experimental work was completed on 31 October 1967.

The research staff consisted of Dr. Jerome Brewer, Principal Investigator, and Mr. George Vaughn.

Special thanks are due Dr. A. D. McElroy and Mr. Roland Hughes who provided encouragement and many fruitful discussions.

ABSTRACT

Interaction second virial coefficients were determined for 55 binary mixtures, formed from the species: He, Ne, Ar, Kr, Xe, H_2, N_2, CO, CO_2, O_2, CH_4, C_3H_8, and Freon-22 from -150° to 50°C. Pure second virial coefficients were measured for CO, CH_4, Xe, Kr and N_2 from -150° to 0°C. The excess second virial coefficient was determined usually to a precision of 0.1 cc/mole. The experimental results were correlated with the Kihara intermolecular potential function and by a corresponding states method using a modified form of the Redlich-Kwong equation of state.

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SUMMARY

Experimental apparatus has been constructed to measure the interaction or mixed second virial coefficients of binary mixtures from which the so-called combining rules of intermolecular potential function may be tested and from which some thermodynamic properties of mixtures may be calculated.

The experimental apparatus has successfully measured the interaction second virial coefficients (B_{12}) of a vast number of gas mixtures from -150°C to 50°C in 25° steps, a total of nine different temperatures. A total of 55 binary mixtures were investigated. The mixtures were formed from the following chemical species: helium, neon, argon, krypton, xenon, hydrogen, nitrogen, carbon monoxide, carbon dioxide, oxygen, methane, propane, and Freon-22. A total of 251 evaluations of B_{12} were made for these mixtures and were based on more than 700 separate experimental determinations. With the same apparatus a total of 138 determinations were made in the evaluations of pure second virial coefficients of CO, CH_4, Xe, Kr and N_2 in the region from 0° to -150°C.

The excess second virial coefficients were obtained usually to a precision of 0.1 cc/mole corresponding to an error in the ratio $\Delta P/P$ of one part in 200,000. From these the mixed or interaction second virial coefficients were calculated. Their accuracy depends on the pure component data as well.

The agreement between the experimental values and those calculated by the Kihara potential was considered fair, the discrepancy was at the lower temperatures where it was as much as 8 cc/mole.

The second virial coefficients of the pure components as well as the interaction second virial coefficients (B_{ij}) were correlated by means of a modified form of the Redlich-Kwong equation of state for the second virial coefficient.

I. INTRODUCTION

The importance of the pure and interaction second virial coefficient in the study of intermolecular potentials and for the determinations of thermodynamic properties of real gas mixtures has been pointed out (Refs. 1 and 2). These coefficients arise from the virial equation of state according to Kamerlingh Onnes (Ref. 3):

$$PV/RT = 1 + B/V + C/V^2 + D/V^3 \ldots \tag{1}$$

where B , C , and D are the second, third, and fourth virial coefficients, respectively. The importance of this equation is due to the fact that it converges rapidly up to moderately high densities and that the virial coefficients are related to intermolecular potentials. Furthermore, on the basis of statistical mechanics the rigor of the following equation can be shown:

$$B_M = \sum x_i x_j B_{ij} \tag{2}$$

where B_M , B_{ii} , B_{jj} , and B_{ij} are the second virial coefficients for the mixture of components i and j and the interaction between i and j , respectively, and x_i is the mole fraction of component i . For a binary mixture this reduces to the following:

$$B_M = x_1^2 B_{11} + 2x_1 x_2 B_{12} + x_2^2 B_{22} \tag{3}$$

Similarly, the third virial coefficient is written as:

$$C_M = \sum x_i x_j x_k C_{ijk} \tag{4}$$

which for a binary mixture reduces to:

$$C_M = x_1^3 C_{111} + 3x_1^2 x_2 C_{112} + 3x_2^2 x_1 C_{122} + x_2^3 C_{222} \quad . \tag{5}$$

The relation of the second virial coefficient to the intermolecular potential $\phi(r)$ function is as follows:

$$B = \int_0^\infty \left[1-\exp(-\phi(r)/kT)\right] db_o(r) \tag{6}$$

where

$$b_o = \frac{2\pi N r^3}{3} \quad . \tag{7}$$

Since the second virial coefficients are known for a number of pure gases, the next most important quantity in the virial equation of state is the interaction second virial coefficient. Data on these coefficients are at present very scarce or incomplete, mostly having been taken at room temperature. There is a clear need therefore to measure the interaction second virial coefficients over a wide range of temperatures to contribute to the study of intermolecular forces and to provide the data for calculation of thermodynamic properties of mixtures. Recent emphasis on cryogenic processes has accented a need for such information at low temperatures.

Therefore, to add to this urgently needed data, the present research program was initiated in order to determine the interaction second virial coefficients for several binary systems between -150°C and 50°C.

II. EXPERIMENTAL METHOD

The interaction second virial coefficient was determined by a differential method which measures the pressure change when two pure gases are mixed at constant temperature and volume, similar to that used by Knobler et al. (Ref. 4). In essence, the method consists of charging two chambers with gas A, and a third chamber with gas B, at the same temperature and pressure. Then gas A in one of the chambers is mixed with gas B using a mercury Toepler pump. The pressure change as a result of mixing is measured with an oil manometer using gas A in one of the chambers as a reference. The temperature difference between the chambers is maintained less than 0.0005°C and the differential pressure measurement is made to less than 0.005 cc. of oil or within 5×10^{-6} atm. This differential pressure is directly related to the excess and the interaction second virial coefficients. The excess second virial coefficients are determined to within

0.1 cc/mole and the error in the interaction second virial coefficient depends upon the error of the excess second virial coefficient and those errors in the pure second virial coefficients.

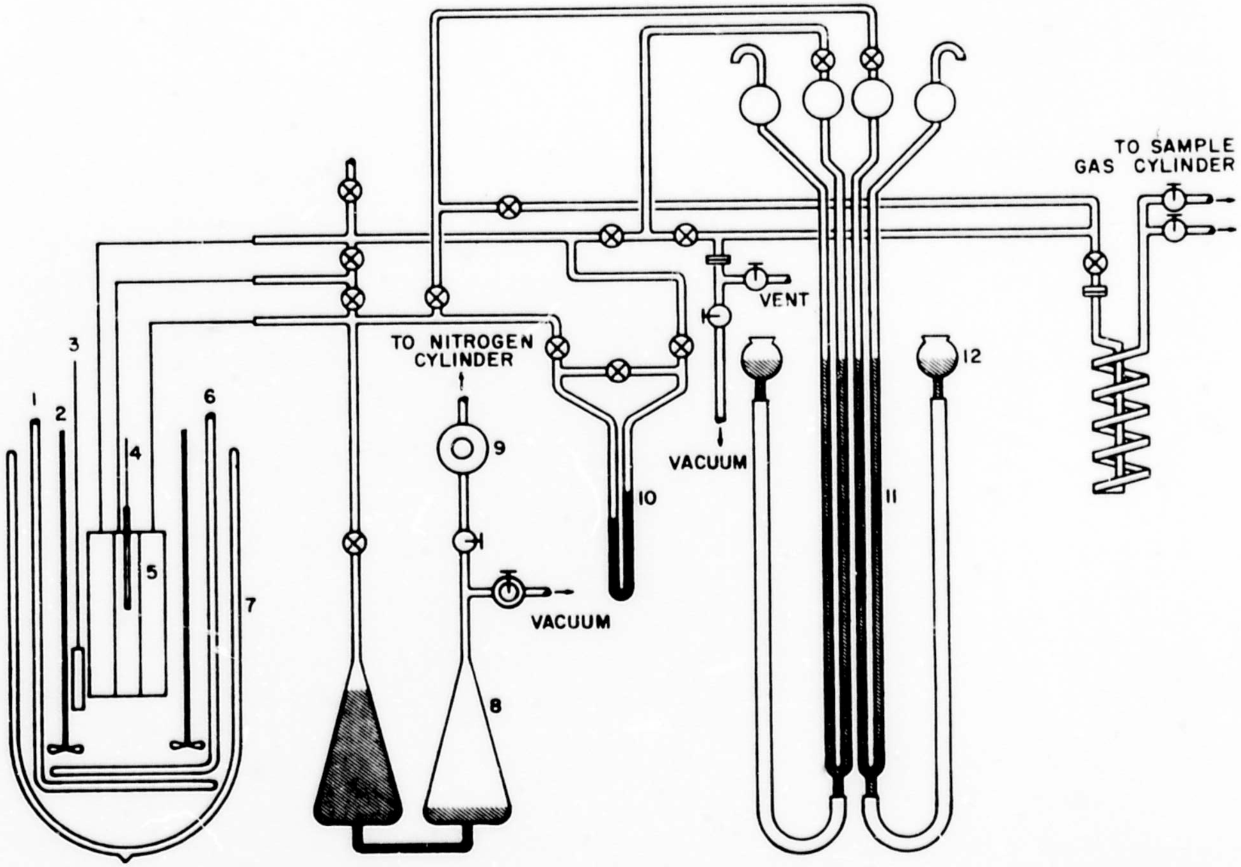
III. EXPERIMENTAL APPARATUS

A. Physical Description

A simple schematic diagram of the apparatus for the measurement of interaction second virial coefficients is shown in Figure 1. This apparatus measures accurately the small pressure change that occurs when two pure gases are mixed at constant temperature. The apparatus consists of: (1) a three-compartment brass cylinder; (2) a low temperature bath assembly; (3) a mercury Toepler pump; (4) an oil manometer; (5) two mercury manometers; and (6) a cold trap. All parts are interconnected with metal and glass tubing, mostly capillary.

The heart of the apparatus is the three-compartmented brass cylinder 4-5/16 in. in diameter which contains the gases under study. Three compartments were made in the solid brass cylinder by drilling three 1-5/8 in. diameter holes completely through it, and oriented 120 degrees. The ends were capped making each compartment about 300 cc. in volume and of equal volume within 0.2 percent. The compartments were connected to a 1 mm. glass capillary tubing by means of 0.5 mm. I.D. stainless steel capillary tubing. (During the last year this was changed to a 1 mm. I.D. tubing to economize the expensive gases, Xe and Kr.) The stainless steel tubing extended nearly to the bottom of each compartment. The sections of the tubing within the compartments had holes drilled in their walls to make the flushings and chargings of the gases more efficient.

The temperature of the compartmented brass cylinders was maintained constant in a liquid bath of water or Freon contained in the stainless steel Dewar. Water or kerosene was used as the bath medium for operation at temperatures of 25° to 50°C, and Freon-11 or Freon-12 was used at the lower temperatures. The bath was cooled by passing a cooling fluid, water, Freon, or liquid nitrogen through a submerged copper tube. A heater, wrapped around this tube, supplied just that amount of heat necessary to maintain a constant temperature. The bath temperature was controlled by a proportional precision temperature controller made by Bailey Instruments Company of Danville, California, and used a sensing element placed directly in the bath. The absolute temperature was determined within 0.05°C from a platinum resistance thermometer placed in a central hole of the brass cylinder making use of a Mueller bridge. Temperature drifts of 0.001°C in the



1. COOLING COILS
2. AGITATORS
3. SENSING THERMOMETER
4. PLATINUM RESISTANCE THERMOMETER
5. BRASS CYLINDER
6. HEATING COIL
7. DEWAR
8. MERCURY TOEPLER PUMP
9. PRESSURE REGULATOR
10. OIL MANOMETER
11. MERCURY MANOMETER
12. LEVELING BULBS

Figure 1 - Experimental Apparatus for the Measurement of Interaction Second Virial Coefficients

bath temperature were easily detected by this means. The bath temperature was maintained within 0.001°C and the temperature gradients between the compartments were probably maintained less than 0.0005°C. Agitation of the bath fluid was provided by an external motor, driving four propellers.

The Freons used for the bath medium were recovered and stored in a reservoir maintained below its boiling point by mechanical refrigeration. For bath temperatures below room temperature, liquid nitrogen or cold nitrogen gas may be used to cool the bath medium.

The mixing of the two pure gases was accomplished by a 600-cc. glass Toepler pump. By using compressed nitrogen gas and vacuum applied to the right-hand chamber of the Toepler pump, it was possible to withdraw a sizable fraction of the two pure gases into the left-hand chamber of the Toepler pump. Mixing actually occurred in the T-joint in the glass capillary. After about 15 cycles of operation of the Toepler pump the gas was completely mixed for purposes of this experiment since further mixing produced no measurable change of pressure.

The pressure which results from the mixing of two pure gases was measured with a 2-mm. capillary oil manometer whose fluid is Octoil-S. This fluid has a vapor pressure of 10^{-8} torr and a density of 0.909 gm/cc at 27°C, which are ideal characteristics for this application. The levels of the oil manometer were measured with a cathetometer to within 0.003 cm. The brass cylinder, the Toepler pump, and the oil manometer are all interconnected with capillary tubing so that the volume of the gas at room temperature within the system is a small fraction of the total. Furthermore, the volume of the gas at room temperature communicating with each leg of the manometer was made nearly equal so that normal variations in room temperature had a negligible effect upon the pressure measurements.

The mercury manometers were used to measure the charging pressure of the two gases before mixing and to aid in a preliminary pressure equilization of the gases prior to use of the oil manometer. When the pressures of the two gases were nearly equalized, as indicated by the mercury manometer readings, they were applied to the oil manometer. Final pressure equilivation was accomplished using the mercury manometer leveling bulbs for fine adjustments.

The cold trap was used when necessary for removing condensables in the gases under study. This prevented any condensation from occurring within the brass cylinder.

B. Experimental Procedure

While temperature equilibrium between the bath and the brass cylinder was being attained, flushing and charging of the two component gases into the test chambers were carried out. The Toepler pump was flushed and charged with an approximate 50-50 mixture of the binary mixture under study at the operating pressure of 2 atm. (If one used an arrangement whereby the volume of the gas normally contained within the Toepler pump is very small, it would not be necessary to charge the Toepler pump with a 50-50 mixture.) The compartment of the brass cylinder adjacent to the Toepler pump was flushed three times with one of the gas constituents under study and finally filled at the operating pressure. The other two compartments were flushed three times with the other constituent of the binary system to be studied and finally filled to the operating pressure. When the stainless steel capillary was increased to 1 mm. considerably less flushing was required. The pressures of the two gases were approximately equalized as indicated by the mercury manometer readings.

With the Toepler pump stopcock open, and the mercury level of the Toepler pump set on its fiducial mark, final pressure equilization was accomplished by adjusting the mercury manometer leveling bulbs. The oil manometer, read by the cathetometer, indicated the differential pressure. When the pressures were equal within 0.01 cm. of oil, the mercury manometers were isolated from the system. Just before the mixing was begun the readings of the oil manometer were recorded as the "differential pressure before mixing." One of the oil manometer stopcocks was closed to isolate the manometer from the Toepler pump. Mixing of the two gas components was accomplished by cycling the mercury within the Toepler pump 15 times. The mercury was then brought back to the fiducial mark and the Toepler pump stopcock was closed. After opening the oil manometer stopcock the differential pressure after mixing was read.

To insure complete mixing the contents of the two compartments were mixed five more times. When the readings could be duplicated, these were accepted as the final differential pressure after mixing. The pressure change as a result of mixing is simply the difference between the final and the initial readings. A correction is applied for the change in volume of the systems brought about by the change in levels of the oil manometer. A further small correction is applied to account for the differences in the room and the bath temperatures. The experimental run was replicated with the positions of the gases reversed.

IV. CALCULATION OF SECOND VIRIAL COEFFICIENTS

When the effect of pressure change on the density of the small amount of gas that is at room temperature is ignored, the pressure change caused by mixing is related to the following variables according to the following equations as derived by Knobler et al. (Ref. 4).

$$\frac{\Delta P}{P_i} = \frac{d_2 E}{2(1+B_{11}d_1)} + \frac{(d_2-d_1)^2}{4d_1d_2} \tag{8}$$

where ΔP = pressure change after mixing,

P_i = filling pressure,

E = excess second virial coefficient,

d_1 = molar density of component 1 ,

d_2 = molar density of component 2 , and

B_{11} = second virial coefficient of component 1 .

In the above equation the excess second virial coefficient E is defined as follows:

$$E = B_{12} - (B_{11}+B_{22})/2 \quad . \tag{9}$$

In the calculation of $\Delta P/P_i$ in the above equation, the third virial coefficient and its interactions were ignored. However, for interactions at the lower temperatures the effect of the third virial coefficients must be included to obtain results within 0.1 cc/mole. The above equation may be simplified with negligible error by eliminating d_2 and d_1 , resulting in the following equation:

$$\frac{\Delta P}{P_i} \cong \frac{P_i E}{2RT\left(1 + \frac{B_{11}+B_{22}}{V_o}\right)} + \frac{(B_{11}-B_{22})^2}{4V_o^2\left(1 - \frac{B_{11}+B_{22}}{V_o}\right)} \tag{10}$$

In the above equation B_{22} is the second virial coefficient of component 2 and V_0 is the ideal molar volume or RT/P_1. The observed value of ΔP must be corrected for the resulting volume change including the effect of the bath and room temperatures being different.

For the purpose of error analysis, the above equation may be reduced to the approximate relation

$$\frac{\Delta P}{P_1} \cong \frac{E}{2d_2} \quad . \tag{11}$$

Differentiating the above equation and setting the molar density equal to P_1/RT and solving for the error in the excess second virial coefficient dE, one obtains

$$dE = \left(\frac{2RT}{P_1^2}\right) d(\Delta P) \quad . \tag{12}$$

For a filling pressure of 2 atm. and a temperature of 25°C, dE is 0.12 cc/mole. This would be the expected error in the excess second virial coefficient provided that the only error was that due to reading the pressure change on mixing to within 10^{-5} atm. or about 0.01 cm. of oil, which is easily done.

After the excess second virial coefficients are determined from the above equations, the interaction second virial coefficient is determined as follows:

$$B_{12} = E + (B_{11}+B_{22})/2 \quad . \tag{13}$$

Therefore, to determine the interaction second virial coefficients, one must have accurate values for the pure second virial coefficients of the gases under study. Should more accurate values of B_{11} and B_{22} be determined, new values for B_{12} are simply determined by substitution in the above equation.

The following are more complete calculations which take into account the effect of the third virial coefficients and include the correction for the volume change, the correction for the difference between the bath and room temperatures, as well as a small temperature coefficient of the manometer fluid density.

Calculate pressure correction due to unequal manometer fluid levels:

$$(P_f-P)_1 = \frac{\Delta V(P_o)(1-B_C P/R_C T_C)}{V_{C(A+B)} + \left[V_{A-B}/(1+B_B P/RT_B)\right] (T_C/T_B)} \tag{14}$$

$$(P_f-P)_2 = \frac{\Delta V(P_o)(1-B_C P/RT_C)}{V_{CC} + \left[V_C/(1+B_p P/RT_B)\right] (T_C/T_B)} \tag{15}$$

Total correction = $(P_f-P)_1 + (P_f-P)_2$,

where $\Delta V = h\pi D^2/8$

$V_{A-B} = 615.1$

$V_C = 307.6$

$V_{C(A+B)} = 1.5$

$V_{CC} = 1.1$

T_B = bath temp. = $t_B + 273.15$

T_C = room temp. = $t_C + 273.15$

$B_C = (B_{11}+B_{22}+E)_{25^\circ}/2$

P = filling pressure, atm.

$E_T = 2RT_B h(1.1)(0.909)/(P_1^2)(13.596)$

$B_B = (B_{11}+B_{22}+E_T)_T/2$

$d = -7.5 \times 10^{-4}\ t + 0.9291$

D = manometer dia. in cm.

P_o = filling pressure in cm. of oil

$P_o = 13.596\ P_i/0.909$

P_i = filling pressure in cm. of Hg

h = apparent ΔP rdg in cm. of oil

$P = P_i/76$

$d_o = P/RT_B$

$V_o = 1/d_o$

Calculate true pressure change of mixing:

$$\Delta P_{actual} = h + \Delta P_{corr} \qquad (17)$$

$$(P_f - P) = (\Delta P_{actual})(-7.5 \times 10^{-4}\ t_C + 0.9291)/(13.596)(76) \qquad (18)$$

Calculate n_1/n_2 :

$$n_1/n_2 = (1+B_2d_2+C_2d_2^2)/(1+B_1d_1+C_1d_1^2) \qquad (19)$$

$$n_1/n_2 = 1 - B_1d_1 + B_1^2d_1^2 \ldots\ldots \frac{B_2d_2}{1+B_1d_1} + \frac{(C_2-C_1)}{V_o^2} \qquad (20)$$

where

$$d_1 \cong P/RT_B(1+B_1d_o) = d_o/(1+B_1d_o) \qquad (21)$$

$$n_1/n_2 = 1 + (B_2-B_1)d_o + 2B_1^2d_o^2 - B_2^2d_o^2 - 2B_1^3d_o^3 - B_1B_2d_o^2 + B_1B_2(B_1+B_2)d_o^3 + (C_1-C_2)d_o^2 \qquad (22)$$

Calculate the excess quantity, E :

$$\alpha = n_1/n_2 = 1 \qquad (23)$$

$$\beta = n_2/n_1 - 1 \qquad (24)$$

$$Z_1 = 1 + B_1/(RT_B/P+B_1) + C_1P^2/R^2T_B^2 \qquad (25)$$

$$Z_2 = 1 + B_2/(RT_B/P+B_2) + C_2P^2/R^2T_B^2 \qquad (26)$$

$$2n_1n_2RT/4v_1^2P = P/2RT_BZ_1Z_2 \qquad (27)$$

$$3RTn_1^3/8Pv_1^3 = 3P^2/8(RT_B)^2(1+3B_1d_o) \qquad (28)$$

$$C_{122} = (C_{111}C_{222}^2)^{1/3} \qquad (29)$$

$$C_{112} = (C_{111}^2C_{222})^{1/3} \qquad (30)$$

The quantity E is calculated from the following equations using the above substitutions.

$$(P_f-P)/P = (2n_1n_2RT/4v_1^2P)\left[E-B_1\alpha/2-B_2\beta/2\right] + (3RTn_1^3/8v_1^3P)\left[-C_{111} - \left(1+3\left[B_1-B_2\right]d_o\right)C_{222} + \left(1+2\left[B_1-B_2\right]d_o\right)C_{122} + \left(1+\left[B_1-B_2\right]d_o\right)C_{112}\right] \qquad (31)$$

V. EXPERIMENTAL RESULTS

A. Sources of Second Virial Coefficients

The second virial coefficients of the following species were taken from the literature: helium, hydrogen, argon, nitrogen, and neon. All of these data were taken from Otto (Ref. 5) except for the data on argon which were taken from Michels (Ref. 6). The data on argon were extrapolated from -140°C to -150°C, introducing a possible error for a few tenths of a cubic centimeter per mole. The data for nitrogen were extrapolated from -130°C to -150°C introducing an error which may be as high as 1 cc/mole. Since the data of Otto were taken at 50°C intervals, a number of data points had to be interpolated. This interpolation was performed linearly from a 1/T graph which was nearly a straight line over short intervals.

Some of the second virial coefficients of the following species were also taken from the literature: CO (Ref. 7), CH_4 (Refs. 8 and 9), Kr (Refs. 10 and 11), Xe (Ref. 12), CO_2 (Refs. 13 and 14), C_3H_8 (Ref. 15), O_2 (Refs. 16 and 17), and Freon-22 (Refs. 18 and 19). These data were supplemented by our new determinations.

B. Pure Virial Coefficients by This Study

Below 0°C we used our own values for B_{11} for CO, CH_4, Kr and Xe, which we believe to be more accurate than previous measurements. We have determined these quantities using the same apparatus we have used for measuring interaction virial coefficients. This was accomplished by measuring the change in pressure that occurs between helium and the unknown gas when the bath temperature is varied. This determination permits the calculation of the change in the second virial coefficient with temperature. If the second virial coefficient of the unknown gas is known at a reference temperature, say 0°C, then one can calculate the virial coefficients at other temperatures based upon the value at the reference temperature of 0°C. The data we have obtained in this case for the pure second virial coefficients are usually about 0.1 cc/mole. These new determinations for the pure second virial coefficients are given in Table I.*

A complete listing of the pure second virial coefficients we have used for our calculations of the interaction virial coefficients are given in Table II; and those for the third virial coefficients (some of these were estimated by Prausnitz (Ref. 20)) are given in Table III.

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* Tables I through IX are shown in the Appendix, p. 26.

The excess quantity, E , for the binary systems studied was determined either by direct measurement or by correlation which contributed an error in the B_{12} determination of less than 0.1 cc/mole. These values are listed in Table IV.

C. Interaction Virial Coefficients

The experimental results and calculations are given in Table V, which shows in successive columns the binary system, the bath temperature, the apparent pressure change of mixing in centimeters of oil, the filling pressure in centimeters of mercury, the manometer pressure correction, the true or actual pressure change of mixing, the excess quantity E , the average value of E for replicate experiments, the second virial coefficients of the pure components, and, finally, the interaction second virial coefficients.

Comparisons of replicate experimental runs show that the excess quantity, E , was usually measured to within 0.1 cc/mole for the entire temperature range from -150°C to 50°C, except where solubility of the gases in the manometer was appreciable.

A comparison of the experimental results with those of Michels and Beorboom (Ref. 21), Tanner and Masson (Ref. 22), Kramer and Miller (Ref. 23), Pfefferle et al. (Ref. 24), and Gorski and Miller (Ref. 25) shows agreement within the estimated errors in most cases.

D. Test with Kihara Potential

The calculations of the interaction second virial coefficients, B_{12} , by means of the Kihara potential (Ref. 26) were performed for several systems. Prausnitz and Myers (Ref. 27) have shown that such calculations agree well with some experimental data. However, these comparisons were made with data taken for a limited number of temperatures. The Kihara parameters have been determined from precise PVT data by Prausnitz and Myers and the Kihara potential functions have been determined from the tabulations by Connolly and Kandalic (Ref. 28). The interaction second virial coefficient was calculated by computer from the following equations according to the Kihara potential and include the quantum corrections:

$$B_{ij} = \frac{2\pi}{3} \rho_{oij}^{3} F_3 + \frac{M_{oi} + M_{oj}}{2} \rho_{oij}^{2} F_2 + \frac{S_{oi} + S_{oj}}{2} + \frac{M_{oi}M_{oj}}{4\pi} \rho_{oij} F_1 + \frac{V_{oi} + V_{oj}}{2} + \frac{M_{oj}S_{oi} + M_{oi}S_{oj}}{8\pi} \quad (32)$$

where

$$\rho_{oij} = \frac{1}{2} (\rho_{oi} + \rho_{oj}) \quad (33)$$

$$U_{oij} = \sqrt{U_{oi}U_{oj}} \quad (34)$$

A comparison of the calculated and experimental values is shown in Table VI.

A study of Table VI shows that in most cases the systems of helium and neon gave a much greater discrepancy between the experimental and calculated values, being more pronounced at the lower temperatures. For example, helium and neon binaries with argon and nitrogen gave the greatest discrepancies, while those of argon-hydrogen and nitrogen-hydrogen checked quite well with the Kihara potential. These comparisons show quite definitely the strong effect of neon and helium in their binary systems. However, the helium-neon system agreed well with calculated values presumably due to some compensation effects. As might be expected, the argon-nitrogen system also checked well with the Kihara potential because the two components are similar. Intermediate in the degree of disparity between calculated and experimental interaction second virial coefficients were the hydrogen-helium and hydrogen-neon systems.

These differences between calculated and experimental results are quite real when it is realized that the experimental results have a precision of 0.1 cc/mole. Moderate disparities at a temperature of -125°C were about 3 cc/mole and greatest disagreements ranged from 5 to 8 cc/mole. A possible conclusion is that a need exists for better combining rules. The most promising area of improvement appears to be in the combining rules attributable to quantum effects, since both helium and neon are quantum gases.

VI. CORRECTED CALCULATIONS AND CORRESPONDING STATES CORRELATION

Some of the calculations of the interaction second virial coefficients in our report of December 1965 (Ref. 29) were in slight error. The sources of errors were: (1) the density of the manometer oil should have been calculated from the equation,

$$d = -7.5 \times 10^{-4}\, t + 0.9291 \quad , \qquad (35)$$

rather than the equation,

$$d = -7.5 \times 10^{-4}\, t + 0.9241 \quad ; \qquad (36)$$

(2) the value of the second virial coefficient of pure nitrogen at 50°C was given incorrectly in our previous report as -2.58 cc/mole, the correct value is -0.26 cc/mole; and (3) in our previous report, we used the density of mercury at 0°C as 13.6 g/cc, whereas now we use the more exact value of 13.596 g/cc.

In our previous report we attempted to show a correlating relationship between the excess quantity, E , and the absolute temperature by plotting log E versus absolute temperature. This correlation was empirical and we find now that a better relationship to fit the pure component data as well as the mixture data is the following:

$$\frac{B_{ij}}{V_{cij}} = A + B\left(\frac{T}{T_{cij}}\right)^{-3/2} + C\left(\frac{T}{T_{cij}}\right)^{-5/2} \quad . \qquad (37)$$

This is a form of the Redlich-Kwong equation of state for the second virial coefficient which is modified to include an additional term to give a better representation of xenon, krypton and methane. We have determined the best values for the constants A , B , and C in the above equation using the data of the following pure components: N_2, Kr, CO, CH_4, Ne and Ar. We have then assumed that the mixing rule for the volume is correct as given by the empirical combining rule by assuming α equal to one in the following equation:

$$V_{cij}^{1/3} = \alpha\left(\frac{V_{ci}^{1/3} + V_{cj}^{1/3}}{2}\right) . \qquad (38)$$

From the values of A , B , and C already determined and the assumed value of V_{ij} , we then determine, by the method of least squares, from the mixture data, the value of T_{cij} and then determine the constant β from the following equation:

$$T_{cij} = \beta\left(T_{ci}T_{cj}\right)^{1/2} . \qquad (39)$$

If β is equal to one, then the geometric combining rule for the temperature of the mixture is verified.

For those systems involving krypton, xenon, carbon monoxide, methane, propane, and Freon-22 (species which have not been considered in previous reports), we have performed only duplicate instead of triplicate experiments in the interest of economy, since we have shown by our previous work the reproducibility of our method. In general, our present results are fully as good as those obtained previously with the exception of those species which could have a significant solubility in the manometer oil. We suspect solubility of this kind could occur with systems involving xenon, propane, and Freon-22. Therefore, our data on these species are not expected to be as accurate as we have obtained with others.

We have purposely refrained from trying to correlate the data on those interaction second virial coefficients involving helium because no known method now exists for determining the pseudocritical temperature and the pseudocritical volume of this gas. We would hope to investigate this problem at some future date.

In our previous report we have analyzed our interaction second virial coefficients on the basis of an intermolecular potential, the Kihara potential. We have found that a satisfactory fit to this potential on the basis of mixtures was not obtained since in several cases discrepancies of the order of 8 cc/mole between experimental and calculated values were obtained. This result led us to analyze our data on the basis of a corresponding states correlation using the modified Redlich-Kwong equation of state as applied to the second virial coefficient. Such a corresponding states correlation is based upon theory as pointed out by Guggenheim (Ref. 30) who states that the second virial coefficient for the mixture as well as the pure components should obey the following relationship:

$$\frac{B}{V^*} = f\left(\frac{T}{T^*}\right) \qquad (40)$$

where V^* is a characteristic volume and T^* is a characteristic temperature which may be the critical volume, V_c, and the critical temperature, T_c, respectively, but not necessarily so. In our analysis we have used the values for V^* as V_c and T^* as T_c for the pure components in all cases except hydrogen where we have chosen the values suggested by Guggenheim. One possibility which we did not investigate was the actual determination of V^* and T^* themselves as a best fit to the second virial coefficients of the pure components. It may be that our data alone are not sufficient to determine both of these characteristic constants for each pure component; however, one possibility may be to determine T^* assuming that V^* is equal to V_c.

In Tables VII, VIII and IX are presented the results of our correlation using the modified Redlich-Kwong formulation of the second virial coefficient using a corresponding states approach according to Guggenheim. This correlating equation was found from the pure components, N_2, Ar, CO, Ne, CH_4 and Kr to be

$$\frac{B_{ij}}{V_{cij}} = 0.33833 - 1.4195\left(\frac{T}{T_{cij}}\right)^{-3/2} - 0.08105\left(\frac{T}{T_{cij}}\right)^{-5/2} \quad . \qquad (41)$$

In Table VII are given the results of the correlation with the pure components showing the experimental and calculated values from the above equation and the standard deviation together with the values of T_c and V_c used.

In Table VIII are given the results for the binary systems showing the comparison between the experimental values and those calculated by the correlating equation. Also shown are the excess quantity, E, and the values of V_{cij} used. The T_{cij} values were found from a least square fit to the experimental values. From these, the value of β was found from the following equation:

$$T_{cij} = \beta\left(T_{ci}T_{cj}\right)^{1/2} \quad . \qquad (42)$$

The standard deviation is also given.

The data are arranged according to temperature in Table IX. In Figure 2 it is shown how equation (41), based on the data of CO, CH_4, Kr Ne, N_2 and Ar, fits these species and those of H_2, C_3H_8, CO_2, O_2, Freon-22 and Xe. The data on C_3H_8, CO_2, O_2 and Freon-22 are not as accurate as the others and if these are not considered, Figure 3 shows the result.

A graphical representation of the correlation of our interaction second virial coefficients to this same equation is given in Figure 4. All binary systems except those containing He are shown. These are omitted because at present there is no acceptable method to evaluate its pseudocritical temperature and volume. From Figure 4, it is seen that the correlation is fairly good except for some systems of Freon-22, C_3H_8 (where disparities were expected because of the pure component data) and Ar-CH_4. The discrepancy of the Ar-CH_4 system was not expected and is not accounted for at this time.

While the above correlations are fairly good, it should be pointed out that the precision of the B_{12} data is about 20 times better than the correlation. The conclusion is that we have not yet found a satisfactory method, either by corresponding states correlation or by intermolecular potential function, of representing our precise data by a single function which applies to all species.

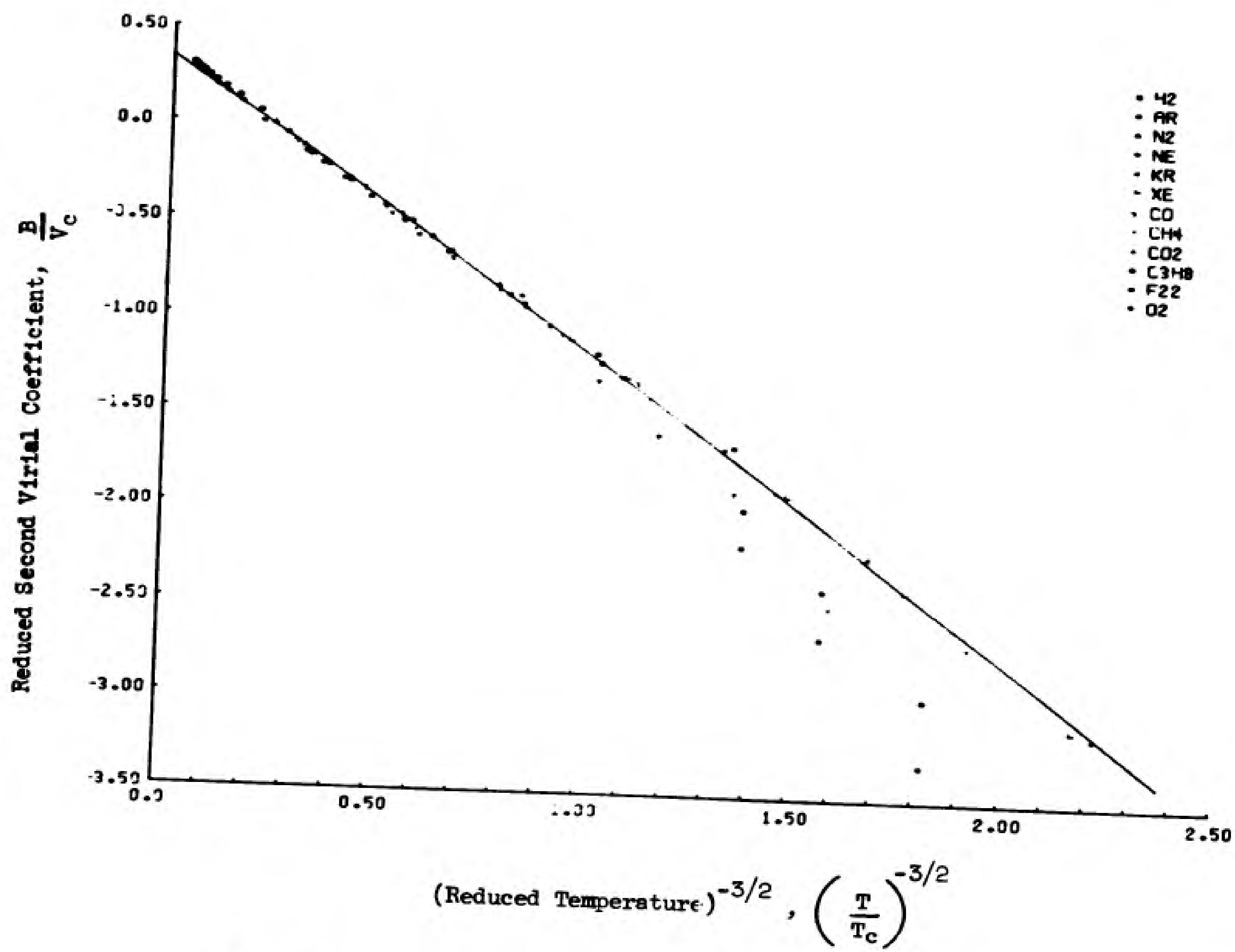

Figure 2 - Correlation of Second Virial Coefficients of Pure Species

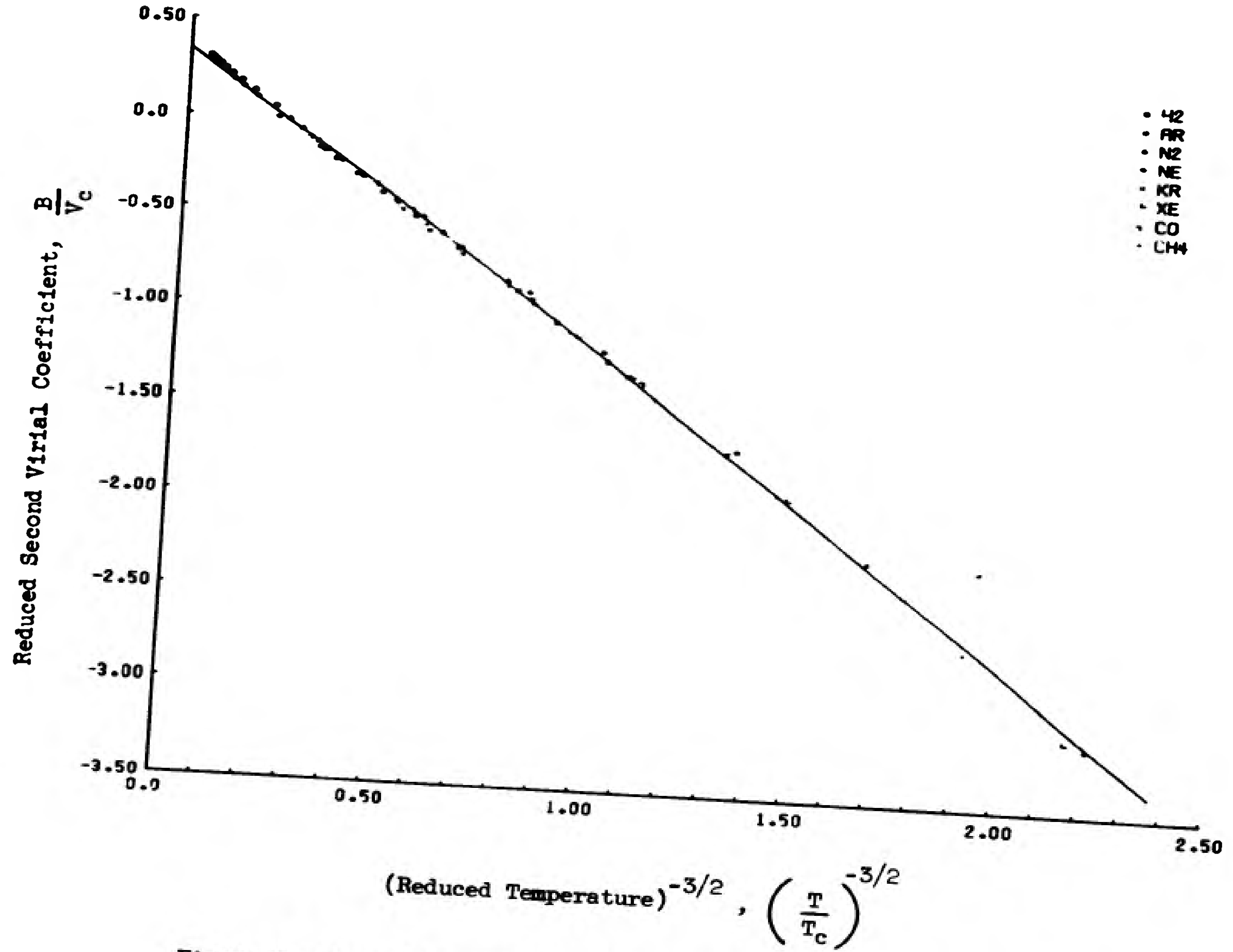

Figure 3 - Correlation of Second Virial Coefficients of Pure Species

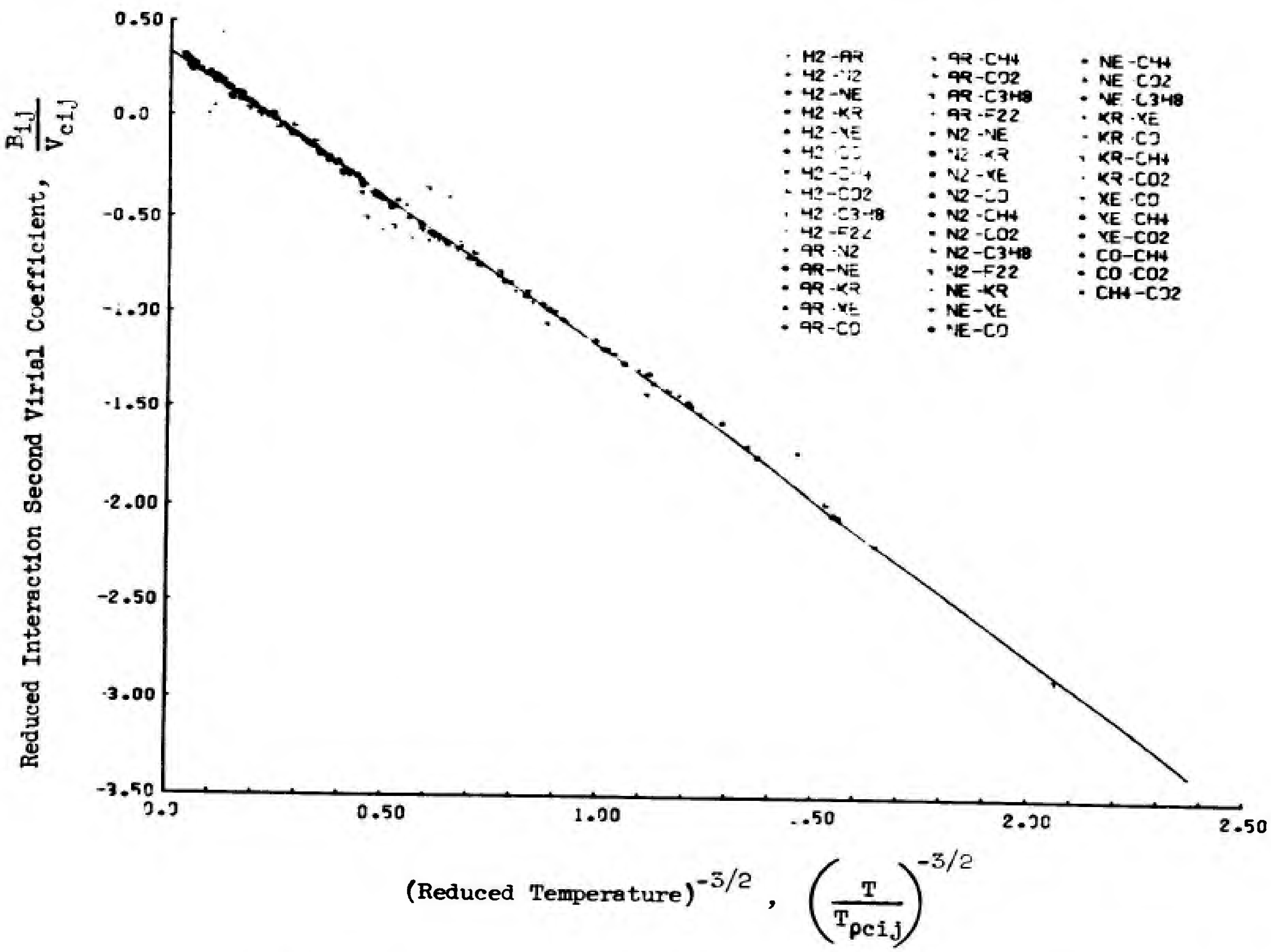

Figure 4 - Correlation of Interaction Second Virial Coefficients

VII. SUGGESTED FURTHER WORK

In view of the undesirable solubility of some of the species in the manometer oil, it has occurred to us that an improvement over the existing apparatus could be effected by increasing the precision to 0.01 cc/mole. We would do this by eliminating the oil manometer entirely and by using an electronic differential null meter to measure the change in volume that occurs on mixing two pure gases at constant pressure. The volume change would be determined by weighing the amount of mercury expelled from the system on an analytical balance. The mixing operation could be performed at constant pressure within the precision of one part in 100 million which is within the state of the art for differential pressure gauges. This new order of precision in the pressure would demand a new and higher order of precision in temperature control which we feel is also within the state of the art. With no oil within the system there would be no solubility problem and improved results would be obtained with all species especially those of xenon, propane and Freon-22. Not only would this new apparatus provide improved results on the interaction second virial coefficients but it would also give improved results for the second virial coefficients of the pure components and permit extending those values to new temperatures.

Our preliminary results on the determination of pure virial coefficients have indicated at least some of the second virial coefficient data are in doubt. For example, our results have indicated that some sizable errors may exist in the nitrogen data, based upon the work of Otto (Ref. 5). Therefore, our suggested extensions of this work could significantly improve these data.

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APPENDIX

TABLES I THROUGH IX

TABLE I

DETERMINATIONS OF PURE SECOND VIRIAL COEFFICIENTS BY THIS STUDY

Specie	Temperature (°C)	B_{11} (cc/mole)	B_{11} (avg.) (cc/mole)
CH_4	- 50	- 83.45	- 83.58
		- 83.56	
		- 83.61	
		- 83.54	
		- 83.66	
		- 83.57	
		- 83.63	
		- 83.65	
	- 75	-106.49	-106.48
		-106.48	
		-106.48	
	-100	-138.61	-138.69
		-138.78	
	-125	-186.06	-185.87
		-186.09	
		-185.76	
		-185.77	
		-185.89	
		-185.92	
		-185.70	
		-185.78	
	-150	-264.58	-264.28
		-264.40	
		-263.85	
		-264.27	
N_2	- 50	- 25.99	- 26.05
		- 25.99	
		- 26.06	
		- 26.17	
		- 26.14	
		- 26.00	
		- 26.04	
	- 50	- 25.81	- 25.81
		- 25.79	
		- 25.84	

TABLE I (Continued)

Specie	Temperature (°C)	(cc/mole)	B_{11} (avg.) (cc/mole)
N_2 (concluded)	- 75	- 37.30	- 37.39
		- 37.30	
		- 37.46	
		- 37.46	
		- 37.39	
		- 37.39	
	- 75	- 37.24	- 37.24
		- 37.25	
		- 37.24	
		- 37.27	
		- 37.26	
	-100	- 52.80	- 52.84
		- 52.92	
		- 52.79	
	-125	- 74.68	- 74.69
		- 74.70	
		- 74.56	
		- 74.57	
		- 74.80	
		- 74.85	
	-150	-108.41	-108.56
		-108.50	
		-108.78	
CO	- 50	- 30.55	- 30.51
		- 30.46	
		- 30.52	
		- 30.46	
		- 30.42	
		- 30.59	
		- 30.51	
		- 30.52	
	- 75	- 42.65	- 42.86
		- 42.69	
		- 43.03	
		- 43.06	
	-100	- 59.70	- 59.89
		- 60.07	

TABLE I (Continued)

Specie	Temperature (°C)	B_{11} (cc/mole)	B_{11}((avg.) (cc/mole)
CO (concluded)	-125	- 84.51	- 84.46
		- 84.64	
		- 84.46	
		- 84.50	
		- 84.58	
		- 84.57	
		- 84.34	
		- 84.38	
		- 84.25	
		- 84.34	
	-150	-123.14	-122.84
		-122.72	
		-123.25	
		-122.73	
		-122.38	
Kr	- 50	- 94.91	- 94.95
		- 94.94	
		- 94.89	
		- 94.87	
		- 94.87	
		- 94.74	
		- 94.98	
		- 95.09	
		- 95.42	
		- 95.26	
		- 94.97	
		- 94.89	
		- 94.96	
		- 94.91	
		- 94.96	
		- 94.83	
		- 94.90	
		- 94.76	
		- 94.85	
	- 75	-119.26	-119.17
		-119.27	
		-119.21	
		-119.09	
		-119.15	
		-119.06	

TABLE I (Concluded)

Specie	Temperature (°F)	B_{11} (cc/mole)	B_{11} (avg.) (cc/mole)
Kr (concluded)	-100	-153.34	-153.40
		-153.30	
		-153.34	
		-153.60	
	-125	-203.96	-204.18
		-203.97	
		-204.32	
		-204.22	
		-204.21	
		-204.22	
		-204.33	
		-204.19	
	-150	-288.28	-288.84
		-289.05	
		-288.84	
		-289.19	
Xe	- 50	-226.72	-226.73
		-226.60	
		-226.89	
	- 75	-283.82	-283.95
		-283.89	
		-284.04	
		-284.04	
	-100	-368.53	-368.32
		-368.12	

TABLE II

SECOND VIRIAL COEFFICIENTS OF PURE SPECIES

Temp. (°C)	He	H_2	A	N_2	Ne	Kr	Xe	CO	CH_4	CO_2	C_3H_8	F_{22}	O_2
50	11.74	15.15	-11.23	- 0.26	12.32	- 42.80	-111.22						- 12.00
25	11.73	14.64	-15.75	- 4.86	11.54	- 52.40	-131.00	- 8.28	- 42.86	-123.60	-388.00	-359.00	- 16.00
0	11.76	13.98	-21.45	-10.57	10.94	- 62.96	-154.26	- 14.19	- 53.35	-150.00	-468.00	-437.00	- 22.00
- 25	11.84	13.14	-28.56	-17.59	10.14					-178.00	-579.00	-545.00	
- 50	11.93	12.10	-37.42	-26.38	9.12	- 94.95	-226.73	- 30.51	- 83.58	-233.00			- 37.00
- 75	11.98	10.79	-49.13	-37.48	7.90	-119.17	-283.95	- 42.86	-106.48				
-100	11.91	9.15	-65.19	-51.86	6.45	-153.40	-368.32	- 59.89	-138.89				- 65.00
-125	11.75	6.78	-88.43	-73.54	4.36	-204.18		- 84.46	-185.67				
-150	11.42	2.95	-109.90	-124.10	0.10	-288.84		-122.84	-264.28				

TABLE III

THIRD VIRIAL COEFFICIENTS OF PURE SPECIES

Temp. (°C)	He	H_2	A	N_2	Ne	Kr	Xe	CO	CH_4	CO_2	C_3H_8	F_{22}	O_2
50	153	267	1129	1309	344	1800	7500						1300
25	160	295	1157	1534	299			1700		5900	0	0	0
0	167	313	1270	1760	255	2620	6080	1800	2700	5750	0	0	1250
- 25	174	331	1414	1904	242					5500	0	0	0
- 50	180	349	1540	2048	228	3400	4650	2050	3500	3150	0	0	1500
- 75	187	359	1777	2087	213	3375	2000						0
-100	194	369	2014	2127	199	3350	0	2650	4500				2030
-125	191	415	2355	2170	254	0		3200	3000				0
-150	189	462	2700	2210	309	0		3700	0				0

TABLE IV

EXCESS QUANTITY FOR BINARY SYSTEMS AT 25°C (CC/MOLE)

System	E_{25}	System	E_{25}
He-N	17.8	Xe-Ne	77.0
H-N	8.1	$CO-N_2$	0.0
He-Ar	20.1	CO-He	20.8
H-Ar	8.3	CO-Ar	0.0
Ne-H	1.1	$CO-H_2$	9.2
Ne-N	9.9	CO-Ne	12.5
He-Ne	0.7	$CO-CH_4$	3.5
Ar-N	-0.6	$CO-CO_2$	22.0
Ar-Ne	13.7	CO-Kr	3.6
H-He	2.8	CO-Xe	29.6
C_3H_4-Ne	216.0	CH_4-N_2	5.7
$C_3H_4-N_2$	138.0	CH_4-He	40.7
C_3H_4-He	238.0	CH_4-Ar	4.5
$C_3H_4-H_2$	192.0	CH_4-H_2	21.8
C_3H_4-Ar	132.0	CH_4-Ne	30.8
$F_{22}-N_2$	121.0	CH_4-CO_2	22.6
F_{22}-Ar	123.0	CH_4-Kr	0.0
F_{22}-Ne	189.0	CH_4-Xe	12.2
F_{22}-He	198.0	CO_2-N_2	27.4
$F_{22}-H_2$	172.0	CO_2-He	82.6
Kr-Xe	13.0	CO_2-Ar	32.6
$Kr-N_2$	5.4	CO_2-H_2	59.1
Kr-He	40.5	CO_2-Ne	70.5
$Kr-H_2$	23.7	CO_2-Kr	22.7
Kr-Ar	4.6	CO_2-Xe	25.8
Kr-Ne	31.6	O_2-He	19.3
$Xe-N_2$	34.5		
Xe-He	91.5		
$Xe-H_2$	64.8		
Xe-Ar	30.0		

TABLE V

EXPERIMENTAL RESULTS

SYSTEM	TEMP C	P-RDG CM OIL	P-FILL CM HG	P-CORR CM OIL	P-ACT CM OIL	E CC/MOL	E-AVG CC/MOL	B-11	B-22	B-12.
N2-AR	50	-0.029	146.1	-0.006	-0.035	-0.45	-0.44	-11.23	-0.26	-6.19
N2-AR		-0.034	145.7	-0.007	-0.041	-0.52				
N2-AR		-0.018	144.5	-0.003	-0.021	-0.27				
N2-AR		-0.034	141.4	-0.005	-0.039	-0.53				
AR-H2	50	0.508	145.5	0.079	0.587	7.50	7.45	-11.23	15.15	9.41
AR-H2		0.499	145.2	0.077	0.576	7.40				
AR-H2		0.493	143.3	0.074	0.567	7.46				
HE-AR	50	1.235	145.2	0.189	1.424	18.21	18.15	-11.23	11.74	18.41
HE-AR		1.237	145.4	0.190	1.427	18.22				
HE-AR		1.233	145.7	0.189	1.422	18.06				
HE-AR		1.235	145.6	0.189	1.424	18.11				
NE-AR	5C	0.730	145.3	0.158	0.888	11.36	11.60	12.32	-11.23	12.15
NE-AR		0.763	145.9	0.165	0.928	11.75				
NE-AR		0.742	144.2	0.160	0.902	11.70				
H2-N2	50	0.485	143.5	0.074	0.559	7.34	7.14	15.15	-0.26	14.58
H2-N2		0.475	142.6	0.C72	0.547	7.28				
H2-N2		0.480	145.1	0.073	0.553	7.10				
H2-N2		0.472	144.1	0.072	0.544	7.08				
H2-N2		0.457	143.8	0.069	0.526	6.89				
HE-N2	50	1.053	144.3	0.161	1.214	15.77	15.82	11.74	-0.26	21.56
HE-N2		1.048	143.4	C.159	1.207	15.87				
NE-N2	50	0.594	144.4	0.090	0.684	8.87	8.93	-0.26	12.32	14.96
NE-N2		0.588	142.5	0.088	0.676	9.00				

TABLE V (Continued)

SYSTEM	TEMP C	P-RDG CM OIL	P-FILL CM HG	P-CORR CM OIL	P-ACT CM OIL	E CC/MOL	E-AVG CC/MOL	B-11	B-22	B-12,
HE-H2	50	0.158	143.9	0.024	0.182	2.38	2.38	15.15	11.74	15.82
HE-H2		0.159	144.1	0.024	0.183	2.38				
NE-H2	50	0.069	145.7	0.015	0.084	1.07	1.08	12.32	15.15	14.81
NE-H2		0.070	145.6	0.015	0.085	1.09				
NE-HE	50	0.035	145.9	0.008	0.043	0.54	0.68	12.32	11.74	12.71
NE-HE		0.046	145.3	0.010	0.056	0.72				
NE-HE		0.053	144.9	0.008	0.061	0.79				
*	*	*	*	*	*	*	*	*		
AR-N2	25	-0.041	145.3	-0.008	-0.049	-0.58	-0.57	-15.75	-4.86	-10.88
AR-N2		-0.039	145.2	-0.008	-0.047	-0.55				
AR-N2		-0.042	145.4	-0.008	-0.050	-0.59				
H2-AR	25	0.622	144.6	0.088	0.710	8.48	8.36	-15.75	14.64	7.80
H2-AR		0.612	144.7	0.087	0.699	8.33				
H2-AR		0.612	145.0	0.087	0.699	8.30				
H2-AR		0.613	144.7	0.086	0.699	8.32				
HE-AR	25	1.475	143.9	0.208	1.683	20.28	20.13	11.73	-15.75	18.12
HE-AR		1.474	144.6	0.208	1.682	20.05				
HE-AR		1.492	145.2	0.210	1.702	20.08				
HE-AR		1.483	145.2	0.210	1.693	20.02				
HE-AR		1.493	145.0	0.212	1.705	20.22				
AR-NE	25	0.949	144.2	0.133	1.082	12.94	13.00	-15.75	11.54	10.89
AR-NE		0.950	144.0	0.132	1.082	12.96				
AR-NE		0.985	146.1	0.140	1.125	13.10				
H2-N2	25	0.594	144.5	0.084	0.678	8.12	8.09	-4.86	14.64	12.98
H2-N2		0.595	144.7	0.084	0.679	8.10				
H2-N2		0.597	145.5	0.085	0.682	8.04				
H2-N2		0.597	145.2	0.085	0.662	8.08				

TABLE V (Continued)

SYSTEM	TEMP C	P-RDG CM OIL	P-FILL CM HG	P-CORR CM OIL	P-ACT CM OIL	E CC/MOL	F-AVG CC/MOL	B-11	B-22	B-12
HE-N2	25	1.297	144.2	0.181	1.478	17.68	17.76	-4.86	11.73	21.19
HE-N2		1.317	144.8	0.184	1.501	17.78				
HE-N2		1.323	145.7	0.188	1.511	17.77				
HE-N2		1.317	145.3	0.187	1.504	17.80				
NE-N2	25	0.705	145.6	0.141	0.846	9.95	9.94	11.54	-4.86	13.28
NE-N2		0.695	144.3	0.138	0.833	9.98				
NE-N2		0.686	144.0	0.136	0.822	9.90				
H2-HE	25	0.219	143.4	0.031	0.250	3.03	2.83	11.73	14.64	16.01
H2-HE		0.193	144.6	0.027	0.220	2.63				
NE-H2	25	0.080	146.8	0.016	0.096	1.11	1.14	11.54	14.64	14.23
NE-H2		0.088	145.1	0.018	0.106	1.25				
NE-H2		0.075	145.3	0.015	0.090	1.06				
NE-HE	25	0.055	145.5	0.011	0.066	0.78	0.76	11.54	11.73	12.39
NE-HE		0.050	144.4	0.010	0.060	0.72				
NE-HE		0.055	144.9	0.011	0.066	0.78				
*	*	*	*	*	*	*	*	*		
AR-N2	0	-0.038	144.5	-0.007	-0.045	-0.49	-0.42	-10.57	-21.45	-16.43
AR-N2		-0.028	145.7	-0.005	-0.033	-0.35				
AR-H2	0	0.710	145.2	0.131	0.841	9.11	9.05	-21.45	13.98	5.31
AR-H2		0.692	145.2	0.127	0.819	8.88				
AR-H2		0.721	145.9	0.133	0.854	9.17				
AR-H2		0.710	145.8	0.131	0.841	9.04				
AR-H2		0.710	145.7	0.130	0.840	9.03				
HE-AR	0	1.701	145.2	0.312	2.013	21.77	21.89	11.76	-21.45	17.05
HE-AR		1.745	146.1	0.321	2.066	22.06				
HE-AR		1.722	145.8	0.316	2.038	21.84				

TABLE V (Continued)

SYSTEM	TEMP C	P-ROG CM OIL	P-FILL CM HG	P-CORR CM OIL	P-ACT CM OIL	E CC/MOL	E-AVG CC/MOL	B-11	B-22	B-12
NE-AR	0	1.103	145.6	0.204	1.307	14.09	14.16	10.94	-21.45	8.91
NE-AR		1.090	144.5	0.199	1.289	14.10				
NE-AR		1.106	144.6	0.203	1.309	14.30				
N2-H2	0	0.690	145.8	0.126	0.816	8.77	8.96	-10.57	13.98	10.66
N2-H2		0.696	144.3	0.126	0.822	9.03				
N2-H2		0.703	144.5	0.127	0.830	9.08				
N2-HE	0	1.540	145.3	0.282	1.822	19.69	19.60	-10.57	11.76	20.19
N2-HE		1.526	145.1	0.279	1.805	19.58				
N2-HE		1.527	145.3	0.279	1.806	19.52				
NE-N2	0	0.868	145.5	0.159	1.027	11.08	11.08	10.94	-10.57	11.27
NE-N2		0.865	145.5	0.158	1.023	11.03				
NE-N2		0.871	145.5	0.160	1.031	11.13				
H2-HE	0	0.280	144.8	0.051	0.331	3.61	3.50	13.98	11.76	16.37
H2-HE		0.265	144.8	0.048	0.313	3.41				
H2-HE		0.275	146.4	0.051	0.326	3.47				
NE-H2	0	0.098	145.7	0.018	0.116	1.25	1.23	10.94	13.98	13.69
NE-H2		0.098	145.8	0.018	0.116	1.25				
NE-H2		0.094	145.2	0.017	0.111	1.20				
NE-HE	0	0.054	145.8	0.010	0.064	0.69	0.76	10.94	11.76	12.11
NE-HE		0.060	146.4	0.011	0.071	0.76				
NE-HE		0.065	145.8	0.012	0.077	0.83				
*	*	*	*	*	*	*	*	*		
AR-N2	-25	-0.060	146.1	-0.010	-0.070	-0.67	-0.65	-28.56	-17.59	-23.73
AR-N2		-0.050	132.7	-0.008	-0.058	-0.67				
AR-N2		-0.053	144.2	-0.009	-0.062	-0.61				
AR-H2	-25	0.885	143.3	0.145	1.030	10.39	10.34	-28.56	13.14	2.03
AR-H2		0.903	145.6	0.151	1.054	10.32				
AR-H2		0.907	145.9	0.152	1.059	10.31				

TABLE V (Continued)

SYSTEM	TEMP C	P-RDG CM OIL	P-FILL CM HG	P-CORR CM OIL	P-ACT CM OIL	E CC/MOL	E-AVG CC/MOL	B-11	B-22	B-12
AR-HE	-25	2.201	145.5	0.368	2.569	25.14	25.19	-28.56	11.84	16.82
AR-HE		2.215	145.8	0.372	2.587	25.22				
AR-HE		2.185	144.6	0.361	2.546	25.17				
N2-HE	-25	1.980	145.0	0.329	2.309	22.77	22.72	-17.59	11.84	19.85
N2-HE		1.982	145.2	0.329	2.311	22.72				
N2-HE		1.950	144.2	0.323	2.273	22.67				
NE-N2	-25	1.110	144.2	0.184	1.294	12.92	12.86	10.14	-17.59	9.13
NE-N2		1.110	144.8	0.185	1.295	12.83				
NE-N2		1.125	145.8	0.188	1.313	12.82				
HE-H2	-25	0.342	144.5	0.057	0.399	3.96	3.94	11.84	13.14	16.43
HE-H2		0.340	144.5	0.056	0.396	3.93				
HE-H2		0.338	144.6	0.056	0.394	3.91				
NE-H2	-25	0.120	144.8	0.020	0.140	1.38	1.39	10.14	13.14	13.03
NE-H2		0.122	145.6	0.020	0.142	1.39				
NE-H2		0.122	145.0	0.020	0.142	1.40				
NE-HE	-25	0.085	144.1	0.014	0.099	0.99	1.01	10.14	11.84	12.00
NE-HE		0.093	144.9	0.015	0.108	1.07				
NE-HE		0.083	144.5	0.014	0.097	0.96				
*	*	*	*	*	*	*	*	*		
NE-N2	-50	1.455	143.5	0.214	1.669	15.10	15.02	9.12	-26.38	6.39
NE-N2		1.470	144.9	0.220	1.690	15.04				
NE-N2		1.470	145.4	0.220	1.690	14.91				
H2-HE	-50	0.398	145.6	0.060	0.458	4.04	4.19	12.10	11.33	16.20
H2-HE		0.420	146.6	0.064	0.484	4.21				
H2-HE		0.427	145.8	0.064	0.491	4.32				
NE-H2	-50	0.160	145.6	0.024	0.184	1.62	1.68	9.12	12.10	12.29
NE-H2		0.180	145.5	0.027	0.207	1.82				
NE-H2		0.158	145.9	0.024	0.182	1.59				

TABLE V (Continued)

SYSTEM	TEMP C	P-RDG CM OIL	P-FILL CM HG	P-CORR CM OIL	P-ACT CM OIL	E CC/MOL	E-AVG CC/MOL	B-11	B-22	B-12
NE-HE	-50	0.113	144.2	0.017	0.130	1.16	1.22	11.93	9.12	11.74
NE-HE		0.125	145.2	0.019	0.144	1.27				
AR-N2	-50	-0.073	146.4	-0.011	-0.084	-0.72	-0.66	-37.42	-26.38	-32.56
AR-N2		-0.066	146.0	-0.010	-0.076	-0.66				
AR-N2		-0.060	145.8	-0.009	-0.069	-0.60				
AR-H2	-50	1.182	144.3	0.175	1.357	12.12	12.18	-37.42	12.10	-0.48
AR-H2		1.191	144.1	0.177	1.368	12.25				
AR-H2		1.205	145.6	0.181	1.386	12.17				
AR-HE	-50	2.800	144.7	0.418	3.218	28.59	28.69	-37.42	11.93	15.94
AR-HE		2.808	144.5	0.418	3.226	28.72				
AR-HE		2.855	145.8	0.430	3.285	28.76				
NE-AR	-50	1.848	145.4	0.275	2.123	18.65	18.60	9.12	-37.42	4.45
NE-AR		1.842	145.9	0.277	2.119	18.52				
NE-AR		1.847	145.6	0.277	2.124	18.64				
N2-H2	-50	1.187	145.6	0.178	1.365	12.03	11.99	-26.38	12.10	4.85
N2-H2		1.203	146.5	0.183	1.336	12.07				
N2-H2		1.185	146.4	0.179	1.364	11.88				
N2-HE	-50	2.580	146.2	0.391	2.971	25.96	25.89	-26.38	11.93	18.67
N2-HE		2.558	145.4	0.386	2.944	26.01				
N2-HE		2.556	146.1	0.386	2.942	25.71				
*	*	*	*	*	*	*	*	*		
NE-N2	-75	2.087	146.0	0.236	2.323	18.05	18.06	7.90	-37.48	3.27
NE-N2		2.090	146.1	0.236	2.326	18.05				
NE-N2		2.095	146.1	0.237	2.332	18.09				
H2-HE	-75	0.565	145.9	0.064	0.629	4.90	5.05	10.79	11.98	16.43
H2-HE		0.580	146.8	0.066	0.646	4.98				
H2-HE		0.603	145.4	0.068	0.671	5.27				

TABLE V (Continued)

SYSTEM	TEMP C	P-RDG CM OIL	P-FILL CM HG	P-CORR CM OIL	P-ACT CM OIL	E CC/MOL	E-AVG CC/MOL	B-11	B-22	B-12
NE-H2	-75	0.227	146.8	0.026	0.253	1.95	1.89	7.90	10.79	11.23
NE-H2		0.213	145.2	0.024	0.237	1.87				
NE-H2		0.214	145.9	0.024	0.238	1.86				
NE-HE	-75	0.178	146.6	0.020	0.198	1.53	1.43	7.90	11.98	11.37
NE-HE		0.153	145.8	0.017	0.170	1.33				
NE-HE		0.165	145.0	0.018	0.183	1.45				
AR-N2	-75	-0.072	143.5	-0.008	-0.080	-0.63	-0.65	-49.13	-37.43	-43.96
AR-N2		-0.070	143.9	-0.008	-0.078	-0.61				
AR-N2		-0.082	144.7	-0.009	-0.091	-0.71				
AR-H2	-75	1.767	147.2	0.201	1.968	15.01	15.01	-49.13	10.79	-4.16
AR-H2		1.777	147.4	0.203	1.980	15.05				
AR-H2		1.700	144.4	0.190	1.890	14.97				
AR-HE	-75	3.850	144.6	0.430	4.280	33.75	33.83	-49.13	11.98	15.26
AR-HE		4.012	147.5	0.458	4.470	33.90				
AR-HE		3.970	146.8	0.451	4.421	33.85				
NE-AR	-75	2.528	145.0	0.284	2.812	22.09	22.07	7.90	-49.13	1.46
NE-AR		2.490	144.3	0.278	2.768	21.95				
NE-AR		2.552	145.4	0.287	2.839	22.17				
N2-H2	-75	1.670	145.7	0.188	1.858	14.49	14.55	-37.48	10.79	1.20
N2-H2		1.702	146.5	0.193	1.895	14.62				
N2-H2		1.682	145.9	0.189	1.871	14.54				
N2-HE	-75	3.542	146.0	0.400	3.942	30.58	30.50	-37.48	11.98	17.75
N2-HE		3.562	145.9	0.402	3.964	30.79				
N2-HE		3.415	144.8	0.382	3.797	29.94				
N2-HE		3.520	145.1	0.394	3.914	30.70				

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SYSTEM	TEMP C	P-RDG CM OIL	P-FILL CM HG	P-CORR CM OIL	P-ACT CM OIL	E CC/MOL	E-AVG CC/MOL	B-11	B-22	B-12
N2-AR	-100	-0.078	145.4	-0.008	-0.086	-0.58	-0.60	-51.56	-55.19	-59.13
N2-AR		-0.087	146.3	-0.009	-0.096	-0.64				
N2-AR		-0.080	145.3	-0.008	-0.088	-0.59				

TABLE V (Continued)

SYSTEM	TEMP C	P-RDG CM OIL	P-FILL CM HG	P-CORR CM OIL	P-ACT CM OIL	E CC/MOL	E-AVG CC/MOL	B-11	B-22	B-12,
AR-H2	-100	2.482	145.4	0.243	2.725	18.54	18.44	9.15	-65.19	-9.58
AR-H2		2.488	146.0	0.245	2.733	18.46				
AR-H2		2.450	145.5	0.240	2.690	18.28				
AR-H2		2.500	146.3	0.247	2.747	18.47				
AR-HE	-100	5.517	146.8	0.548	6.065	40.49	40.51	11.91	-65.19	13.87
AR-HE		5.512	146.3	0.546	6.058	40.72				
AR-HE		5.455	146.1	0.537	5.992	40.31				
AR-HE		5.451	145.8	0.537	5.988	40.51				
NE-AR	-100	3.624	146.1	0.358	3.982	26.85	26.80	6.45	-65.19	-2.57
NE-AR		3.550	144.8	0.347	3.897	26.74				
NE-AR		3.561	144.8	0.348	3.909	26.82				
N2-H2	-100	2.422	146.5	0.240	2.662	17.90	17.96	-51.86	9.15	-3.39
N2-H2		2.428	146.2	0.240	2.668	18.01				
N2-H2		2.412	145.8	0.238	2.650	17.98				
N2-HE	-100	4.960	144.6	0.486	5.446	37.57	37.23	11.91	-51.86	17.25
N2-HE		5.016	146.4	0.497	5.513	37.09				
N2-HE		5.088	147.6	0.508	5.596	37.04				
N2-HE		5.044	146.6	0.501	5.545	37.20				
NE-N2	-100	2.922	144.3	0.285	3.207	22.23	22.17	6.45	-51.86	-0.54
NE-N2		2.935	145.1	0.288	3.223	22.09				
NE-N2		2.936	144.8	0.287	3.223	22.18				
H2-HE	-100	0.752	145.6	0.074	0.826	5.65	5.67	9.15	11.91	16.20
H2-HE		0.758	146.2	0.075	0.833	5.65				
H2-HE		0.756	145.3	0.075	0.831	5.71				
NE-H2	-100	0.296	145.8	0.029	0.319	2.17	2.18	6.45	9.15	9.98
NE-H2		0.290	145.7	0.029	0.319	2.18				
NE-H2		0.293	145.6	0.029	0.322	2.20				
NE-HE	-100	0.224	144.8	0.022	0.246	1.70	1.73	6.45	11.91	10.91
NE-HE		0.228	144.7	0.022	0.250	1.73				
NE-HE		0.232	144.8	0.023	0.255	1.76				

TABLE V (Continued)

SYSTEM	TEMP C	P-RDG CM OIL	P-FILL CM HG	P-CORR CM OIL	P-ACT CM OIL	E CC/MOL	E-AVG CC/MOL	B-11	B-22	B-12
*	*	*	*	*	*	*	*	*		
N2-AR	-125	-0.098	144.9	-0.008	-0.106	-0.61	-0.60	-73.54	-88.43	-81.58
N2-AR		-0.096	145.5	-0.008	-0.104	-0.59				
N2-AR		-0.095	143.9	-0.008	-0.103	-0.60				
AR-H2	-125	3.750	143.8	0.311	4.061	24.06	24.01	-88.43	6.78	-16.32
AR-H2		3.770	144.4	0.314	4.084	24.01				
AR-H2		3.776	144.7	0.315	4.091	23.94				
AR-HE	-125	8.017	145.0	0.672	8.689	50.63	50.54	-88.43	11.75	12.20
AR-HE		7.961	144.6	0.666	8.627	50.56				
AR-HE		7.974	144.9	0.669	8.643	50.43				
NE-AR	-125	5.347	145.2	0.448	5.795	33.66	33.68	4.36	-88.43	-9.36
NE-AR		5.310	144.7	0.444	5.754	33.65				
NE-AR		5.355	145.2	0.449	5.804	33.72				
N2-H2	-125	3.657	145.3	0.306	3.963	23.03	23.06	-73.54	6.78	-10.32
N2-H2		3.673	145.5	0.308	3.981	23.07				
N2-H2		3.657	145.2	0.307	3.964	23.08				
N2-HE	-125	7.358	145.8	0.620	7.978	46.07	46.22	-73.54	11.75	15.32
N2-HE		7.435	146.2	0.628	8.063	46.31				
N2-HE		7.411	146.0	0.625	8.036	46.27				
NE-N2	-125	4.446	145.3	0.372	4.818	28.01	28.05	4.36	-73.54	-6.54
NE-N2		4.448	145.2	0.373	4.821	28.07				
NE-N2		4.463	145.5	0.375	4.838	28.06				
H2-HE	-125	1.051	145.8	0.089	1.140	6.66	6.66	6.78	11.75	15.92
H2-HE		1.057	146.2	0.090	1.147	6.66				
H2-HE		1.057	146.3	0.090	1.147	6.65				
NE-H2	-125	0.415	145.5	0.035	0.450	2.64	2.63	4.36	6.78	3.20
NE-H2		0.416	146.1	0.035	0.451	2.62				
NE-H2		0.417	145.5	0.035	0.452	2.65				

TABLE V (Continued)

SYSTEM	TEMP C	P-RDG CM OIL	P-FILL CM HG	P-CORR CM OIL	P-ACT CM OIL	E CC/MOL	E-AVG CC/MOL	B-11	B-22	B-12
NE-HE	-125	0.347	145.9	0.029	0.376	2.19	2.21	4.36	11.75	10.26
NE-HE		0.345	144.8	0.029	0.374	2.21				
NE-HE		0.350	145.5	0.029	0.379	2.22				
*	*	*	*	*	*	*	*	*		
N2-AR	-150	-0.087	144.7	-0.006	-0.093	-0.43	-0.48	-109.90	-124.10	-117.48
N2-AR		-0.105	145.2	-0.007	-0.112	-0.52				
N2-AR		-0.095	144.8	-0.007	-0.102	-0.47				
H2-AR	-150	6.515	144.5	0.453	6.968	33.71	33.70	2.95	-124.10	-26.87
H2-AR		6.578	145.3	0.459	7.037	33.62				
H2-AR		6.608	145.3	0.460	7.068	33.79				
HE-AR	-150	13.160	145.8	0.927	14.087	67.01	66.97	11.42	-124.10	10.63
HE-AR		13.095	145.5	0.918	14.013	66.83				
HE-AR		13.150	145.6	0.923	14.073	67.08				
AR-NE	-150	8.877	145.4	0.621	9.498	45.31	45.43	-124.10	0.10	-16.57
AR-NE		8.883	145.0	0.620	9.503	45.61				
AR-NE		8.940	145.8	0.627	9.567	45.37				
N2-H2	-150	6.215	145.1	0.429	6.644	31.81	31.83	2.95	-109.90	-21.65
N2-H2		6.170	144.5	0.427	6.597	31.89				
N2-H2		6.360	146.8	0.446	6.806	31.87				
N2-H2		6.237	145.4	0.429	6.666	31.74				
N2-HE	-150	11.405	143.0	0.788	12.193	60.41	60.77	11.42	-109.90	11.53
HE-N2		11.905	145.3	0.828	12.733	60.93				
HE-N2		11.760	144.7	0.820	12.580	60.81				
HE-N2		11.758	144.6	0.820	12.578	60.93				
NE-N2	-150	7.347	144.5	0.510	7.857	38.04	38.04	0.10	-109.90	-16.86
NE-N2		7.335	144.4	0.508	7.843	37.99				
NE-N2		7.315	144.1	0.507	7.822	38.11				

TABLE V (Continued)

SYSTEM	TEMP C	P-RDG CM OIL	P-FILL CM HG	P-CORR CM OIL	P-ACT CM OIL	E CC/MOL	E-AVG CC/MOL	B-11	B-22	B-12
*	*	*	*	*	*	*	*	*		
H2-HE	-15C	1.522	145.0	0.106	1.628	7.98	7.96	2.95	11.42	15.14
H2-HE		1.525	145.2	0.106	1.631	7.98				
H2-HE		1.508	144.8	0.104	1.612	7.92				
NE-H2	-15C	0.615	143.8	0.042	0.657	3.26	3.22	0.10	2.95	4.75
NE-H2		0.612	145.2	0.043	0.655	3.19				
NE-H2		0.613	144.9	0.043	0.656	3.21				
HE-NE	-150	0.560	145.9	0.039	0.599	2.90	2.92	11.42	0.10	8.68
HE-NE		0.561	145.6	0.039	0.600	2.92				
HE-NE		0.560	145.1	0.039	0.599	2.93				
*	*	*	*	*	*	*	*	*		
CO2-NE	-5C	11.821	144.8	1.493	13.314	115.67	115.76	-233.00	9.12	3.82
CO2-NE		11.788	144.3	1.479	13.267	116.03				
CO2-NE		11.870	145.2	1.502	13.372	115.54				
CO2-NE		11.949	145.5	1.517	13.466	115.81				
CO2-N2	-50	5.422	145.1	0.683	6.105	52.54	52.24	-26.38	-233.00	-77.45
CO2-N2		5.332	144.8	0.671	6.003	51.89				
CO2-N2		5.433	145.6	0.685	6.118	52.29				
CO2-H2	-50	10.368	144.9	1.307	11.675	101.29	101.46	12.10	-233.00	-8.99
CO2-H2		10.447	145.1	1.318	11.765	101.78				
CO2-H2		10.370	144.9	1.308	11.678	101.31				
CO2-HE	-50	13.520	144.6	1.698	15.218	132.46	133.02	11.93	-233.00	22.49
CO2-HE		13.695	145.1	1.732	15.427	133.55				
CO2-HE		13.645	145.3	1.723	15.368	132.54				
CO2-HE		13.548	144.3	1.705	15.253	133.53				

TABLE V (Continued)

SYSTEM	TEMP C	P-RDG CM OIL	P-FILL CM HG	P-CORR CM OIL	P-ACT CM OIL	E CC/MOL	E-AVG CC/MOL	B-11	B-22	B-12,
CO2-AR	-50	6.185	144.4	0.777	6.962	60.52	60.43	-233.00	-37.42	-74.78
CO2-AR		6.285	145.5	0.795	7.080	60.61				
CO2-AR		6.203	144.9	0.781	6.984	60.23				
CO2-AR		6.253	145.1	0.790	7.043	60.62				
CO2-AR		6.255	145.5	0.790	7.045	60.19				
*	*	*	*	*	*	*	*	*		
CO2-N2	-25	3.461	144.9	0.486	3.947	38.31	38.12	-17.59	-178.00	-59.68
CO2-N2		3.435	144.8	0.483	3.918	38.09				
CO2-N2		3.468	145.5	0.489	3.957	38.09				
CO2-N2		3.416	144.7	0.480	3.896	37.97				
CO2-AR	-25	4.031	144.3	0.564	4.595	44.93	44.96	-28.56	-178.00	-58.32
CO2-AR		4.077	145.1	0.574	4.651	45.04				
CO2-AR		4.090	145.4	0.576	4.666	44.92				
CO2-HE	-25	9.635	145.1	1.357	10.992	106.69	106.65	-176.00	11.84	23.57
CO2-HE		9.493	144.1	1.328	10.821	106.66				
CO2-HE		9.643	145.3	1.362	11.005	106.59				
CO2-H2	-25	7.056	144.6	0.989	8.045	78.76	78.82	13.14	-178.00	-3.61
CO2-H2		7.089	144.8	0.996	8.085	78.88				
CO2-NE	-25	8.260	144.6	1.157	9.417	92.03	91.95	10.14	-178.00	8.02
CO2-NE		8.279	145.1	1.163	9.442	91.70				
CO2-NE		8.235	144.4	1.153	9.388	92.11				

TABLE V (Continued)

SYSTEM	TEMP C	P-RDG CM OIL	P-FILL CM HG	P-CORR CM OIL	P-ACT CM OIL	E CC/MOL	E-AVG CC/MOL	B-11	B-22	B-12
KR-HE	50	2.477	147.6	0.468	2.945	36.40	36.52	-42.80	11.74	20.99
KR-HE		2.483	147.1	0.466	2.949	36.65				
KR-HE		2.487	148.0	0.483	2.970	36.62				
KR-HE		2.500	149.1	0.483	2.986	36.28				
KR-HE		2.505	148.4	0.486	2.991	36.62				
KR-H2	50	1.367	149.4	0.267	1.634	19.76	19.84	-42.80	15.15	6.01
KR-H2		1.378	149.4	0.269	1.647	19.91				
KR-AR	50	0.233	146.1	0.044	0.277	3.49	3.59	-42.80	-11.23	-23.43
KR-AR		0.253	146.8	0.048	0.301	3.75				
KR-AR		0.240	148.6	0.047	0.287	3.49				
KR-AR		0.247	148.2	0.048	0.295	3.62				
KR-N2	50	0.305	148.0	0.059	0.364	4.47	4.45	-42.80	-0.26	-17.08
KR-N2		0.303	148.5	0.059	0.362	4.42				
KR-NE	50	1.853	147.5	0.349	2.202	27.24	27.37	-42.80	12.32	12.13
KR-NE		1.868	147.4	0.351	2.219	27.48				
KR-NE		1.855	147.7	0.359	2.214	27.38				
KR-NE		1.855	147.7	0.359	2.214	27.39				
XE-HE	50	5.522	150.1	1.077	6.599	78.61	78.52	-111.22	11.74	28.78
XE-HE		5.468	149.4	1.058	6.526	78.43				
XE-H2	50	3.707	149.1	0.724	4.431	53.70	53.80	-111.22	15.15	5.76
XE-H2		3.690	148.4	0.717	4.407	53.89				

TABLE V (Continued)

SYSTEM	TEMP C	P-RDG CM OIL	P-FILL CM HG	P-CORR CM OIL	P-ACT CM OIL	E CC/MOL	E-AVG CC/MOL	3-11	9-22	8-12,
XE-AR	50	1.687	149.1	0.330	2.017	24.43	24.48	-111.22	-11.23	-36.74
XE-AR		1.705	149.5	0.333	2.038	24.54				
XE-N2	50	1.970	149.0	0.384	2.354	28.54	28.59	-111.22	-0.26	-27.15
XE-N2		1.985	149.3	0.388	2.373	28.65				
XE-NE	50	4.515	149.1	0.879	5.394	65.27	65.19	-111.22	12.32	15.74
XE-NE		4.552	149.8	0.889	5.441	65.11				
XE-KR	50	0.672	150.0	0.131	0.803	9.62	9.45	-111.22	-42.30	-67.56
XE-KR		0.648	150.0	0.127	0.775	9.28				
*	*	*	*	*	*	*	*	*		
C3H8-N2	25	10.765	149.0	1.932	12.697	137.62	137.64	-388.00	-4.86	-58.79
C3H8-N2		10.770	149.1	1.936	12.706	137.66				
C3H8-NE	25	13.465	132.8	2.155	15.620	214.19	214.31	-388.00	11.54	26.08
C3H8-NE		13.482	132.8	2.158	15.640	214.43				
C3H8-HE	25	14.577	132.3	2.329	16.906	234.02	234.37	-388.00	11.73	46.23
C3H8-HE		14.638	132.3	2.333	16.971	234.65				
C3H8-HE		14.613	132.3	2.334	16.947	234.44				
C3H8-H2	25	15.015	149.3	2.699	17.714	191.64	191.80	-388.00	14.64	5.12
C3H8-H2		15.035	149.2	2.703	17.738	191.97				
C3H8-AR	25	10.332	149.2	1.856	12.188	131.61	131.69	-388.00	-15.75	-70.18
C3H8-AR		10.340	149.3	1.862	12.202	131.78				
F22 -HE	25	12.442	129.7	1.942	14.384	207.49	207.62	-359.00	11.73	33.99
F22 -HE		12.467	129.8	1.949	14.416	207.76				
F22 -H2	25	13.478	149.1	2.421	15.899	172.92	172.96	-359.00	14.64	0.78
F22 -H2		13.502	149.2	2.425	15.927	172.99				

TABLE V (Continued)

SYSTEM	TEMP C	P-ROG CM OIL	P-FILL CM HG	P-CORR CM OIL	P-ACT CM OIL	F CC/MOL	F-AVG CC/MOL	B-11	B-22	B-12
F22 -AR	25	9.627	149.3	1.734	11.361	123.01	123.13	-359.00	-15.75	-64.24
F22 -AR		9.626	149.1	1.729	11.355	123.25				
F22 -N2	25	9.457	149.1	1.699	11.156	121.05	121.08	-359.00	-4.36	-60.85
F22 -N2		9.472	149.3	1.703	11.175	121.11				
F22 -NE	25	14.235	145.9	2.500	16.735	189.93	189.93	-359.00	11.54	16.20
F22 -NE		14.104	145.3	2.469	16.573	189.93				

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SYSTEM	TEMP C	P-ROG CM OIL	P-FILL CM HG	P-CORR CM OIL	P-ACT CM OIL	F CC/MOL	F-AVG CC/MOL	B-11	B-22	B-12
KR-HE	0	3.740	150.1	0.609	4.349	43.96	43.92	-62.96	11.76	18.32
KR-HE		3.737	150.1	0.608	4.345	43.89				
KR-H2	0	2.149	149.0	0.354	2.503	25.68	25.67	-62.96	13.98	1.18
KR-H2		2.155	149.3	0.356	2.511	25.66				
KR-AR	0	0.424	147.4	0.068	0.492	5.14	4.96	-62.96	-21.45	-37.24
KR-AR		0.396	147.5	0.063	0.459	4.79				
KR-N2	0	0.523	149.4	0.086	0.609	6.19	6.05	-62.96	-10.57	-30.71
KR-N2		0.501	149.6	0.083	0.584	5.92				
KR-NE	0	2.903	149.8	0.471	3.374	34.23	34.25	-62.96	10.94	8.24
KR-NE		2.920	150.2	0.475	3.395	34.27				
KR-CO	0	0.334	149.3	0.055	0.389	3.96	3.92	-62.96	-14.19	-34.65
KR-CO		0.327	149.3	0.054	0.381	3.88				
KR-CH4	0	0.012	149.3	0.002	0.014	0.14	0.16	-62.96	-53.35	-58.00
KR-CH4		0.015	149.2	0.002	0.017	0.18				
KR-CO2	0	2.078	149.2	0.343	2.421	24.40	24.24	-62.96	-150.00	-82.24
KR-CO2		2.070	149.8	0.342	2.412	24.09				

TABLE V (Continued)

SYSTEM	TEMP C	P-RCG CM OIL	P-FILL CM HG	P-CORR CM OIL	P-ACT CM OIL	E CC/MOL	E-AVG CC/MOL	B-11	B-22	B-12,
XE-HE	0	8.270	148.5	1.331	9.601	98.33	98.11	-154.26	11.76	26.86
XE-HE		8.235	148.4	1.320	9.555	97.89				
XE-H2	0	5.848	148.8	0.962	6.810	69.59	69.57	-154.26	13.98	-0.57
XE-H2		5.835	148.7	0.961	6.796	69.55				
XE-AR	0	2.663	148.3	0.428	3.091	31.70	31.64	-154.26	-21.45	-56.22
XE-AR		2.652	148.1	0.425	3.077	31.58				
XE-N2	0	3.128	148.7	0.512	3.640	37.05	37.06	-154.26	-10.57	-45.36
XE-N2		3.154	149.5	0.521	3.675	37.07				
XE-NE	0	7.077	150.0	1.150	8.227	82.51	82.52	-154.26	10.94	10.86
XE-NE		7.067	149.8	1.142	8.209	82.52				
XE-KR	0	1.196	149.1	0.193	1.389	14.02	13.90	-154.26	-62.96	-94.71
XE-KR		1.176	149.1	0.189	1.365	13.78				
XE-CO	0	2.690	149.2	0.442	3.132	31.66	31.74	-154.26	-14.19	-52.49
XE-CO		2.702	149.3	0.445	3.147	31.82				
XE-CH4	0	1.110	149.3	0.182	1.292	12.99	13.11	-154.26	-53.35	-90.69
XE-CH4		1.130	149.4	0.186	1.316	13.24				
XE-CO2	0	2.346	149.2	0.385	2.731	27.25	27.40	-154.26	-150.09	-124.73
XE-CO2		2.371	149.1	0.389	2.760	27.56				
CO-HE	0	1.892	149.1	0.311	2.203	22.66	22.75	11.76	-14.19	21.53
CO-HE		1.906	149.2	0.314	2.222	22.83				
CO-H2	0	0.844	149.1	0.139	0.983	10.13	10.24	13.98	-14.19	10.13
CO-H2		0.862	149.1	0.143	1.005	10.35				
CO-AR	0	-0.057	149.2	-0.009	-0.066	-0.68	-0.66	-21.45	-14.19	-18.48
CO-AR		-0.055	149.2	-0.009	-0.064	-0.65				

TABLE V (Continued)

SYSTEM	TEMP C	P-RDG CM OIL	P-FILL CM HG	P-CURR CM OIL	P-ACT CM OIL	E CC/MOL	E-AVG CC/MOL	B-11	B-22	B-12
CO-N2	0	0.029	149.3	0.005	0.034	0.35	0.42	-10.57	-14.19	-11.96
CO-N2		0.042	148.9	0.007	0.049	0.50				
CO-NE	0	1.148	149.5	0.190	1.338	13.72	13.86	10.94	-14.19	12.23
CO-NE		1.168	149.2	0.193	1.361	14.00				
CO-CH4	0	0.315	149.2	0.052	0.367	3.73	3.84	-14.19	-53.35	-29.93
CO-CH4		0.333	149.4	0.055	0.388	3.95				
CO-CO2	0	1.985	149.1	0.327	2.312	23.44	23.65	-14.19	-150.00	-58.44
CO-CO2		2.006	149.0	0.330	2.336	23.73				
CO-CO2		2.013	149.1	0.332	2.345	23.78				
CH4-HE	0	3.709	149.1	0.608	4.317	44.15	44.11	-53.35	11.76	23.31
CH4-HE		3.704	149.2	0.608	4.312	44.06				
CH4-H2	0	1.984	149.3	0.327	2.311	23.65	23.70	13.98	-53.35	4.02
CH4-H2		1.990	149.2	0.328	2.318	23.76				
CH4-AR	0	0.410	149.2	0.068	0.478	4.88	4.85	-21.45	-53.35	-32.55
CH4-AR		0.407	149.3	0.067	0.474	4.83				
CH4-N2	0	0.523	149.2	0.086	0.609	6.21	6.24	-10.57	-53.35	-25.72
CH4-N2		0.527	149.3	0.087	0.614	6.26				
CH4-NE	0	2.830	149.6	0.468	3.298	33.60	33.62	10.94	-53.35	12.42
CH4-NE		2.822	149.2	0.456	3.288	33.64				
CO2-HE	0	7.522	149.3	1.236	8.758	88.75	88.82	11.76	-150.00	19.70
CO2-HE		7.543	149.4	1.243	8.786	88.89				
CO2-H2	0	5.412	149.5	0.890	6.302	63.71	63.75	13.98	-150.00	-4.26
CO2-H2		5.413	149.5	0.892	6.305	63.79				
CO2-AR	0	2.967	149.0	0.488	3.455	35.06	35.11	-21.45	-150.00	-50.62
CO2-AR		3.005	149.8	0.496	3.501	35.16				

TABLE V (Continued)

SYSTEM	TEMP C	P-RCG CM OIL	P-FILL CM HG	P-CORR CM OIL	P-ACT CM OIL	E CC/MOL	E-AVG CC/MOL	B-11	B-22	B-12,
CO2-N2	0	2.500	149.3	0.412	2.912	29.43	29.41	-10.57	-150.00	-50.88
CO2-N2		2.492	149.3	0.411	2.903	29.38				
CO2-NE	0	6.406	149.2	1.055	7.461	75.76	75.78	10.94	-150.00	6.25
CO2-NE		6.380	148.9	1.050	7.430	75.80				
CO2-CH4	0	1.997	146.9	0.324	2.321	24.14	24.13	-53.35	-150.00	-77.55
CO2-CH4		1.996	146.9	0.324	2.320	24.12				
C3H8-HE	0	6.463	75.5	0.537	7.000	273.69	274.00	-468.00	11.76	45.88
C3H8-HE		6.485	75.6	0.542	7.027	274.32				
C3H8-H2	0	11.838	113.5	1.479	13.317	228.10	228.31	-468.00	13.98	1.30
C3H8-H2		11.844	113.5	1.482	13.326	228.52				
C3H8-AR	0	14.177	149.2	2.325	16.502	161.27	161.47	-468.00	-21.45	-83.26
C3H8-AR		14.185	149.1	2.327	16.512	161.66				
C3H8-N2	0	14.763	149.3	2.422	17.185	167.70	167.80	-468.00	-10.57	-71.49
C3H8-N2		14.764	149.3	2.425	17.189	167.89				
C3H8-NE	0	9.213	94.6	0.960	10.173	252.58	252.77	-468.00	10.94	24.24
C3H8-NE		9.238	94.5	0.963	10.201	253.37				
C3H8-NE		9.217	94.6	0.961	10.178	252.35				
F22 -HE	0	10.301	99.7	1.130	11.431	255.48	255.32	-437.00	11.76	42.70
F22 -HE		10.298	99.7	1.130	11.428	255.16				
F22 -H2	0	8.678	99.5	0.952	9.630	216.19	216.48	-437.00	13.98	4.97
F22 -H2		8.687	99.4	0.952	9.639	216.77				
F22 -AR	0	13.953	149.0	2.287	16.240	159.35	159.55	-437.00	-21.45	-69.67
F22 -AR		13.940	148.8	2.277	16.217	159.75				
F22 -N2	0	13.737	149.2	2.256	15.993	156.98	156.97	-437.00	-10.57	-66.82
F22 -N2		13.731	149.1	2.249	15.980	156.97				
F22 -N2		13.752	149.2	2.253	16.005	156.95				

TABLE V (Continued)

SYSTEM	TEMP C	P-RDG CM OIL	P-FILL CM HG	P-CORR CM OIL	P-ACT CM OIL	B CC/MOL	B-AVG CC/MOL	B-11	B-22	B-12
F22 -NE	0	9.408	99.5	1.034	10.442	234.45	234.59	-437.00	10.94	21.55
F22 -NE		9.409	99.4	1.033	10.442	234.70				
O2-HE	0	1.760	149.3	0.290	2.050	21.00	21.02	-22.00	11.76	15.90
O2-HE		1.763	149.3	0.291	2.054	21.03				
*	*	*	*	*	*	*	*	*		
CO2-HE	-25	9.847	147.2	1.452	11.299	106.65	106.79	-178.00	11.84	23.71
CO2-HE		9.868	147.3	1.460	11.328	106.84				
CO2-HE		9.872	147.2	1.458	11.330	106.90				
CO2-H2	-25	7.510	149.9	1.128	8.638	78.55	78.64	-178.00	13.14	-3.75
CO2-H2		7.512	149.8	1.129	8.641	78.69				
CO2-H2		7.548	149.9	1.130	8.678	78.88				
CO2-H2		7.580	150.6	1.143	8.723	78.59				
CO2-AR	-25	4.279	148.9	0.639	4.918	45.17	44.93	-28.56	-178.00	-58.35
CO2-AR		4.293	149.1	0.639	4.932	45.10				
CO2-AR		4.218	148.6	0.627	4.845	44.69				
CO2-AR		4.218	148.5	0.628	4.846	44.78				
CO2-[illegible]2	-25	3.532	147.9	0.524	4.056	37.83	38.05	-178.00	-17.59	-59.75
CO2-N2		3.532	147.8	0.524	4.056	37.83				
CO2-N2		3.579	147.9	0.531	4.110	38.29				
CO2-N2		3.580	148.0	0.532	4.112	38.24				
CO2-NE	-25	8.502	147.3	1.253	9.755	91.78	91.78	10.14	-178.00	7.85
CO2-NE		8.440	147.0	1.244	9.684	91.69				
CO2-NE		8.510	147.4	1.256	9.766	91.85				
CO2-NE		8.574	148.2	1.276	9.850	91.79				
C3H8-HE	-25	8.840	75.6	0.672	9.512	334.73	335.02	-579.00	11.84	51.44
C3H8-HE		8.880	75.8	0.676	9.556	335.31				

TABLE V (Continued)

SYSTEM	TEMP C	P-ROG CM OIL	P-FILL CM HG	P-CORR CM OIL	P-ACT CM OIL	E CC/MOL	E-AVG CC/MOL	B-11	B-22	B-12
C3H8-H2	-25	12.895	99.5	1.283	14.178	284.38	285.27	-579.00	13.14	2.34
C3H8-H2		12.920	99.5	1.285	14.205	285.79				
C3H8-H2		12.883	99.4	1.281	14.164	285.14				
C3H8-AR	-25	10.182	104.4	1.063	11.245	204.57	205.02	-579.00	-28.56	-98.76
C3H8-AR		10.203	104.3	1.065	11.268	205.58				
C3H8-AR		10.192	104.4	1.064	11.256	204.91				
C3H8-N2	-25	10.598	104.5	1.107	11.705	212.34	212.56	-579.00	-17.59	-85.74
C3H8-N2		10.606	104.5	1.107	11.713	212.78				
C3H8-NE	-25	12.657	94.1	1.191	13.848	312.08	312.50	-579.00	10.14	28.07
C3H8-NE		12.690	94.1	1.195	13.885	312.99				
C3H8-NE		12.657	94.1	1.195	13.852	312.43				
F22 -HE	-25	15.875	99.7	1.588	17.463	351.18	351.76	-545.00	11.84	85.18
F22 -HE		15.928	99.6	1.591	17.519	352.24				
F22 -HE		15.885	99.6	1.590	17.475	351.86				
F22 -H2	-25	13.868	99.5	1.384	15.252	307.77	308.25	-545.00	13.14	42.32
F22 -H2		13.918	99.5	1.386	15.304	308.66				
F22 -H2		13.883	99.5	1.386	15.269	308.32				
F22 -AR	-25	11.763	103.3	1.220	12.983	242.10	242.28	-545.00	-28.56	-44.49
F22 -AR		11.802	103.4	1.223	13.025	242.47				
F22 -N2	-25	11.904	104.7	1.245	13.149	238.55	238.72	-545.00	-17.59	-42.57
F22 -N2		11.843	104.4	1.239	13.082	238.90				
F22 -NE	-25	14.718	99.1	1.462	16.180	329.18	329.15	-545.00	10.14	61.72
F22 -NE		14.675	98.9	1.457	16.132	329.12				
*	*	*	*	*	*	*	*	*		
KR-HE	-50	6.360	148.9	0.839	7.199	60.11	60.21	-94.95	11.93	18.70
KR-HE		6.320	148.2	0.829	7.149	60.30				

TABLE V (Continued)

SYSTEM	TEMP C	P-RDG CM OIL	P-FILL CM HG	P-CORR CM OIL	P-ACT CM OIL	E CC/MOL	E-AVG CC/MOL	B-11	B-22	B-12
KR-H2	-50	3.523	145.0	0.452	3.975	35.03	34.99	-94.95	12.10	-6.44
KR-H2		3.645	148.1	0.487	4.132	34.90				
KR-H2		3.660	148.0	0.487	4.147	35.04				
KR-AR	-50	0.698	148.5	0.092	0.790	6.60	6.58	-94.95	-37.42	-59.60
KR-AR		0.688	147.8	0.090	0.778	6.57				
KR-N2	-50	0.848	148.3	0.110	0.958	8.00	7.99	-94.95	-26.38	-52.68
KR-N2		0.846	148.7	0.111	0.957	7.97				
KR-NE	-50	4.836	149.3	0.639	5.475	45.48	45.36	-94.95	9.12	2.45
KR-NE		4.827	149.4	0.636	5.463	45.25				
KR-CO	-50	0.615	149.2	0.083	0.698	5.77	5.81	-94.95	-30.51	-56.92
KR-CO		0.623	149.1	0.083	0.706	5.85				
KR-CH4	-50	0.030	149.3	0.004	0.034	0.28	0.34	-94.95	-83.58	-88.92
KR-CH4		0.044	149.3	0.006	0.050	0.41				
KR-CO2	-50	4.759	149.2	0.637	5.396	43.58	43.71	-94.95	-233.00	-120.27
KR-CO2		4.801	149.3	0.643	5.444	43.92				
KR-CO2		4.770	149.2	0.636	5.406	43.62				
XE-HE	-50	9.435	120.0	1.001	10.436	132.74	132.83	-226.73	11.93	25.43
XE-HE		9.566	120.6	1.018	10.584	132.93				
XE-H2	-50	9.885	145.4	1.268	11.153	96.16	96.14	-226.73	12.10	-11.18
XE-H2		9.855	145.1	1.259	11.114	96.11				
XE-AR	-50	4.880	148.1	0.636	5.516	45.55	45.57	-226.73	-37.42	-86.50
XE-AR		4.870	147.7	0.631	5.501	45.60				
XE-N2	-50	5.559	147.6	0.722	6.281	52.23	52.19	-226.73	-26.38	-74.38
XE-N2		5.570	147.3	0.721	6.291	52.15				
XE-NE	-50	12.343	149.5	1.627	13.970	113.70	113.61	-226.73	9.12	4.80
XE-NE		12.337	149.6	1.625	13.963	113.51				

TABLE V (Continued)

SYSTEM	TEMP C	P-RDG CM OIL	P-FILL CM HG	P-CURR CM OIL	P-ACT CM OIL	E CC/MOL	E-AVG CC/MOL	B-11	B-22	B-12.
XE-KR	-50	1.957	150.0	0.257	2.214	17.67	17.74	-226.73	-94.95	-143.10
XE-KR		1.978	150.0	0.258	2.236	17.81				
XE-CH4	-50	2.081	149.0	0.275	2.356	19.02	19.17	-226.73	-83.58	-135.98
XE-CH4		2.109	149.1	0.281	2.390	19.32				
XE-CO2	-50	4.967	148.9	0.652	5.619	44.70	44.79	-226.73	-233.00	-185.98
XE-CO2		4.983	149.1	0.659	5.647	44.87				
CO-HE	-50	3.137	149.1	0.423	3.560	29.87	29.91	-30.51	11.93	20.62
CO-HE		3.153	149.3	0.425	3.578	29.96				
CO-AR	-50	-0.058	149.2	-0.008	-0.066	-0.54	-0.49	-30.51	-37.42	-34.45
CO-AR		-0.046	149.2	-0.006	-0.052	-0.43				
CO-NE	-50	1.938	149.2	0.261	2.199	18.43	18.52	-30.51	9.12	7.83
CO-NE		1.959	149.2	0.263	2.222	18.62				
CO-CO2	-50	4.635	149.2	0.618	5.253	42.67	42.77	-30.51	-233.00	-88.98
CO-CO2		4.675	149.3	0.620	5.295	42.87				
CO-CO2		4.643	149.3	0.621	5.264	42.77				
CH4-HE	-50	6.111	149.1	0.822	6.933	57.80	57.86	-83.58	11.93	22.04
CH4-HE		6.137	149.2	0.824	6.961	57.92				
CH4-AR	-50	0.703	149.2	0.094	0.797	6.62	6.70	-83.58	-37.42	-53.80
CH4-AR		0.720	149.2	0.097	0.817	6.78				
CH4-NE	-50	4.692	149.2	0.630	5.322	44.30	44.41	-83.58	9.12	7.18
CH4-NE		4.713	149.3	0.635	5.348	44.52				
CO2-HE	-50	14.430	149.3	1.939	16.369	133.68	133.57	-233.00	11.93	23.04
CO2-HE		14.395	149.3	1.939	16.334	133.46				
CO2-AR	-50	6.623	149.1	0.880	7.503	60.94	61.01	-233.00	-37.42	-74.20
CO2-AR		6.640	149.2	0.886	7.526	61.09				

TABLE V (Continued)

SYSTEM	TEMP C	P-RDG CM OIL	P-FILL CM HG	P-CORR CM OIL	P-ACT CM OIL	E CC/MOL	E-AVG CC/MOL	B-11	B-22	B-12
CO2-NE	-50	12.535	149.2	1.669	14.204	115.76	115.92	-233.00	9.12	3.98
CO2-NE		12.564	149.3	1.682	14.246	116.08				
*	*	*	*	*	*	*	*	*		
KR-HE	-75	8.520	148.0	1.009	9.529	71.22	71.25	-119.17	11.98	17.66
KR-HE		8.560	148.2	1.013	9.573	71.28				
KR-H2	-75	5.096	148.7	0.606	5.702	42.25	42.19	-119.17	10.79	-12.00
KR-H2		5.089	148.8	0.606	5.695	42.12				
KR-AR	-75	0.997	147.8	0.117	1.114	8.29	8.25	-119.17	-49.13	-75.90
KR-AR		0.983	147.4	0.115	1.098	8.21				
KR-N2	-75	1.280	149.8	0.152	1.432	10.36	10.40	-119.17	-37.48	-67.92
KR-N2		1.288	149.8	0.154	1.442	10.45				
KR-NE	-75	6.615	149.3	0.790	7.405	54.35	54.42	-119.17	7.90	-1.22
KR-NE		6.695	150.0	0.803	7.498	54.49				
XE-HE	-75	13.091	119.6	1.249	14.340	161.22	161.48	-283.95	11.98	25.50
XE-HE		13.130	119.7	1.250	14.380	161.41				
XE-HE		13.202	119.9	1.261	14.463	161.81				
XE-HE	-75	19.255	145.5	2.222	21.477	161.93	161.93	-283.95	11.98	25.94
XE-HE		13.130	119.7	1.250	14.380	161.41				
XE-H2	-75	10.635	125.7	1.068	11.703	119.08	119.06	-283.95	10.79	-17.52
XE-H2		10.658	125.8	1.068	11.726	119.03				
XE-AR	-75	7.268	147.9	0.852	8.120	58.81	58.52	-283.95	-49.13	-108.02
XE-AR		7.340	149.7	0.871	8.211	58.03				
XE-AR		7.278	148.6	0.857	8.135	58.36				
XE-AR		7.303	148.3	0.856	8.159	58.67				
XE-AR		7.492	150.1	0.887	8.379	58.74				

TABLE V (Continued)

SYSTEM	TEMP C	P-RDG CM OIL	P-FILL CM HG	P-COR CM OIL	P-ACT CM OIL	E CC/MOL	E-AVG CC/MOL	B-11	B-22	B-12
XE-NE	-75	13.028	128.9	1.336	14.364	138.67	138.58	-233.95	7.90	0.56
XE-NE		13.091	129.2	1.342	14.433	138.49				
XE-KR	-75	3.130	151.2	0.372	3.502	24.00	23.95	-233.95	-119.17	-177.61
XE-KR		3.118	151.3	0.372	3.490	23.91				
*	*	*	*	*	*	*	*	*		
KR-HE	-100	12.035	147.4	1.240	13.275	86.74	86.82	-153.40	11.91	16.07
KR-HE		12.130	147.9	1.255	13.385	86.39				
KR-H2	-100	7.478	148.7	0.774	8.252	52.94	52.97	-153.40	9.15	-19.15
KR-H2		7.535	149.3	0.784	8.319	53.01				
KR-AR	-100	1.500	149.4	0.155	1.655	10.40	10.45	-153.40	-65.19	-98.85
KR-AR		1.517	149.6	0.157	1.674	10.50				
KR-N2	-100	1.948	149.6	0.201	2.149	13.47	13.49	-153.40	-51.86	-89.14
KR-N2		1.938	149.1	0.200	2.138	13.51				
KR-NE	-100	9.230	146.7	0.945	10.175	67.13	67.18	-153.40	6.45	-6.29
KR-NE		9.403	147.9	0.963	10.371	67.24				
KR-XE	-100	1.350	79.6	0.074	1.424	31.28	31.32	-368.32	-153.40	-229.54
KR-XE		1.363	80.0	0.076	1.439	31.35				
KR-CO	-100	1.485	148.9	0.153	1.638	10.36	10.39	-153.40	-59.89	-96.26
KR-CO		1.492	148.9	0.154	1.646	10.41				
KR-CH4	-100	0.104	149.0	0.011	0.115	0.72	0.74	-153.40	-138.69	-145.31
KR-CH4		0.109	149.6	0.011	0.120	0.75				
XE-HE	-100	8.806	80.6	0.495	9.301	201.23	201.45	-368.32	11.91	23.24
XE-HE		8.905	81.0	0.503	9.408	201.61				

TABLE V (Continued)

SYSTEM	TEMP C	P-REG CM OIL	P-FILL CM HG	P-CORR CM OIL	P-ACT CM OIL	E CC/MOL	E-AVG CC/MOL	B-11	B-22	B-12
XE-H2	-100	6.043	77.3	0.325	6.368	149.79	150.07	-368.32	9.15	-29.52
XE-H2		6.039	77.1	0.324	6.363	150.34				
XE-AR	-100	3.232	80.1	0.182	3.464	75.45	75.52	-368.32	-65.19	-141.24
XE-AR		3.312	80.4	0.184	3.496	75.59				
XE-N2	-100	3.214	75.0	0.168	3.382	84.36	84.66	-368.32	-51.36	-125.43
XE-N2		3.215	74.8	0.168	3.383	84.96				
XE-NE	-100	7.727	81.1	0.438	8.165	174.42	174.32	-368.32	5.45	-6.62
XE-NE		7.858	81.8	0.447	8.305	174.22				
XE-CO	-100	3.177	79.1	0.174	3.351	74.99	75.41	-368.32	-59.89	-138.70
XE-CO		3.250	79.6	0.180	3.430	75.81				
XE-CO		3.235	79.5	0.177	3.412	75.42				
XE-CH4	-100	1.452	79.7	0.080	1.532	33.80	33.74	-368.32	-138.69	-219.77
XE-CH4		1.445	79.6	0.079	1.524	33.67				
CO-HE	-100	5.953	149.3	0.619	6.572	42.38	42.40	-59.89	11.91	18.41
CO-HE		5.937	149.1	0.618	6.555	42.42				
CO-AR	-100	-0.038	149.3	-0.004	-0.042	-0.26	-0.22	-59.89	-65.19	-62.76
CO-AR		-0.025	149.3	-0.003	-0.028	-0.17				
CO-NE	-100	3.787	149.2	0.396	4.183	27.10	27.14	-59.89	6.45	0.42
CO-NE		3.810	149.5	0.400	4.210	27.18				
CH4-HE	-100	11.737	148.9	1.222	12.959	83.27	83.22	-138.69	11.91	19.83
CH4-HE		11.708	148.9	1.221	12.929	83.16				
CH4-AR	-100	1.577	148.8	0.163	1.740	11.08	11.05	-138.69	-65.19	-93.89
CH4-AR		1.567	148.8	0.161	1.728	11.01				
CH4-NE	-100	9.198	149.2	0.960	10.158	65.10	65.05	-138.69	6.45	-1.07
CH4-NE		9.183	149.1	0.957	10.140	65.00				

TABLE V (Continued)

SYSTEM	TEMP C	P-ADS CM OIL	P-FILL CM HG	P-CORR CM OIL	P-ACT CM OIL	B CC/MOL	B-AVG CC/MOL	B-11	B-22	B-12
*	*	*	*	*	*	*	*	*		
KR-HE	-125	19.575	151.4	1.763	21.338	111.21	111.75	11.75	-204.16	15.53
KR-HE		19.495	151.1	1.759	21.257	111.31				
KR-HE		19.450	150.4	1.747	21.197	112.31				
KR-HE		19.365	150.1	1.736	21.101	112.16				
KR-H2	-125	11.774	147.4	1.032	12.836	70.50	70.56	-204.18	6.78	-28.14
KR-H2		11.761	147.2	1.031	12.792	70.61				
KR-AR	-125	2.517	148.0	0.219	2.736	14.96	15.03	-204.18	-88.43	-131.27
KR-AR		2.660	151.5	0.237	2.897	15.10				
KR-N2	-125	3.250	147.9	0.283	3.533	19.27	19.28	-204.18	-73.54	-119.58
KR-N2		3.267	148.2	0.284	3.551	19.28				
KR-NE	-125	15.100	149.9	1.343	16.448	87.38	87.42	-204.16	4.36	-12.49
KR-NE		15.345	151.2	1.384	16.729	87.47				
KR-CO	-125	0.860	88.3	0.045	0.905	14.18	14.16	-204.18	-84.45	-130.16
KR-CO		0.858	88.3	0.045	0.903	14.14				
KR-CH4	-125	0.050	79.5	0.002	0.052	1.18	1.16	-204.18	-165.37	-193.86
KR-CH4		0.049	79.9	0.002	0.050	1.14				
CO-HE	-125	8.837	149.2	0.789	9.626	53.02	52.99	-84.46	11.75	16.64
CO-HE		8.855	149.3	0.786	9.641	52.96				
CO-AR	-125	0.010	149.1	0.001	0.011	0.07	0.07	-84.46	-88.43	-86.38
CO-AR		0.010	149.2	0.001	0.011	0.07				
CO-NE	-125	5.736	149.3	0.512	6.248	34.43	34.41	-84.46	4.36	-5.64
CO-NE		5.766	149.7	0.515	6.281	34.40				
CH4-HE	-125	9.053	105.4	0.573	9.626	105.16	105.12	-135.87	11.75	18.96
CH4-HE		9.055	105.4	0.570	9.625	105.07				

TABLE V (Concluded)

SYSTEM	TEMP C	P-RDG CM OIL	P-FILL CM HG	P-CORR CM OIL	P-ACT CM OIL	E CC/MOL	E-AVG CC/MOL	B-11	B-22	B-12
CH4-AR	-125	2.436	149.1	0.213	2.649	14.06	14.10	-195.87	-88.43	-123.05
CH4-AR		2.455	149.2	0.215	2.670	14.14				
CH4-NE	-125	8.084	112.1	0.537	8.621	82.91	82.93	-195.87	4.36	-7.32
CH4-NE		8.081	112.2	0.543	8.624	82.96				
*	*	*	*	*	*	*	*	*		
KR-CO	-150	1.273	76.1	0.047	1.320	22.67	22.71	-238.84	-122.84	-133.13
KR-CO		1.277	76.1	0.047	1.324	22.74				
KR-CH4	-150	0.093	75.5	0.003	0.096	1.64	1.66	-238.84	-264.28	-274.90
KR-CH4		0.095	75.6	0.003	0.098	1.67				
CO-HE	-150	13.654	145.4	0.989	14.643	70.06	70.02	-122.84	11.42	14.31
CO-HE		13.672	145.4	0.986	14.658	69.97				
CO-AR	-150	0.130	148.9	0.009	0.139	0.63	0.66	-122.84	-124.10	-122.81
CO-AR		0.145	149.1	0.011	0.157	0.70				
CO-NE	-150	9.453	148.1	0.695	10.148	46.71	46.66	-122.84	0.10	-14.71
CO-NE		9.466	148.1	0.691	10.157	46.61				
CH4-HE	-150	7.808	75.6	0.294	8.102	142.16	142.17	-264.28	11.42	15.74
CH4-HE		7.812	75.6	0.295	8.107	142.18				
CH4-AR	-150	9.825	149.2	0.706	10.531	45.12	45.12	-264.28	-124.10	-149.97
CH4-AR		9.807	149.3	0.710	10.517	45.12				
CH4-NE	-150	6.818	78.9	0.266	7.084	114.13	114.13	-264.28	0.10	-17.96
CH4-NE		6.804	78.7	0.266	7.070	114.12				

TABLE VI

COMPARISON OF EXPERIMENTAL VALUES WITH KIHARA POTENTIAL

Temp. (°C)	Ar-He Exp.	Ar-He Calc.	Ar-[illegible] Exp.	Ar-[illegible] Calc.	Ar-Ne Exp.	Ar-Ne Calc.	$Ar-H_2$ Exp.	$Ar-H_2$ Calc.
25	18.00	15.14	7.75	8.24	-0.81	7.08	-10.87	-9.94
0	16.92	14.49	5.26	6.19	8.83	5.15	-16.42	-15.3[illegible]
- 25	16.67	13.24	2.57	3.76	6.76	[illegible]	-23.[illegible]	-22.12
- 50	15.78	12.54	-0.54	0.58	4.34	-0.27	-30.55	-30.65
- 75	1[illegible]	11.14	-4.24	-3.54	1.33	-4.13	-43.[illegible]	-41.[illegible]
-100	13.63	9.24	-9.68	-6.89	-2.72	-9.34	-59.1[illegible]	-57.2[illegible]
-125	11.91	6.52	-16.95	-16.86	-8.54	-16.73	-81.58	-79.25

Temp. (°C)	$He-H_2$ Exp.	$He-H_2$ Calc.	He-[illegible] Exp.	He-[illegible] Calc.	He-[illegible] Exp.	He-[illegible] Calc.	[illegible]-Ne Exp.	[illegible]-Ne Calc.	[illegible] Exp.	[illegible] Calc.	[illegible] Exp.	[illegible] Calc.
25	[illegible]	14.46	12.[illegible]	12.30	[illegible]1.09	16.[illegible]	14.22	1[illegible]	[illegible]	1[illegible]	1[illegible]	1[illegible].84
0	16.34	14.35	12.10	12.74	[illegible]	17.04	13.[illegible]	[illegible]	1[illegible]1	[illegible]	11.[illegible]	[illegible]
- 25	16.40	14.17	11.[illegible]	[illegible]	[illegible]	16.86	13.[illegible]	11.4	[illegible]	[illegible]	[illegible]	[illegible]
- 50	16.17	13.[illegible]	11.[illegible]	[illegible]	[illegible]	1[illegible].65	[illegible]	[illegible]	4.[illegible]	[illegible]	[illegible]	[illegible]
- 75	[illegible]	[illegible]	11.3[illegible]	11.[illegible]	[illegible]	14.57	11.[illegible]	[illegible]	1.1	[illegible]	[illegible]	[illegible]
-100	[illegible]	13.[illegible]	10.[illegible]	11.40	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	-4.2[illegible]	[illegible]	-4.[illegible]
-125	[illegible]	12.5[illegible]	1[illegible].24	1[illegible]	15.05	1[illegible].17	[illegible]	[illegible]	[illegible]	-1[illegible]	[illegible]	-1[illegible]

TABLE VII

CORRELATION OF PURE SECOND VIRIAL COEFFICIENTS

SPECIE	TEMP(C)	B11,CC/MOL EXP	B11,CC/MOL CALC	TC K	TPC K	VC CC/MOL	VPC CC/MOL	STD DEV
H2	50.	15.15	13.40	43.40	43.40	60.00	50.00	0.0306
H2	25.	14.64	12.94					
H2	0.	13.98	12.38					
H2	-25.	13.14	11.67					
H2	-50.	12.10	10.76					
H2	-75.	10.79	9.55					
H2	-100.	9.15	7.88					
H2	-125.	6.78	5.47					
H2	-150.	2.95	1.77					
AR	50.	-11.23	-9.46	150.70	150.70	75.20	75.20	0.0313
AR	25.	-15.75	-14.02					
AR	0.	-21.45	-19.68					
AR	-25.	-28.56	-26.83					
AR	-50.	-37.42	-36.08					
AR	-75.	-49.13	-48.43					
AR	-100.	-65.19	-65.54					
AR	-125.	-88.43	-90.43					
AR	-150.	-124.10	-129.15					

TABLE VII (Continued)

SPECIE	TEMP(C)	B11,CC/MOL EXP	CALC	TC K	TPC K	V CC/MOL	VPC CC/MOL	STD DEV
N2	50.	-0.26	-1.43	126.20	126.20	90.10	90.10	0.0096
N2	25.	-4.86	-5.59					
N2	0.	-10.57	-10.74					
N2	-25.	-17.59	-17.25					
N2	-50.	-26.38	-25.67					
N2	-75.	-37.48	-36.89					
N2	-100.	-51.86	-52.41					
N2	-125.	-73.54	-74.96					
NE	50.	12.32	11.06	44.50	44.50	41.70	41.70	0.0186
NE	25.	11.54	10.67					
NE	0.	10.94	10.18					
NE	-25.	10.14	9.57					
NE	-50.	9.12	8.78					
NE	-75.	7.90	7.73					
NE	-100.	6.45	6.28					
NE	-150.	0.10	0.99					
KR	50.	-42.80	-39.60	209.40	209.40	92.20	92.20	0.0258
KR	25.	-52.40	-48.93					
KR	0.	-62.96	-60.50					
KR	-50.	-94.95	-94.15					
KR	-75.	-119.17	-119.56					
KR	-100.	-153.40	-154.88					
KR	-125.	-204.18	-206.48					
KR	-150.	-288.84	-287.16					

TABLE VII (Continued)

SPECIE	TEMP(C)	B11,CC/MOL EXP	B11,CC/MOL CALC	TC K	TPC K	VC CC/MOL	VPC CC/MOL	STD DEV
XE	50.	-111.22	-110.35	289.80	289.80	118.80	118.80	0.0329
XE	25.	-131.00	-130.37					
XE	0.	-154.26	-155.26					
XE	-50.	-226.73	-227.89					
XE	-75.	-283.95	-282.98					
XE	-100.	-368.32	-359.84					
CC	25.	-8.28	-8.89	133.00	133.00	93.20	93.20	0.0201
CC	0.	-14.19	-14.67					
CC	-50.	-30.51	-31.41					
CO	-75.	-42.86	-44.01					
CO	-100.	-59.89	-61.43					
CO	-125.	-84.46	-86.77					
CO	-150.	-122.84	-126.10					
CH4	25.	-42.86	-40.69	190.30	190.30	98.80	98.80	0.0231
CH4	0.	-53.35	-51.37					
CH4	-50.	-83.58	-82.40					
CH4	-75.	-106.48	-105.80					
CH4	-100.	-138.69	-138.30					
CH4	-125.	-185.87	-185.72					
CH4	-150.	-264.28	-259.74					

TABLE VII (Concluded)

SPECIE	TEMP(C)	B11,CC/MOL EXP	B11,CC/MOL CALC	TC K	TPC K	VC CC/MOL	VPC CC/MOL	STD DEV
CO2	25.	-123.60	-113.72	304.20	304.20	94.00	94.00	0.2655
CO2	0.	-150.00	-134.99					
CO2	-25.	-178.00	-161.98					
CO2	-50.	-233.00	-197.10					
C3H8	25.	-388.00	-345.03	370.00	370.00	195.70	195.70	0.4430
C3H8	0.	-468.00	-405.61					
C3H8	-25.	-579.00	-482.61					
F22	25.	-359.00	-290.32	369.60	369.60	165.00	165.00	0.7804
F22	0.	-437.00	-341.30					
F22	-25.	-545.00	-406.12					
O2	50.	-12.00	-10.62	154.30	154.30	74.40	74.40	0.0254
O2	25.	-16.00	-15.31					
O2	0.	-22.00	-21.11					
O2	-50.	-37.00	-37.95					
O2	-100.	-65.00	-68.19					

TABLE VIII

CORRELATION OF INTERACTION SECOND VIRIAL COEFFICIENTS (BY SYSTEM)

SPECIE	TEMP C	B12,CC/MOL EXP	B12,CC/MOL CALC	E CC/MOL	TPC12 K	VPC12 CC/MOL	ALPHA	BETA	STD DEV
H2-AR	50.	9.41	9.41	7.45	82.55	61.75	1.000	1.021	0.018
H2-AR	25.	7.80	7.92	8.36					
H2-AR	0.	5.31	6.08	9.05					
H2-AR	-25.	2.63	3.75	10.34					
H2-AR	-50.	-0.48	0.75	12.18					
H2-AR	-75.	-4.16	-3.24	15.01					
H2-AR	-100.	-9.58	-8.75	18.44					
H2-AR	-125.	-16.82	-16.73	24.01					
H2-AR	-150.	-26.87	-29.05	33.70					
H2-N2	5C.	14.58	12.85	7.14	71.50	68.09	1.000	0.966	0.014
H2-N2	25.	12.98	11.53	8.09					
H2-N2	C.	10.66	9.90	8.96					
H2-N2	-5C.	4.81	5.19	11.95					
H2-N2	-75.	1.20	1.65	14.55					
H2-N2	-100.	-3.39	-3.22	17.96					
H2-N2	-125.	-1C.32	-10.26	23.06					
H2-N2	-15C.	-21.65	-21.14	31.83					
H2-NE	50.	14.81	13.31	1.08	33.30	45.72	1.000	0.758	0.022
H2-NE	25.	14.23	13.03	1.14					
H2-NE	0.	13.69	12.69	1.23					
H2-NE	-25.	13.03	12.26	1.39					
H2-NE	-50.	12.29	11.70	1.68					
H2-NE	-75.	11.23	10.96	1.89					
H2-NE	-100.	9.98	9.94	2.18					
H2-NE	-125.	8.20	8.47	2.63					
H2-NE	-150.	4.75	6.20	3.22					

TABLE VIII (Continued)

SPECIE	TEMP C	B12,CC/MOL EXP	B12,CC/MOL CALC	E CC/MOL	TPC12 K	VPC12 CC/MOL	ALPHA	BETA	STD DEV
H2-KR	50.	6.01	7.01	19.84	96.81	68.96	1.000	1.016	0.020
H2-KR	0.	1.18	2.26	25.67					
H2-KR	-50.	-6.44	-5.33	34.99					
H2-KR	-75.	-12.00	-11.03	42.19					
H2-KR	-100.	-19.15	-18.90	52.97					
H2-KR	-125.	-28.14	-30.31	70.56					
H2-XE	50.	5.76	5.41	53.80	105.65	79.51	1.000	0.942	0.008
H2-XE	0.	-0.57	-0.85	69.57					
H2-XE	-50.	-11.18	-10.86	96.14					
H2-XE	-75.	-17.52	-18.38	119.05					
H2-XE	-100.	-29.52	-28.76	150.07					
H2-CO	0.	10.13	10.13	10.24	71.33	69.37	1.000	0.939	0.0
H2-CH4	0.	4.02	4.02	23.70	91.89	71.65	1.000	1.011	0.0
H2-CO2	0.	-4.26	-1.19	63.75	106.91	69.70	1.000	0.930	0.036
H2-CO2	-25.	-3.75	-5.08	78.68					
H2-CO2	-50.	-8.99	-10.13	101.46					

TABLE VIII (Continued)

SPECIE	TEMP C	B12,CC/MOL EXP	CALC	E CC/MOL	TPC12 K	VPC12 CC/MOL	ALPHA	BETA	STD DEV
H2-C3H8	25.	5.12	7.63	191.80	96.66	106.83	1.000	0.763	0.034
H2-C3H8	0.	1.30	3.58	224.31					
H2-C3H8	-25.	2.34	-1.54	285.27					
H2-F22	25.	0.78	20.09	172.96	60.05	96.35	1.000	0.474	0.258
H2-F22	0.	4.97	18.32	216.43					
H2-F22	-25.	42.32	16.09	308.25					
AR-H2	50.	9.41	9.41	7.45	82.55	61.75	1.000	1.021	0.018
AR-H2	25.	7.80	7.92	8.36					
AR-H2	0.	5.31	6.08	9.05					
AR-H2	-25.	2.63	3.75	10.34					
AR-H2	-50.	-0.48	0.75	12.18					
AR-H2	-75.	-4.16	-3.24	15.01					
AR-H2	-100.	-9.58	-8.75	18.44					
AR-H2	-125.	-16.82	-16.73	24.01					
AR-H2	-150.	-26.87	-29.05	33.70					
AR-N2	50.	-6.19	-5.49	-0.44	137.81	82.43	1.000	0.999	0.017
AR-N2	25.	-10.88	-9.85	-0.57					
AR-N2	0.	-16.43	-15.25	-0.42					
AR-N2	-25.	-23.73	-22.07	-0.65					
AR-N2	-50.	-32.56	-30.89	-0.66					
AR-N2	-75.	-43.96	-42.67	-0.65					
AR-N2	-100.	-59.13	-58.96	-0.60					
AR-N2	-125.	-81.58	-82.65	-0.60					
AR-N2	-150.	-117.48	-119.46	-0.48					

TABLE VIII (Continued)

SPECIE	TEMP C	B12,CC/MCL EXP	B12,CC/MCL CALC	E CC/MOL	TPC12 K	VPC12 CC/MOL	ALPHA	BETA	STD DEV
AR-NE	50.	12.15	10.92	11.60	70.37	56.81	1.000	0.859	0.012
AR-NE	25.	10.89	9.85	13.00					
AR-NE	0.	8.91	8.52	14.16					
AR-NE	-50.	4.45	4.68	18.60					
AR-NE	-75.	1.46	1.81	22.07					
AR-NE	-100.	-2.57	-2.16	26.80					
AR-NE	-125.	-8.36	-7.90	33.68					
AR-NE	-150.	-16.57	-16.75	45.43					
AR-KR	50.	-23.43	-20.50	3.59	175.18	83.41	1.000	0.986	0.028
AR-KR	0.	-37.24	-34.81	4.96					
AR-KR	-50.	-59.60	-57.82	6.58					
AR-KR	-75.	-75.90	-75.17	8.25					
AR-KR	-100.	-98.85	-99.22	10.45					
AR-KR	-125.	-131.27	-134.29	15.03					
AR-XE	50.	-36.74	-34.39	24.48	196.98	95.34	1.000	0.943	0.020
AR-XE	0.	-56.22	-54.04	31.64					
AR-XE	-50.	-86.50	-85.65	45.57					
AR-XE	-75.	-108.02	-109.50	58.52					
AR-XE	-100.	-141.24	-142.63	75.52					

TABLE VIII (Continued)

SPECIE	TEMP C	B12,CC/MOL EXP	B12,CC/MOL CALC	E CC/MOL	TPC12 K	VPC12 CC/MOL	ALPHA	BETA	STD DEV
AR-CO	0.	-18.48	-16.41	-0.66	139.64	83.88	1.000	0.986	0.020
AR-CO	-50.	-34.45	-32.66	-0.49					
AR-CO	-100.	-62.76	-61.82	-0.22					
AR-CO	-125.	-86.38	-86.44	0.07					
AR-CO	-150.	-122.81	-124.69	0.66					
AR-CH4	0.	-32.55	-26.90	4.85	158.70	86.46	1.000	0.937	0.114
AR-CH4	-50.	-53.80	-47.35	6.70					
AR-CH4	-100.	-90.89	-84.08	11.05					
AR-CH4	-125.	-123.05	-115.14	14.10					
AR-CH4	-150.	-149.07	-163.50	45.12					
AR-CO2	0.	-50.62	-47.71	35.11	196.92	84.25	1.000	0.920	0.028
AR-CO2	-25.	-58.35	-59.87	44.93					
AR-CO2	-50.	-74.78	-75.63	60.43					
AR-C3H8	25.	-70.18	-66.57	131.69	209.03	126.00	1.000	0.885	0.029
AR-C3H8	0.	-83.26	-82.34	161.47					
AR-C3H8	-25.	-98.76	-102.30	205.02					
AR-F22	25.	-64.24	-44.27	123.13	186.23	114.29	1.000	0.789	0.223
AR-F22	0.	-69.67	-56.21	159.55					
AR-F22	-25.	-44.49	-71.32	242.28					

TABLE VIII (Continued)

SPECIE	TEMP C	B12,CC/MOL EXP	B12,CC/MOL CALC	E CC/MOL	TPC12 K	VPC12 CC/MOL	ALPHA	BETA	STD DEV
N2-H2	50.	14.58	12.85	7.14	71.50	63.09	1.000	0.956	0.014
N2-H2	25.	12.98	11.53	8.09					
N2-H2	0.	10.66	9.90	8.96					
N2-H2	-50.	4.81	5.19	11.95					
N2-H2	-75.	1.20	1.65	14.55					
N2-H2	-100.	-3.39	-3.22	17.96					
N2-H2	-125.	-10.32	-10.26	23.06					
N2-H2	-150.	-21.65	-21.14	31.83					
N2-AR	50.	-6.19	-5.49	-0.44	137.81	82.43	1.000	0.999	0.017
N2-AR	25.	-10.88	-9.85	-0.57					
N2-AR	0.	-16.43	-15.25	-0.42					
N2-AR	-25.	-23.73	-22.07	-0.65					
N2-AR	-50.	-32.56	-30.89	-0.66					
N2-AR	-75.	-43.96	-42.67	-0.65					
N2-AR	-100.	-59.13	-58.96	-0.60					
N2-AR	-125.	-81.58	-82.65	-0.60					
N2-AR	-150.	-117.48	-119.46	-0.48					
N2-NE	50.	14.96	12.77	8.93	66.85	62.83	1.000	0.892	0.018
N2-NE	25.	13.28	11.67	9.94					
N2-NE	0.	11.27	10.31	11.08					
N2-NE	-25.	9.13	8.59	12.86					
N2-NE	-50.	6.39	6.38	15.02					
N2-NE	-75.	3.27	3.44	18.06					
N2-NE	-100.	-0.54	-0.61	22.17					
N2-NE	-125.	-6.54	-6.47	28.05					
N2-NE	-150.	-16.86	-15.52	38.04					

TABLE VIII (Continued)

SPECIE	TEMP C	B12,CC/MOL EXP	B12,CC/MOL CALC	E CC/MOL	TPC12 K	VPC12 CC/MOL	ALPHA	BETA	STD DEV
N2-KR	50.	-17.08	-15.27	4.45	159.45	91.15	1.000	0.981	0.023
N2-KR	0.	-30.71	-28.79	6.05					
N2-KR	-50.	-52.68	-50.50	7.99					
N2-KR	-75.	-67.92	-66.85	10.40					
N2-KR	-100.	-89.14	-89.51	13.49					
N2-KR	-125.	-119.58	-122.50	19.28					
N2-XE	50.	-27.15	-26.58	28.59	177.20	103.79	1.000	0.927	0.007
N2-XE	0.	-45.36	-44.72	37.06					
N2-XE	-50.	-74.38	-73.87	52.18					
N2-XE	-100.	-125.43	-126.33	84.66					
N2-CO	0.	-11.96	-11.96	0.42	128.23	91.64	1.000	0.990	0.0
N2-CH4	0.	-25.72	-25.72	6.24	152.47	94.38	1.000	0.984	0.0
N2-CO2	0.	-50.88	-48.61	29.41	191.48	92.04	1.000	0.977	0.021
N2-CO2	-25.	-55.75	-61.31	38.05					
N2-CO2	-50.	-77.45	-77.79	52.24					
N2-C3H8	25.	-58.79	-55.75	137.64	189.90	136.15	1.000	0.879	0.024
N2-C3H8	0.	-71.49	-70.42	167.80					
N2-C3H8	-25.	-85.74	-88.97	212.56					

TABLE VIII (Continued)

SPECIE	TEMP C	B12,CC/MOL EXP	B12,CC/MOL CALC	E CC/MOL	TPC12 K	VPC12 CC/MOL	ALPHA	BETA	STD DEV
N2-F22	25.	-60.85	-41.55	121.08	177.45	123.80	1.000	0.822	0.201
N2-F22	0.	-66.82	-53.55	156.97					
N2-F22	-25.	-42.57	-68.72	238.72					
NE-H2	50.	14.81	13.31	1.08	33.30	45.72	1.000	0.758	0.022
NE-H2	25.	14.23	13.03	1.14					
NE-H2	0.	13.69	12.69	1.23					
NE-H2	-25.	13.03	12.26	1.39					
NE-H2	-50.	12.29	11.70	1.68					
NE-H2	-75.	11.23	10.96	1.89					
NE-H2	-100.	9.98	9.94	2.18					
NE-H2	-125.	8.20	8.47	2.63					
NE-H2	-150.	4.75	6.20	3.22					
NE-AR	50.	12.15	10.92	11.60	70.37	56.81	1.000	0.859	0.012
NE-AR	25.	10.89	9.85	13.00					
NE-AR	0.	8.91	8.52	14.16					
NE-AR	-50.	4.45	4.68	18.60					
NE-AR	-75.	1.46	1.81	22.07					
NE-AR	-100.	-2.57	-2.16	26.80					
NE-AR	-125.	-8.36	-7.90	33.68					
NE-AR	-150.	-16.57	-16.75	45.43					

TABLE VIII (Continued)

SPECIE	TEMP C	B12,CC/MCL EXP	B12,CC/MCL CALC	E CC/MOL	TPC12 K	VPC12 CC/MUL	ALPHA	BETA	STD DEV
NE-N2	50.	14.96	12.77	8.93	66.85	62.83	1.000	0.892	0.018
NE-N2	25.	13.28	11.67	9.94					
NE-N2	0.	11.27	10.31	11.08					
NE-N2	-25.	9.13	8.59	12.86					
NE-N2	-50.	6.39	6.38	15.02					
NE-N2	-75.	3.27	3.44	18.06					
NE-N2	-100.	-0.54	-0.61	22.17					
NE-N2	-125.	-6.54	-6.47	28.05					
NE-N2	-150.	-16.86	-15.52	38.04					
NE-KR	50.	12.13	10.96	27.37	76.63	63.65	1.000	0.794	0.012
NE-KR	0.	8.24	7.89	34.25					
NE-KR	-50.	2.45	3.00	45.36					
NE-KR	-75.	-1.22	-0.68	54.42					
NE-KR	-100.	-6.29	-5.74	67.18					
NE-KR	-125.	-12.49	-13.07	87.42					
NE-XE	50.	15.74	13.31	65.19	74.03	73.66	1.000	0.652	0.021
NE-XE	0.	10.86	9.94	82.52					
NE-XE	-50.	4.80	4.56	113.61					
NE-XE	-75.	0.56	0.54	138.58					
NE-XE	-100.	-6.62	-5.02	174.32					

TABLE VIII (Continued)

SPECIE	TEMP C	B12,CC/MOL EXP	B12,CC/MOL CALC	E CC/MOL	TPC12 K	VPC12 CC/MOL	ALPHA	BETA	STD DEV
NE-CO	0.	12.23	10.98	13.86	64.95	64.04	1.000	0.844	0.012
NE-CO	-50.	7.83	7.15	18.52					
NE-CO	-100.	0.42	0.33	27.14					
NE-CO	-125.	-5.64	-5.38	34.41					
NE-CO	-150.	-14.71	-14.20	46.66					
NE-CH4	0.	12.42	10.59	33.62	67.87	66.20	1.000	0.737	0.016
NE-CH4	-50.	7.18	6.36	44.41					
NE-CH4	-100.	-1.07	-1.18	65.05					
NE-CH4	-125.	-7.82	-7.50	82.93					
NE-CH4	-150.	-17.56	-17.26	114.13					
NE-CO2	0.	6.25	8.38	75.78	75.15	64.35	1.000	0.646	0.029
NE-CO2	-25.	7.85	6.29	91.78					
NE-CO2	-50.	3.82	3.58	115.76					
NE-C3H8	25.	26.08	27.31	214.31	37.74	99.69	1.000	0.294	0.027
NE-C3H8	0.	24.24	26.40	252.77					
NE-C3H8	-25.	26.07	25.26	312.50					
KR-H2	50.	6.01	7.01	19.84	96.81	68.96	1.000	1.016	0.020
KR-H2	0.	1.18	2.26	25.67					
KR-H2	-50.	-6.44	-5.33	34.99					
KR-H2	-75.	-12.00	-11.03	42.19					
KR-H2	-100.	-19.15	-18.90	52.97					
KR-H2	-125.	-28.14	-30.31	70.56					

TABLE VIII (Continued)

SPECIE	TEMP C	B12,CC/MOL EXP	B12,CC/MOL CALC	E CC/MOL	TPC12 K	VPC12 CC/MOL	ALPHA	BETA	STD DEV
KR-AR	50.	-23.43	-20.50	3.53	175.18	83.41	1.000	0.986	0.028
KR-AR	0.	-37.24	-34.81	4.96					
KR-AR	-50.	-59.60	-57.82	6.58					
KR-AR	-75.	-75.90	-75.17	8.25					
KR-AR	-1CC.	-98.85	-99.22	10.45					
KR-AR	-125.	-131.27	-134.29	15.03					
KR-N2	50.	-17.08	-15.27	4.45	159.45	91.15	1.000	0.981	0.023
KR-N2	0.	-30.71	-28.79	6.05					
KR-N2	-50.	-52.68	-50.50	7.99					
KR-N2	-75.	-67.92	-66.85	10.40					
KR-N2	-1CC.	-89.14	-89.51	13.49					
KR-N2	-125.	-119.58	-122.50	19.28					
KR-NE	50.	12.13	10.96	27.37	76.63	63.6_	1.000	0.794	0.012
KR-NE	0.	8.24	7.89	34.25					
KR-NE	-50.	2.45	3.00	45.36					
KR-NE	-75.	-1.22	-C.68	54.42					
KR-NE	-1CC.	-6.29	-5.74	67.18					
KR-NE	-125.	-12.49	-13.07	87.42					

TABLE VIII (Continued)

SPECIE	TEMP C	B12,CC/MOL EXP	B12,CC/MOL CALC	E CC/MOL	TPC12 K	VPC12 CC/MOL	ALPHA	BETA	STD DEV
KR-XE	50.	-67.56	-64.93	9.45	241.64	104.94	1.000	0.981	0.014
KR-XE	0.	-94.71	-94.70	13.90					
KR-XE	-50.	-143.10	-142.73	17.74					
KR-XE	-75.	-177.61	-179.07	23.95					
KR-XE	-100.	-229.54	-229.64	31.32					
KR-CO	0.	-34.65	-31.59	3.92	163.39	92.70	1.000	0.979	0.023
KR-CO	-50.	-56.92	-54.53	5.81					
KR-CO	-100.	-96.26	-95.76	10.39					
KR-CO	-125.	-130.16	-130.64	14.16					
KR-CO	-150.	-183.13	-184.97	22.71					
KR-CH4	0.	-58.00	-55.93	0.16	199.68	95.46	1.000	1.000	0.020
KR-CH4	-50.	-88.92	-88.26	0.34					
KR-CH4	-100.	-145.31	-146.56	0.74					
KR-CH4	-125.	-193.86	-196.05	1.16					
KR-CH4	-150.	-274.90	-273.38	1.66					
KR-CO2	0.	-82.24	-80.39	24.24	236.72	93.10	1.000	0.938	0.024
KR-CO2	-50.	-120.27	-121.63	43.71					
XE-H2	50.	5.76	5.41	53.80	105.65	79.51	1.000	0.942	0.008
XE-H2	0.	-0.57	-0.85	69.57					
XE-H2	-50.	-11.18	-10.86	96.14					
XE-H2	-75.	-17.52	-18.38	119.05					
XE-H2	-100.	-29.52	-28.76	150.07					

TABLE VIII (Continued)

SPECIE	TEMP C	B12,CC/MOL EXP	B12,CC/MOL CALC	E CC/MOL	TPC12 K	VPC12 CC/MOL	ALPHA	BETA	STD DEV
XE-AR	50.	-36.74	-34.39	24.48	196.98	95.34	1.000	0.943	0.020
XE-AR	0.	-56.22	-54.04	31.64					
XE-AR	-50.	-86.50	-85.65	45.57					
XE-AR	-75.	-108.02	-109.50	58.52					
XE-AR	-100.	-141.24	-142.63	75.52					
XE-N2	50.	-27.15	-26.53	28.59	177.20	103.79	1.000	0.927	0.007
XE-N2	0.	-45.36	-44.72	37.06					
XE-N2	-50.	-74.38	-73.87	52.18					
XE-N2	-100.	-125.43	-126.33	84.66					
XE-NE	50.	15.74	13.31	65.19	74.03	73.66	1.000	0.652	0.021
XE-NE	0.	10.86	9.94	82.52					
XE-NE	-50.	4.80	4.56	113.61					
XE-NE	-75.	0.56	0.54	138.58					
XE-NE	-100.	-6.62	-5.02	174.32					
XE-KR	50.	-67.56	-64.93	9.45	241.64	104.94	1.000	0.981	0.014
XE-KR	0.	-94.71	-94.70	13.90					
XE-KR	-50.	-143.10	-142.73	17.74					
XE-KR	-75.	-177.61	-179.07	23.95					
XE-KR	-100.	-229.54	-229.64	31.32					

TABLE VIII (Continued)

SPECIE	TEMP C	B12,CC/MCL EXP	B12,CC/MCL CALC	E CC/MOL	TPC12 K	VPC12 CC/MOL	ALPHA	BETA	STD DEV
XE-CO	0.	-52.49	-50.88	31.74	184.83	105.48	1.000	0.941	0.016
XE-CO	-100.	-138.70	-139.51	75.41					
XE-CH4	0.	-9C.69	-89.6C	13.11	231.89	108.49	1.000	0.987	0.007
XE-CH4	-50.	-135.98	-136.12	19.17					
XE-CH4	-100.	-219.77	-220.23	33.74					
XE-CO2	0.	-124.73	-125.11	27.40	275.38	105.92	1.000	0.927	0.005
XE-CO2	-5C.	-185.C8	-184.79	44.79					
CO-H2	0.	10.13	10.13	10.24	71.33	69.37	1.000	0.939	0.0
CO-AR	0.	-18.48	-16.41	-0.66	139.64	83.88	1.000	0.986	0.020
CO-AR	-50.	-34.45	-32.66	-0.49					
CO-AR	-100.	-62.76	-61.82	-0.22					
CO-AR	-125.	-86.38	-86.44	0.07					
CO-AR	-150.	-122.81	-124.69	0.66					
CO-N2	0.	-11.96	-11.96	0.42	128.23	91.64	1.000	0.990	0.0
CO-NE	0.	12.23	10.98	13.86	64.95	64.04	1.000	0.844	0.012
CO-NE	-50.	7.83	7.15	18.52					
CO-NE	-100.	0.42	0.33	27.14					
CO-NE	-125.	-5.64	-5.38	34.41					
CO-NE	-15C.	-14.71	-14.20	46.66					

TABLE VIII (Continued)

SPECIE	TEMP C	B12,CC/MOL EXP	B12,CC/MOL CALC	E CC/MOL	TPC12 K	VPC12 CC/MOL	ALPHA	BETA	STD DEV
CO-KR	0.	-34.65	-31.59	3.92	163.39	92.70	1.000	0.979	0.023
CO-KR	-50.	-56.92	-54.53	5.81					
CO-KR	-100.	-96.26	-95.76	10.39					
CO-KR	-125.	-130.16	-130.64	14.16					
CO-KR	-150.	-183.13	-184.97	22.71					
CO-XE	0.	-52.49	-50.88	31.74	184.83	105.48	1.000	0.941	0.016
CO-XE	-100.	-138.70	-139.51	75.41					
CO-CH4	0.	-29.93	-29.93	3.84	158.81	95.97	1.000	0.998	0.0
CO-CO2	0.	-58.44	-57.26	23.65	203.28	93.60	1.000	1.011	0.016
CO-CO2	-50.	-88.98	-89.86	42.77					
CH4-H2	0.	4.02	4.02	23.70	91.89	71.65	1.000	1.011	0.0
CH4-AR	0.	-32.55	-26.90	4.85	158.70	86.46	1.000	0.937	0.114
CH4-AR	-50.	-53.80	-47.35	6.70					
CH4-AR	-100.	-90.89	-84.08	11.05					
CH4-AR	-125.	-123.05	-115.14	14.10					
CH4-AR	-150.	-149.07	-163.50	45.12					

TABLE VIII (Continued)

SPECIE	TEMP C	B12,CC/MOL EXP	B12,CC/MOL CALC	E CC/MOL	TPC12 K	VPC12 CC/MOL	ALPHA	BETA	STD DEV
CH4-N2	0.	-25.72	-25.72	6.24	152.47	94.38	1.000	0.984	0.0
CH4-NE	0.	12.42	10.59	33.62	67.87	66.20	1.000	0.737	0.016
CH4-NE	-50.	7.18	6.36	44.41					
CH4-NE	-100.	-1.07	-1.18	65.05					
CH4-NE	-125.	-7.82	-7.50	82.93					
CH4-NE	-150.	-17.96	-17.26	114.13					
CH4-KR	0.	-58.00	-55.93	0.16	199.68	95.46	1.000	1.000	0.020
CH4-KR	-50.	-88.92	-88.26	0.34					
CH4-KR	-100.	-145.31	-146.56	0.74					
CH4-KR	-125.	-193.86	-196.05	1.16					
CH4-KR	-150.	-274.90	-273.38	1.66					
CH4-XE	0.	-90.69	-89.60	13.11	231.89	108.49	1.000	0.987	0.007
CH4-XE	-50.	-135.98	-136.12	19.17					
CH4-XE	-100.	-219.77	-220.23	33.74					
CH4-CO	0.	-29.93	-29.93	3.84	158.81	95.97	1.000	0.998	0.0
CH4-CO2	0.	-77.55	-77.55	24.13	229.15	96.38	1.000	0.952	0.0

TABLE VIII (Continued)

SPECIE	TEMP C	B12,CC/MOL EXP	CALC	E CC/MOL	TPC12 K	VPC12 CC/MOL	ALPHA	BETA	STD DEV
C02-H2	0.	-4.26	-1.19	63.75	106.91	69.70	1.000	0.930	0.036
C02-H2	-25.	-3.75	-5.08	78.68					
C02-H2	-50.	-8.99	-10.13	101.46					
CC2-AR	0.	-50.62	-47.71	35.11	196.92	84.25	1.000	0.920	0.028
CC2-AR	-25.	-56.35	-59.87	44.93					
CC2-AR	-50.	-74.78	-75.63	60.43					
CC2-N2	0.	-50.88	-48.61	29.41	191.48	92.04	1.000	0.977	0.021
C02-N2	-25.	-59.75	-61.31	38.05					
C02-N2	-50.	-77.45	-77.79	52.24					
CC2-NE	0.	6.25	8.38	75.78	75.15	64.35	1.000	0.646	0.029
C02-NE	-25.	7.85	6.29	91.78					
C02-NE	-50.	3.82	3.58	115.76					
CC2-KR	0.	-82.24	-80.39	24.24	236.72	93.10	1.000	0.938	0.024
C02-KR	-50.	-120.27	-121.63	43.71					
C02-XE	0.	-124.73	-125.11	27.40	275.38	105.92	1.000	0.927	0.005
C02-XE	-50.	-185.08	-184.79	44.79					

TABLE VIII (Continued)

SPECIE	TEMP C	B12,CC/MOL EXP	CALC	E CC/MOL	TPC12 K	VPC12 CC/MOL	ALPHA	BETA	STD DEV
CO2-CO	0.	-58.44	-57.26	23.65	203.28	93.60	1.000	1.011	0.016
CO2-CO	-50.	-88.98	-89.86	42.77					
CO2-CH4	0.	-77.55	-77.55	24.13	229.15	96.38	1.000	0.952	0.0
C3H8-H2	25.	5.12	7.63	191.80	96.66	106.83	1.000	0.763	0.034
C3H8-H2	0.	1.30	3.58	228.31					
C3H8-H2	-25.	2.34	-1.54	285.27					
C3H8-AR	25.	-7C.18	-66.57	131.69	209.03	126.00	1.000	0.885	0.029
C3H8-AR	0.	-83.26	-82.34	161.47					
C3H8-AR	-25.	-98.76	-102.30	205.02					
C3H8-N2	25.	-58.79	-55.75	137.64	189.90	136.15	1.000	0.879	0.024
C3H8-N2	0.	-71.49	-70.42	167.80					
C3H8-N2	-25.	-85.74	-88.97	212.56					
C3H8-NE	25.	26.C8	27.31	214.31	37.74	99.69	1.000	0.294	0.027
C3H8-NE	0.	24.24	26.40	252.77					
C3H8-NE	-25.	28.07	25.26	312.50					

TABLE VIII (Concluded)

SPECIE	TEMP C	B12,CC/MOL EXP	B12,CC/MOL CALC	E CC/MOL	TPC12 K	VPC12 CC/MOL	ALPHA	BETA	STD DEV
F22-H2	25.	0.78	20.09	172.96	60.05	96.35	1.000	0.474	0.258
F22-H2	0.	4.97	18.32	216.48					
F22-H2	-25.	42.32	16.09	308.25					
F22-AR	25.	-64.24	-44.27	123.13	186.23	114.29	1.000	0.789	0.223
F22-AR	0.	-65.67	-56.21	159.55					
F22-AR	-25.	-44.49	-71.32	242.28					
F22-N2	25.	-60.85	.55	121.08	177.45	123.80	1.000	0.822	0.201
F22-N2	0.	-66.82	3.55	156.97					
F22-N2	-25.	-42.57	-68.72	238.72					

TABLE IX

CORRELATION OF INTERACTION SECOND VIRIAL COEFFICIENTS (BY TEMPERATURE)

TEMP C	SPECIE	B12,CC/MOL EXP	B12,CC/MOL CALC	E CC/MOL	TPC12 K	VPC12 CC/MOL	ALPHA	BETA	STD DEV
50.	H2-AR	9.41	9.41	7.45	82.55	61.75	1.000	1.021	0.018
50.	H2-N2	14.58	12.85	7.14	71.50	68.09	1.000	0.966	0.014
50.	H2-NE	14.81	13.31	1.08	33.30	45.72	1.000	0.758	0.022
50.	H2-KR	6.01	7.01	19.84	96.81	68.96	1.000	1.016	0.020
50.	H2-XE	5.76	5.41	53.80	105.65	79.51	1.000	0.942	0.008
50.	AR-H2	9.41	9.41	7.45	82.55	61.75	1.000	1.021	0.018
50.	AR-N2	-6.19	-5.49	-0.44	137.81	82.43	1.000	0.999	0.017
50.	AR-NE	12.15	10.92	11.60	70.37	56.81	1.000	0.859	0.012
50.	AR-KR	-23.43	-20.50	3.59	175.18	83.41	1.000	0.986	0.028
50.	AR-XE	-36.74	-34.39	24.48	196.98	95.34	1.000	0.943	0.020
50.	N2-H2	14.58	12.85	7.14	71.50	68.09	1.000	0.966	0.014
50.	N2-AR	-6.19	-5.49	-0.44	137.81	82.43	1.000	0.999	0.017
50.	N2-NE	14.96	12.77	8.93	66.85	62.83	1.000	0.892	0.018
50.	N2-KR	-17.08	-15.27	4.45	159.45	91.15	1.000	0.981	0.023
50.	N2-XE	-27.15	-26.58	28.59	177.20	103.79	1.000	0.927	0.007
50.	NE-H2	14.81	13.31	1.08	33.30	45.72	1.000	0.758	0.022
50.	NE-AR	12.15	10.92	11.60	70.37	56.81	1.000	0.859	0.012
50.	NE-N2	14.96	12.77	8.93	66.85	62.83	1.000	0.892	0.018
50.	NE-KR	12.13	10.96	27.37	76.63	63.65	1.000	0.794	0.012
50.	NE-XE	15.74	13.31	65.19	74.03	73.66	1.000	0.652	0.021
50.	KR-H2	6.01	7.01	19.84	96.81	68.96	1.000	1.016	0.020
50.	KR-AR	-23.43	-20.50	3.59	175.18	83.41	1.000	0.986	0.028
50.	KR-N2	-17.08	-15.27	4.45	159.45	91.15	1.000	0.981	0.023
50.	KR-NE	12.13	10.96	27.37	76.63	63.65	1.000	0.794	0.012
50.	KR-XE	-67.56	-64.93	9.45	241.64	104.94	1.000	0.981	0.014

TABLE IX (Continued)

TEMP C	SPECIE	F12,CC/MOL EXP	F12,CC/MOL CALC	E CC/MOL	TPC12 K	VPC12 CC/MOL	ALPHA	BETA	STD DEV
50.	XE-H2	5.76	5.41	53.80	105.65	79.51	1.000	0.942	0.008
50.	XE-AR	-36.74	-34.39	24.48	196.98	95.34	1.000	0.943	0.020
50.	XE-N2	-27.15	-26.58	28.59	177.20	103.79	1.000	0.927	0.007
50.	XE-NE	15.74	13.31	65.19	74.03	73.66	1.000	0.652	0.021
50.	XE-KR	-67.56	-64.93	9.45	241.64	104.94	1.000	0.981	0.014
25.	H2-AR	7.80	7.92	8.36	82.55	61.75	1.000	1.021	0.018
25.	H2-N2	12.98	11.53	8.09	71.50	68.09	1.000	0.966	0.014
25.	H2-NE	14.23	13.03	1.14	33.30	45.72	1.000	0.758	0.022
25.	H2-C3H8	5.12	7.63	191.80	96.66	106.83	1.000	0.763	0.034
25.	H2-F22	0.78	20.09	172.96	60.05	96.35	1.000	0.474	0.258
25.	AR-H2	7.80	7.92	8.36	82.55	61.75	1.000	1.021	0.018
25.	AR-N2	-10.88	-9.85	-0.57	137.81	82.43	1.000	0.999	0.017
25.	AR-NE	10.89	9.85	13.00	70.37	56.81	1.000	0.859	0.012
25.	AR-C3H8	-70.18	-66.57	131.69	209.03	126.00	1.000	0.885	0.029
25.	AR-F22	-64.24	-44.27	123.13	186.23	114.29	1.000	0.789	0.223
25.	N2-H2	12.98	11.53	8.09	71.50	68.09	1.000	0.966	0.014
25.	N2-AR	-10.88	-9.85	-0.57	137.81	82.43	1.000	0.999	0.017
25.	N2-NE	13.28	11.67	9.94	66.85	62.83	1.000	0.892	0.018
25.	N2-C3H8	-58.79	-55.75	137.64	189.90	136.15	1.000	0.879	0.024
25.	N2-F22	-60.85	-41.55	121.08	177.45	123.80	1.000	0.822	0.201
25.	NE-H2	14.23	13.03	1.14	33.30	45.72	1.000	0.758	0.022
25.	NE-AR	10.89	9.85	13.00	70.37	56.81	1.000	0.859	0.012
25.	NE-N2	13.28	11.67	9.94	66.85	62.83	1.000	0.892	0.018
25.	NE-C3H8	26.08	27.31	214.31	37.74	99.69	1.000	0.294	0.027
25.	C3H8-H2	5.12	7.63	191.80	96.66	106.83	1.000	0.763	0.034
25.	C3H8-AR	-70.18	-66.57	131.69	209.03	126.00	1.000	0.885	0.029

TABLE IX (continued)

TEMP C	SPECIE	B12,CC/MOL EXP	B12,CC/MOL CALC	E CC/MOL	TPC12 K	VPC12 CC/MOL	ALPHA	BETA	STD DEV
25.	C3H8-N2	-58.79	-55.75	137.64	189.90	136.15	1.000	0.879	0.024
25.	C3H8-NE	26.08	27.31	214.31	37.74	99.69	1.000	0.294	0.027
25.	F22-H2	0.78	20.09	172.96	60.05	96.35	1.000	0.474	0.258
25.	F22-AR	-64.24	-44.27	123.13	186.23	114.29	1.000	0.789	0.223
25.	F22-N2	-60.85	-41.55	121.08	177.45	123.80	1.000	0.822	0.201
0.	H2-AR	5.31	6.08	9.05	82.55	61.75	1.000	1.021	0.018
0.	H2-N2	10.66	9.90	8.96	71.50	68.09	1.000	0.966	0.014
0.	H2-NE	13.69	12.69	1.23	33.30	45.72	1.000	0.758	0.022
0.	H2-KR	1.18	2.26	25.67	96.81	68.96	1.000	1.016	0.020
0.	H2-XE	-0.57	-0.85	69.57	105.65	79.51	1.000	0.942	0.008
0.	H2-CO	10.13	10.13	10.24	71.33	69.37	1.000	0.939	0.0
0.	H2-CH4	4.02	4.02	23.70	91.89	71.65	1.000	1.011	0.0
0.	H2-CO2	-4.26	-1.19	63.75	106.91	69.70	1.000	0.930	0.036
0.	H2-C3H8	1.30	3.58	228.31	96.66	106.83	1.000	0.763	0.034
0.	H2-F22	4.97	18.32	216.48	60.05	96.35	1.000	0.474	0.258
0.	AR-H2	5.31	6.08	9.05	82.55	61.75	1.000	1.021	0.018
0.	AR-N2	-16.43	-15.25	-0.42	137.81	82.43	1.000	0.999	0.017
0.	AR-NE	8.91	8.52	14.16	70.37	56.81	1.000	0.859	0.012
0.	AR-KR	-37.24	-34.81	4.96	175.18	83.41	1.000	0.986	0.028
0.	AR-XE	-56.22	-54.04	31.64	196.98	95.34	1.000	0.943	0.020
0.	AR-CO	-18.48	-16.41	-0.66	139.64	83.88	1.000	0.986	0.020
0.	AR-CH4	-32.55	-26.90	4.85	158.70	86.46	1.000	0.937	0.114
0.	AR-CO2	-50.62	-47.71	35.11	196.92	84.25	1.000	0.920	0.028
0.	AR-C3H8	-83.26	-82.34	161.47	209.03	126.00	1.000	0.885	0.029
0.	AR-F22	-69.67	-56.21	159.55	186.23	114.29	1.000	0.789	0.223
0.	N2-H2	10.66	9.90	8.96	71.50	68.09	1.000	0.966	0.014

TABLE IX (Continued)

TEMP C	SPECIE	B12,CC/MOL EXP	CALC	E CC/MOL	TPC12 K	VPC12 CC/MOL	ALPHA	BETA	STD DEV
0.	N2-AR	-16.43	-15.25	-0.42	137.81	82.43	1.000	0.999	0.017
0.	N2-NE	11.27	10.31	11.08	66.85	62.83	1.000	0.892	0.018
0.	N2-KR	-30.71	-28.79	6.05	159.45	91.15	1.000	0.981	0.023
0.	N2-XE	-45.36	-44.72	37.06	177.20	103.79	1.000	0.927	0.C07
0.	N2-CC	-11.96	-11.96	0.42	128.23	91.64	1.000	0.990	0.0
0.	N2-CH4	-25.72	-25.72	6.24	152.47	94.38	1.000	0.984	0.0
0.	N2-CC2	-5C.88	-48.61	29.41	191.48	92.04	1.000	0.977	0.021
0.	N2-C3H8	-71.49	-70.42	167.80	189.90	136.15	1.000	0.879	0.024
0.	N2-F22	-66.82	-53.55	156.97	177.45	123.80	1.000	0.822	0.201
0.	NE-H2	13.69	12.69	1.23	33.30	45.72	1.000	0.758	0.022
0.	NE-AR	8.91	8.52	14.16	70.37	56.81	1.000	0.859	0.012
0.	NE-N2	11.27	10.31	11.08	66.85	62.83	1.000	0.892	0.018
0.	NE-KR	8.24	7.89	34.25	76.63	63.65	1.000	0.794	0.012
0.	NE-XE	10.86	9.94	82.52	74.03	73.66	1.000	0.652	0.021
0.	NE-CO	12.23	1C.98	13.86	64.95	64.04	1.000	0.844	0.012
0.	NE-CH4	12.42	10.59	33.62	67.87	66.20	1.000	0.737	0.016
0.	NE-CO2	6.25	8.38	75.78	75.15	64.35	1.000	0.646	0.029
0.	NE-C3H8	24.24	26.4C	252.77	37.74	99.69	1.000	0.294	0.027
0.	KR-H2	1.18	2.26	25.67	96.81	68.96	1.000	1.016	0.020
0.	KR-AR	-37.24	-34.81	4.96	175.18	83.41	1.000	0.986	0.028
0.	KR-N2	-3C.71	-28.79	6.05	159.45	91.15	1.000	0.981	0.023
0.	KR-NE	8.24	7.89	34.25	76.63	63.65	1.000	0.794	0.012
0.	KR-XE	-94.71	-94.70	13.90	241.64	104.94	1.000	0.981	0.014
0.	KR-CO	-34.65	-31.59	3.92	163.39	92.70	1.000	0.979	0.023
0.	KR-CH4	-5E.CO	-55.93	0.16	199.68	95.46	1.000	1.000	0.020
0.	KR-CC2	-82.24	-80.39	24.24	236.72	93.10	1.000	0.938	0.024
0.	XE-H2	-0.57	-0.85	69.57	105.65	79.51	1.000	0.942	0.008

TABLE IX (Continued)

TEMP C	SPECIE	B12, CC/MOL EXP	B12, CC/MOL CALC	E CC/MOL	TPC12 K	VPC12 CC/MOL	ALPHA	BETA	STD DEV
0.	XE-AR	-56.22	-54.04	31.64	196.98	95.34	1.000	0.943	0.020
0.	XE-N2	-45.36	-44.72	37.06	177.20	103.79	1.000	0.927	0.007
0.	XE-NE	10.86	9.94	82.52	74.03	73.66	1.000	0.652	0.021
0.	XE-KR	-94.71	-94.70	13.90	241.64	104.94	1.000	0.981	0.014
0.	XE-CO	-52.49	-50.88	31.74	184.83	105.48	1.000	0.941	0.016
0.	XE-CH4	-90.69	-89.60	13.11	231.89	108.49	1.000	0.987	0.007
0.	XE-CO2	-124.73	-125.11	27.40	275.38	105.92	1.000	0.927	0.005
0.	CO-H2	10.13	10.13	10.24	71.33	69.37	1.000	0.939	0.0
0.	CO-AR	-18.48	-16.41	-0.66	139.64	83.88	1.000	0.986	0.020
0.	CO-N2	-11.96	-11.96	0.42	128.23	91.64	1.000	0.990	0.0
0.	CO-NE	12.23	10.98	13.86	64.95	64.04	1.000	0.844	0.012
0.	CO-KR	-34.65	-31.59	3.92	163.39	92.70	1.000	0.979	0.023
0.	CO-XE	-52.49	-50.88	31.74	184.83	105.48	1.000	0.941	0.016
0.	CO-CH4	-29.93	-29.93	3.84	158.81	95.97	1.000	0.998	0.0
0.	CO-CO2	-58.44	-57.26	23.65	203.28	93.60	1.000	1.011	0.016
0.	CH4-H2	4.02	4.02	23.70	91.89	71.65	1.000	1.011	0.0
0.	CH4-AR	-32.55	-26.90	4.85	158.70	86.46	1.000	0.937	0.114
0.	CH4-N2	-25.72	-25.72	6.24	152.47	94.38	1.000	0.984	0.0
0.	CH4-NE	12.42	10.59	33.62	67.87	66.20	1.000	0.737	0.016
0.	CH4-KR	-58.00	-55.93	0.16	199.68	95.46	1.000	1.000	0.020
0.	CH4-XE	-90.69	-89.60	13.11	231.89	108.49	1.000	0.987	0.007
0.	CH4-CO	-29.93	-29.93	3.84	158.81	95.97	1.000	0.998	0.0
0.	CH4-CO2	-77.55	-77.55	24.13	229.15	96.38	1.000	0.952	0.0
0.	CO2-H2	-4.26	-1.19	63.75	106.91	69.70	1.000	0.930	0.036
0.	CO2-AR	-50.62	-47.71	35.11	196.92	84.25	1.000	0.920	0.028
0.	CO2-N2	-50.88	-48.61	29.41	191.48	92.04	1.000	0.977	0.021
0.	CO2-NE	6.25	8.38	75.78	75.15	64.35	1.000	0.646	0.029

TABLE IX (Continued)

TEMP C	SPECIE	B12,CC/MOL EXP	B12,CC/MOL CALC	E CC/MOL	TPC12 K	VPC12 CC/MOL	ALPHA	BETA	STD DEV
0.	CO2-KR	-82.24	-80.39	24.24	236.72	93.10	1.000	0.938	0.024
0.	CO2-XE	-124.73	-125.11	27.40	275.38	105.92	1.000	0.927	0.005
0.	CO2-CO	-58.44	-57.26	23.65	203.28	93.60	1.000	1.011	0.016
0.	CO2-CH4	-77.55	-77.55	24.13	229.15	96.38	1.000	0.952	0.0
0.	C3H8-H2	1.30	3.58	228.31	96.66	106.8[illegible]	1.000	0.763	0.034
0.	C3H8-AR	-83.26	-82.34	161.47	209.03	126.0[illegible]	1.000	0.885	0.029
0.	C3H8-N2	-71.49	-70.42	167.80	189.90	136.15	1.000	0.879	0.024
0.	C3H8-NE	24.24	26.40	252.77	37.74	99.69	1.000	0.294	0.027
0.	F22-H2	4.97	18.32	216.48	60.05	96.35	1.000	0.474	0.258
C.	F22-AR	-65.67	-56.21	159.55	186.23	114.29	1.000	0.789	0.223
0.	F22-N2	-66.82	-53.55	156.97	177.45	123.80	1.000	0.822	0.201
-25.	H2-AR	2.63	3.75	10.34	82.55	61.75	1.000	1.021	0.018
-25.	H2-NE	13.03	12.26	1.39	33.30	45.72	1.000	0.758	0.022
-25.	H2-CO2	-3.75	-5.08	78.68	106.91	69.70	1.000	0.930	0.036
-25.	H2-C3H8	2.34	-1.54	2[illegible]5.27	96.66	106.83	1.000	0.763	0.034
-25.	H2-F22	42.32	16.09	308.25	60.05	96.35	1.000	0.474	0.258
-25.	AR-H2	2.63	3.75	10.34	82.55	61.75	1.000	1.021	0.018
-25.	AR-N2	-23.73	-22.07	-0.65	137.81	82.43	1.000	0.999	0.017
-25.	AR-CO2	-56.35	-59.87	44.93	196.92	84.25	1.000	0.920	0.028
-25.	AR-C3H8	-98.76	-102.30	205.02	209.03	126.00	1.000	0.885	0.029
-25.	AR-F22	-44.49	-71.32	242.28	186.23	114.29	1.000	0.789	0.223
-25.	N2-AR	-23.73	-22.07	-0.65	137.81	82.43	1.000	0.999	0.017
-25.	N2-NE	9.13	8.59	12.86	66.85	62.83	1.000	0.892	0.018
-25.	N2-CO2	-59.75	-61.31	38.05	191.48	92.04	1.000	0.977	0.021
-25.	N2-C3H8	-85.74	-88.97	212.56	189.90	136.15	1.000	0.879	0.024
-25.	N2-F22	-42.57	-68.72	238.72	177.45	123.80	1.000	0.822	0.201

TABLE IX (Continued)

TEMP C	SPECIE	B12, CC/MOL EXP	B12, CC/MOL CALC	E CC/MOL	TPC12 K	VPC12 CC/MOL	ALPHA	BETA	STD DEV
-25.	NE-H2	13.03	12.26	1.39	33.30	45.72	1.000	0.758	0.022
-25.	NE-N2	9.13	8.59	12.86	66.85	62.83	1.000	0.892	0.018
-25.	NE-CO2	7.85	6.29	91.78	75.15	64.35	1.000	0.646	0.029
-25.	NE-C3H8	28.07	25.26	312.50	37.74	99.69	1.000	0.294	0.[illegible]27
-25.	CO2-H2	-3.75	-5.08	78.68	106.91	69.70	1.000	0.930	0.036
-25.	CO2-AR	-58.35	-59.87	44.93	196.92	84.25	1.000	0.920	0.028
-25.	CO2-N2	-59.75	-61.31	38.05	191.48	92.04	1.000	0.977	0.021
-25.	CO2-NE	7.85	6.29	91.78	75.15	64.35	1.000	0.646	0.029
-25.	C3H8-H2	2.34	-1.54	285.27	96.66	106.83	1.000	0.763	0.034
-25.	C3H8-AR	-98.76	-102.30	205.02	209.03	126.00	1.000	0.885	0.029
-25.	C3H8-N2	-85.74	-88.97	212.56	189.90	136.15	1.000	0.879	0.024
-25.	C3H8-NE	28.07	25.26	312.50	37.74	99.69	1.000	0.294	0.027
-25.	F22-H2	42.32	16.09	308.25	60.05	96.35	1.000	0.474	0.258
-25.	F22-AR	-44.49	-71.32	242.28	186.23	114.29	1.000	0.789	0.223
-25.	F22-N2	-42.57	-68.72	238.72	177.45	123.80	1.000	0.822	0.201
-50.	H2-AR	-0.48	0.75	12.18	82.55	61.75	1.000	1.021	0.018
-50.	H2-N2	4.81	5.19	11.95	71.50	68.09	1.000	0.966	0.014
-50.	H2-NE	12.29	11.70	1.68	33.30	45.72	1.000	0.758	0.022
-50.	H2-KR	-6.44	-5.33	34.99	96.81	68.96	1.000	1.016	0.02[illegible]
-50.	H2-XE	-11.18	-10.86	96.14	105.65	79.51	1.000	0.942	0.008
-50.	H2-CO2	-8.99	-10.13	101.46	106.91	69.70	1.000	0.930	0.036
-50.	AR-H2	-0.48	0.75	12.18	82.55	61.75	1.000	1.021	0.018
-50.	AR-N2	-32.56	-30.89	-0.66	137.81	82.43	1.000	0.999	0.017
-50.	AR-NE	4.45	4.68	18.60	70.37	56.81	1.000	0.859	0.012
-50.	AR-KR	-59.60	-57.82	6.58	175.18	83.41	1.000	0.986	0.028
-50.	AR-XE	-86.50	-85.65	45.57	196.98	95.34	1.000	0.943	0.020

TABLE IX (Continued)

TEMP C	SPECIE	B12, CC/MOL EXP	B12, CC/MOL CALC	E CC/MOL	TPC12 K	VPC12 CC/MOL	ALPHA	BETA	STD DEV
-50.	AR-CO	-34.45	-32.66	-0.49	139.64	83.88	1.000	0.986	0.020
-50.	AR-CH4	-53.80	-47.35	6.70	158.70	86.46	1.000	0.937	0.114
-50.	AR-CO2	-74.78	-75.63	60.43	196.92	84.25	1.000	0.920	0.028
-50.	N2-H2	4.81	5.19	11.95	71.50	68.09	1.000	0.966	0.014
-50.	N2-AR	-32.56	-30.89	-0.66	137.81	82.43	1.000	0.999	0.017
-50.	N2-NE	6.39	6.38	15.02	66.85	62.83	1.000	0.892	0.018
-50.	N2-KR	-52.68	-50.50	7.99	159.45	91.15	1.000	0.981	0.023
-50.	N2-XE	-74.38	-73.87	52.18	177.20	103.79	1.000	0.927	0.007
-50.	N2-CO2	-77.45	-77.79	52.24	191.48	92.04	1.000	0.977	0.021
-50.	NE-H2	12.29	11.70	1.68	33.30	45.72	1.000	0.758	0.022
-5C.	NE-AR	4.45	4.68	18.60	70.37	56.81	1.000	0.859	0.012
-50.	NE-N2	6.39	6.38	15.02	66.85	62.83	1.000	0.892	0.018
-50.	NE-KR	2.45	3.00	45.36	76.63	63.65	1.000	0.794	0.012
-50.	NE-XE	4.80	4.56	113.61	74.03	73.66	1.000	0.652	0.021
-50.	NE-CC	7.83	7.15	18.52	64.95	64.04	1.000	0.844	0.012
-50.	NE-CH4	7.18	6.36	44.41	67.87	66.20	1.000	0.737	0.016
-50.	NE-CO2	3.82	3.58	115.76	75.15	64.35	1.000	0.646	0.029
-50.	KR-H2	-6.44	-5.33	34.99	96.81	68.96	1.000	1.016	0.020
-50.	KR-AR	-59.60	-57.82	6.58	175.18	83.41	1.000	0.986	0.028
-50.	KR-N2	-52.68	-50.5C	7.99	159.45	91.15	1.000	0.981	0.023
-50.	KR-NE	2.45	3.00	45.36	76.63	63.65	1.000	0.794	0.012
-50.	KR-XE	-143.10	-142.73	17.74	241.64	104.94	1.000	0.981	0.014
-50.	KR-CO	-56.92	-54.53	5.81	163.39	92.70	1.000	0.979	0.023
-50.	KR-CH4	-88.92	-88.26	0.34	199.68	95.46	1.000	1.000	0.020
-50.	KR-CC2	-120.27	-121.63	43.71	236.72	93.10	1.000	0.938	0.024
-50.	XE-H2	-11.18	-10.86	96.14	105.65	79.51	1.000	0.942	0.008
-50.	XE-AR	-86.50	-85.65	45.57	196.98	95.34	1.000	0.943	0.020

TABLE IX (Continued)

TEMP C	SPECIE	B12, CC/MOL EXP	B12, CC/MOL CALC	E CC/MOL	TPC12 K	VPC12 CC/MOL	ALPHA	BETA	STD DEV
-50.	XE-N2	-74.38	-73.67	52.18	177.20	103.79	1.000	0.927	0.007
-50.	XE-NE	4.80	4.56	113.61	74.03	73.66	1.000	0.652	0.021
-50.	XE-KR	-143.10	-142.73	17.74	241.64	104.94	1.000	0.981	0.014
-50.	XE-CH4	-135.98	-136.12	19.17	231.89	108.49	1.000	0.987	0.007
-50.	XE-CO2	-185.08	-184.79	44.79	275.38	105.92	1.000	0.927	0.005
-50.	CO-AR	-34.45	-32.66	-0.49	139.64	83.88	1.000	0.986	0.020
-50.	CO-NE	7.83	7.15	18.52	64.95	64.04	1.000	0.844	0.012
-50.	CO-KR	-56.92	-54.53	5.81	163.39	92.70	1.000	0.979	0.023
-50.	CO-CO2	-88.98	-89.86	42.77	203.28	93.60	1.000	1.011	0.016
-50.	CH4-AR	-53.80	-47.35	6.70	158.70	86.46	1.000	0.937	0.114
-50.	CH4-NE	7.18	6.36	44.41	67.87	66.20	1.000	0.737	0.016
-50.	CH4-KR	-88.92	-88.26	0.34	199.68	95.46	1.000	1.000	0.020
-50.	CH4-XE	-135.98	-136.12	19.17	231.89	108.49	1.000	0.987	0.007
-50.	CO2-H2	-8.99	-10.13	101.46	106.91	69.70	1.000	0.930	0.036
-50.	CO2-AR	-74.78	-75.63	60.43	196.92	84.25	1.000	0.920	0.028
-50.	CO2-N2	-77.45	-77.79	52.24	191.48	92.04	1.000	0.977	0.021
-50.	CO2-NE	3.82	3.58	115.76	75.15	64.35	1.000	0.646	0.029
-50.	CO2-KR	-120.27	-121.63	43.71	236.72	93.10	1.000	0.938	0.024
-50.	CO2-XE	-185.08	-184.79	44.79	275.38	105.92	1.000	0.927	0.005
-50.	CO2-CO	-88.98	-89.86	42.77	203.28	93.60	1.000	1.011	0.016
-75.	H2-AR	-4.16	-3.24	15.01	82.55	61.75	1.000	1.021	0.018
-75.	H2-N2	1.20	1.65	14.55	71.50	68.09	1.000	0.966	0.014
-75.	H2-NE	11.23	10.96	1.89	33.30	45.72	1.000	0.758	0.022
-75.	H2-KR	-12.00	-11.03	42.19	96.81	68.96	1.000	1.016	0.020
-75.	H2-XE	-17.52	-18.38	119.05	105.65	79.51	1.000	0.942	0.008
-75.	AR-H2	-4.16	-3.24	15.01	82.55	61.75	1.000	1.021	0.018

TABLE IX (Continued)

TEMP C	SPECIE	B12,CC/MOL EXP	CALC	E CC/MOL	TPC12 K	VPC12 CC/MOL	ALPHA	BETA	STD DEV
-75.	AR-N2	-43.96	-42.67	-0.65	137.81	82.43	1.000	0.999	0.017
-75.	AR-NE	1.46	1.81	22.07	70.37	56.81	1.000	0.859	0.012
-75.	AR-KR	-75.90	-75.17	8.25	175.18	83.41	1.000	0.986	0.028
-75.	AR-XE	-108.02	-109.50	58.52	196.98	95.34	1.000	0.943	0.020
-75.	N2-H2	1.20	1.65	14.55	71.50	68.09	1.000	0.966	0.014
-75.	N2-AR	-43.96	-42.67	-0.65	137.81	82.43	1.000	0.999	0.017
-75.	N2-NE	3.27	3.44	18.06	66.85	62.83	1.000	0.892	0.018
-75.	N2-KR	-67.92	-66.85	10.40	159.45	91.15	1.000	0.981	0.023
-75.	NE-H2	11.23	10.96	1.89	33.30	45.72	1.000	0.758	0.022
-75.	NE-AR	1.46	1.81	22.07	70.37	56.81	1.000	0.859	0.012
-75.	NE-N2	3.27	3.44	18.06	66.85	62.83	1.000	0.892	0.018
-75.	NE-KR	-1.22	-0.68	54.42	76.63	63.65	1.000	0.794	0.012
-75.	NE-XE	0.56	0.54	138.58	74.03	73.66	1.000	0.652	0.021
-75.	KR-H2	-12.00	-11.03	42.19	96.81	68.96	1.000	1.016	0.020
-75.	KR-AR	-75.90	-75.17	8.25	175.18	83.41	1.000	0.986	0.028
-75.	KR-N2	-67.92	-66.85	10.40	159.45	91.15	1.000	0.981	0.023
-75.	KR-NE	-1.22	-0.68	54.42	76.63	63.65	1.000	0.794	0.012
-75.	KR-XE	-177.61	-179.07	23.95	241.64	104.94	1.000	0.981	0.014
-75.	XE-H2	-17.52	-18.38	119.05	105.65	79.51	1.000	0.942	0.008
-75.	XE-AR	-108.02	-109.50	58.52	196.98	95.34	1.000	0.943	0.020
-75.	XE-NE	0.56	0.54	138.58	74.03	73.66	1.000	0.652	0.021
-75.	XE-KR	-177.61	-179.07	23.95	241.64	104.94	1.000	0.981	0.014
-100.	H2-AR	-9.58	-8.75	18.44	82.55	61.75	1.000	1.021	0.018
-100.	H2-N2	-3.39	-3.22	17.96	71.50	68.09	1.000	0.966	0.014
-100.	H2-NE	9.98	9.94	2.18	33.30	45.72	1.000	0.758	0.022
-100.	H2-KR	-19.15	-18.90	52.97	96.81	68.96	1.000	1.016	0.020

TABLE IX (Continued)

TEMP C	SPECIE	B12,CC/MOL EXP	B12,CC/MOL CALC	E CC/MOL	TPC12 K	VPC12 CC/MOL	ALPHA	BETA	STD DEV
-100.	H2-XE	-29.52	-28.76	150.07	105.65	79.51	1.000	0.942	0.008
-100.	AR-H2	-9.58	-8.75	18.44	82.55	61.75	1.000	1.021	0.018
-100.	AR-N2	-59.13	-58.96	-0.60	137.81	82.43	1.000	0.999	0.017
-100.	AR-NE	-2.57	-2.16	26.80	70.37	56.81	1.000	0.859	0.012
-100.	AR-KR	-98.85	-99.22	10.45	175.18	83.41	1.000	0.986	0.028
-100.	AR-XE	-141.24	-142.63	75.52	196.98	95.34	1.000	0.943	0.020
-100.	AR-CO	-62.76	-61.82	-0.22	139.64	83.88	1.000	0.986	0.020
-100.	AR-CH4	-90.89	-84.08	11.05	158.70	86.46	1.000	0.937	0.114
-100.	N2-H2	-3.39	-3.22	17.96	71.50	68.09	1.000	0.966	0.014
-100.	N2-AR	-59.13	-58.96	-0.60	137.81	82.43	1.000	0.999	0.017
-100.	N2-NE	-0.54	-0.61	22.17	66.85	62.83	1.000	0.892	0.018
-100.	N2-KR	-89.14	-89.51	13.49	159.45	91.15	1.000	0.981	0.023
-100.	N2-XE	-125.43	-126.33	84.66	177.20	103.79	1.000	0.927	0.007
-100.	NE-H2	9.98	9.94	2.18	33.30	45.72	1.000	0.758	0.022
-100.	NE-AR	-2.57	-2.16	26.80	70.37	56.81	1.000	0.859	0.012
-100.	NE-N2	-0.54	-0.61	22.17	66.85	62.83	1.000	0.892	0.018
-100.	NE-KR	-6.29	-5.74	67.18	76.63	63.65	1.000	0.794	0.012
-100.	NE-XE	-6.62	-5.02	174.32	74.03	73.66	1.000	0.652	0.021
-100.	NE-CO	0.42	0.33	27.14	64.95	64.04	1.000	0.844	0.012
-100.	NE-CH4	-1.07	-1.18	65.05	67.87	66.20	1.000	0.737	0.016
-100.	KR-H2	-19.15	-18.90	52.97	96.81	68.96	1.000	1.016	0.020
-100.	KR-AR	-98.85	-99.22	10.45	175.18	83.41	1.000	0.986	0.028
-100.	KR-N2	-89.14	-89.51	13.49	159.45	91.15	1.000	0.981	0.023
-100.	KR-NE	-6.29	-5.74	67.18	76.63	63.65	1.000	0.794	0.012
-100.	KR-XE	-229.54	-229.64	31.32	241.64	104.94	1.000	0.981	0.014
-100.	KR-CO	-96.26	-95.76	10.39	163.39	92.70	1.000	0.979	0.023
-100.	KR-CH4	-145.31	-146.56	0.74	199.68	95.46	1.000	1.000	0.020

TABLE IX (Continued)

TEMP C	SPECIE	B12, CC/MOL EXP	B12, CC/MOL CALC	E CC/MOL	TPC12 K	VPC12 CC/MOL	ALPHA	BETA	STD DEV
-100.	XE-H2	-29.52	-28.76	150.07	105.65	79.51	1.000	0.942	0.008
-100.	XE-AR	-141.24	-142.63	75.52	196.98	95.34	1.000	0.943	0.020
-100.	XE-N2	-125.43	-126.33	84.66	177.20	103.79	1.000	0.927	0.007
-100.	XE-NE	-6.62	-5.02	174.32	74.03	73.66	1.000	0.652	0.021
-100.	XE-KR	-229.54	-229.64	31.32	241.64	104.94	1.000	0.981	0.014
-100.	XE-CO	-138.70	-139.51	75.41	184.83	105.48	1.000	0.941	0.016
-100.	XE-CH4	-219.77	-220.23	33.74	231.89	108.49	1.000	0.987	0.007
-100.	CO-AR	-62.76	-61.82	-0.22	139.64	83.88	1.000	0.986	0.020
-100.	CO-NE	0.42	0.33	27.14	64.95	64.04	1.000	0.844	0.012
-100.	CO-KR	-96.26	-95.76	10.39	163.39	92.70	1.000	0.979	0.023
-100.	CO-XE	-138.70	-139.51	75.41	184.83	105.48	1.000	0.941	0.016
-100.	CH4-AR	-90.89	-84.08	11.05	158.70	86.46	1.000	0.937	0.114
-100.	CH4-NE	-1.07	-1.18	65.05	67.87	66.20	1.000	0.737	0.016
-100.	CH4-KR	-145.31	-146.56	0.74	199.68	95.46	1.000	1.000	0.020
-100.	CH4-XE	-219.77	-220.23	33.74	231.89	108.49	1.000	0.987	0.007
-125.	H2-AR	-16.82	-16.73	24.01	82.55	61.75	1.000	1.021	0.018
-125.	H2-N2	-10.32	-10.26	23.06	71.50	68.09	1.000	0.966	0.014
-125.	H2-NE	8.20	8.47	2.63	33.30	45.72	1.000	0.758	0.022
-125.	H2-KR	-28.14	-30.31	70.56	96.81	68.96	1.000	1.016	0.020
-125.	AR-H2	-16.82	-16.73	24.01	82.55	61.75	1.000	1.021	0.018
-125.	AR-N2	-81.58	-82.65	-0.60	137.81	82.43	1.000	0.999	0.017
-125.	AR-NE	-8.36	-7.90	33.68	70.37	56.81	1.000	0.859	0.012
-125.	AR-KR	-131.27	-134.29	15.03	175.18	83.41	1.000	0.986	0.028
-125.	AR-CO	-86.38	-86.44	0.07	139.64	83.88	1.000	0.986	0.020
-125.	AR-CH4	-123.05	-115.14	14.10	158.70	86.46	1.000	0.937	0.114
-125.	N2-H2	-10.32	-10.26	23.06	71.50	68.09	1.000	0.966	0.014

TABLE IX (Continued)

TEMP C	SPECIE	B12,CC/MOL EXP	B12,CC/MOL CALC	E CC/MOL	TPC12 K	VPC12 CC/MOL	ALPHA	BETA	STD DEV
-125.	N2-AR	-81.58	-82.65	-0.60	137.81	82.43	1.000	0.999	0.017
-125.	N2-NE	-6.54	-6.47	28.05	66.85	62.83	1.000	0.892	0.018
-125.	N2-KR	-119.58	-122.50	19.28	159.45	91.15	1.000	0.981	0.023
-125.	NE-H2	8.20	8.47	2.63	33.30	45.72	1.000	0.758	0.022
-125.	NE-AR	-8.36	-7.90	33.68	70.37	56.81	1.000	0.859	0.012
-125.	NE-N2	-6.54	-6.47	28.05	66.85	62.83	1.000	0.892	0.018
-125.	NE-KR	-12.49	-13.07	87.42	76.63	63.65	1.000	0.794	0.012
-125.	NE-CO	-5.64	-5.38	34.41	64.95	64.04	1.000	0.844	0.012
-125.	NE-CH4	-7.82	-7.50	82.93	67.87	66.20	1.000	0.737	0.016
-125.	KR-H2	-28.14	-30.31	70.56	96.81	68.96	1.000	1.016	0.020
-125.	KR-AR	-131.27	-134.29	15.03	175.18	83.41	1.000	0.986	0.028
-125.	KR-N2	-119.58	-122.50	19.28	159.45	91.15	1.000	0.981	0.023
-125.	KR-NE	-12.49	-13.07	87.42	76.63	63.65	1.000	0.794	0.012
-125.	KR-CO	-130.16	-130.64	14.16	163.39	92.70	1.000	0.979	0.023
-125.	KR-CH4	-193.86	-196.05	1.16	199.68	95.46	1.000	1.000	0.020
-125.	CO-AR	-86.38	-86.44	0.07	139.64	83.88	1.000	0.986	0.020
-125.	CO-NE	-5.64	-5.38	34.41	64.95	64.04	1.000	0.844	0.012
-125.	CO-KR	-130.16	-130.64	14.16	163.39	92.70	1.000	0.979	0.023
-125.	CH4-AR	-123.05	-115.14	14.10	158.70	86.46	1.000	0.937	0.114
-125.	CH4-NE	-7.82	-7.50	82.93	67.87	66.20	1.000	0.737	0.016
-125.	CH4-KR	-193.86	-196.05	1.16	199.68	95.46	1.000	1.000	0.020
-150.	H2-AR	-26.87	-29.05	33.70	82.55	61.75	1.000	1.021	0.018
-150.	H2-N2	-21.65	-21.14	31.83	71.50	68.09	1.000	0.966	0.014
-150.	H2-NE	4.75	6.20	3.22	33.30	45.72	1.000	0.758	0.022
-150.	AR-H2	-26.87	-29.05	33.70	82.55	61.75	1.000	1.021	0.018
-150.	AR-N2	-117.48	-119.46	-0.48	137.81	82.43	1.000	0.999	0.017

TABLE IX (Concluded)

TEMP C	SPECIE	B12,CC/MOL EXP	B12,CC/MOL CALC	E CC/MOL	TPC12 K	VPC12 CC/MOL	ALPHA	BETA	STD DEV
-150.	AR-NE	-16.57	-16.75	45.43	70.37	56.81	1.000	0.859	0.012
-150.	AR-CO	-122.81	-124.69	0.66	139.64	83.88	1.000	0.986	0.020
-150.	AR-CH4	-149.07	-163.50	45.12	158.70	86.46	1.000	0.937	0.114
-150.	N2-H2	-21.65	-21.14	31.83	71.50	68.09	1.000	0.966	0.014
-150.	N2-AR	-117.48	-119.46	-0.48	137.81	82.43	1.000	0.999	0.017
-150.	N2-NE	-16.86	-15.52	38.04	66.85	62.83	1.000	0.892	0.018
-150.	NE-H2	4.75	6.20	3.22	33.30	45.72	1.000	0.758	0.022
-150.	NE-AR	-16.57	-16.75	45.43	70.37	56.81	1.000	0.859	0.012
-150.	NE-N2	-16.86	-15.52	38.04	66.85	62.83	1.000	0.892	0.018
-150.	NE-CO	-14.71	-14.20	46.66	64.95	64.04	1.000	0.844	0.012
-150.	NE-CH4	-17.96	-17.26	114.13	67.87	66.20	1.000	0.737	0.016
-150.	KR-CO	-183.13	-184.97	22.71	163.39	92.70	1.000	0.979	0.023
-150.	KR-CH4	-274.90	-273.38	1.66	199.68	95.46	1.000	1.000	0.020
-150.	CO-AR	-122.81	-124.69	0.66	139.64	83.88	1.000	0.986	0.020
-150.	CO-NE	-14.71	-14.20	46.66	64.95	64.04	1.000	0.844	0.012
-150.	CO-KR	-183.13	-184.97	22.71	163.39	92.70	1.000	0.979	0.023
-150.	CH4-AR	-149.07	-163.50	45.12	158.70	86.46	1.000	0.937	0.114
-150.	CH4-NE	-17.96	-17.26	114.13	67.87	66.20	1.000	0.737	0.016
-150.	CH4-KR	-274.90	-273.38	1.66	199.68	95.46	1.000	1.000	0.020

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13. ABSTRACT

Interaction second virial coefficients were determined for 55 binary mixtures, formed from the species: He, Ne, Ar, Kr, Xe, H_2, N_2, CO, CO_2, O_2, CH_4, C_3H_8, and Freon-22 from -150° to 50°C. Pure second virial coefficients were measured for CO, CH_4, Xe, Kr and N_2 from -150° to 0°C. The excess second virial coefficient was determined usually to a precision of 0.1 cc/mole. The experimental results were correlated with the Kihara intermolecular potential function and by a corresponding states method using a modified form of the Redlich-Kwong equation of state.

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	ROLE	WT	ROLE	WT	ROLE	WT
Virial Coefficients						
Second Virial Coefficients						
Interaction Second Virial Coefficients						
Excess Second Virial Coefficients						
PVT of Gases						
Kihara Potential						
Intermolecular Potentials						
Redlich-Kwong Equation of State						
Thermodynamic Properties of Gases						

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