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CALCULATED LIQUID PHASE THERMODYNAMIC PROPERTIES AND LIQUID-VAPOR EQUILIBRIA FOR FLUORINE-OXYGEN (FLOX) MIXTURES

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NATIONAL BUREAU OF STANDARDS, Richard W. Roberts, Director

CONTENTS

* The thermodynamic properties given in these tables are based on the thermochemical BTU = 1054.35J.

CALCULATED LIQUID PHASE THERMODYNAMIC PROPERTIES AND LIQUID-VAPOR EQUILIBRIA FOR FLUORINE-OXYGEN (FLOX) MIXTURES*

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ABSTRACT

Liquid phase thermodynamic properties and liquid-vapor equilibria of fluorine-oxygen mixtures, for which no experimental data exist, have been calculated. The results are based on excess properties predicted from the Snider-Herrington equations, with an adjusted combining rule, and the corresponding data for the pure fluids. Mixtures considered are 0.6, 0.7, 0.8, 0.88, and 0.9 weight fraction of fluorine from 55 to 90K up to 70 x 10^5 Pa. In the compressed liquid, molar volumes, enthalpy, entropy, and constant pressure specific heat were determined. Along the saturation boundary, coexistent vapor compositions and solution vapor pressures were determined as well. Corresponding properties of pure fluorine from experimental data have also been included. Results are tabulated in both British and S.I. units.

Key Words: Calculated properties; enthalpy; entropy; liquid; fluorine; fluorine-oxygen; mixtures; hard-sphere model; liquid-vapor equilibria; specific heat; volume.

1. INTRODUCTION

Liquid mixtures of fluorine and oxygen are potential candidates for oxidizers in chemical rocket propulsion systems. As such, there is a need for thermophysical properties of selected mixtures over a range of temperatures and pressures, for which experimental data do not exist. It is the purpose of this study to provide the "best" calculated mixture properties within the current state-of-the-art.

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To predict the thermodynamic properties and phase equilibria of liquid mixtures reliably, it is essential at some point to introduce appropriate numerical data on the components of the mixture and on the nature of the unlike molecule interactions. The latter information is generally obtained by evaluating some experimental data on the fluid mixture, not necessarily on the property of interest, to account for inadequacies of the combining rules. Calculations can then be made on the property of interest, preferably in regions where some data are available to assess the degree to which the real mixture values are reproduced.

Recent work on hard-sphere perturbation models has resulted in at least one set of relatively simple equations for liquid mixtures, i.e., the Snider-Herrington equations [1], which represent the correct temperature dependence of thermophysical excess properties. Staveley [2] showed that results calculated from these equations compare much better with newer data than with some of the data originally used by the authors. This led Miller, Kidnay, and Hiza [3] to apply the Snider-Herrington equations to the infinite dilution Henry's constants for the neon-krypton system with marked success. In these latter calculations, the adjustment to account for the inadequacy of the combining rule for the energy parameters was consistent with the correlation of Hiza and Duncan [4], making it unnecessary to sacrifice experimental data to obtain information on the unlike molecule interactions. Miller [5] also demonstrated that for a number of other systems, the deviation parameters needed to predict mixture properties with the Snider-Herrington equations are consistent with those obtained from independent gas phase data, which for the most part are properly represented in magnitude by the Hiza-Duncan correlation.

Fluorine-oxygen mixtures are particularly intriguing in the above context, since appropriate data are not available to determine the inadequacies of the combining rules nor to determine the reliability of any calculations. However, accurate data for the pure fluids, fluorine [6] and oxygen[7], are available. If one can postulate something about the nature of the unlike molecule interactions, it is possible to obtain liquid fluorine-oxygen mixture properties from the pure fluid properties data and the excess properties determined with the Snider-Herrington equations.

Though the desired information for fluorine-oxygen interactions is not available, previous experience with comparable oxygen systems can be applied to this problem, since oxygen appears to be the responsible molecule in exceptions encountered in the correlation effort [4]. To model the fluorine-oxygen system after other simple oxygen systems, it must be assumed that fluorine is well-behaved, and that the mixtures formed are purely physical solutions.

In this study, the argon-oxygen system was used as the model to estimate an adjustment to the geometric mean combining rule for the characteristic energy parameter of the fluorine-oxygen system. Fluorine-oxygen liquid mixtures containing 0.6, 0.7, 0.8, 0.88, and 0.9 weight fraction of fluorine and pure fluorine were considered in the present calculations from the saturation boundary up to 70×10^5 Pa from 55 to 90K. The properties determined were molar volume, enthalpy, entropy, and constant pressure specific heat. Along the saturation boundary, the coexistent vapor phase compositions and solution vapor pressures were determined as well.

2. CALCULATION METHODS

The equations used in these calculations are well documented; thus, only the specific logic and unique features of the present calculations are included here.

The form of the equation of state of Longuet-Higgins and Widom [8], upon which the mixture equations of Snider and Herrington are based is:

$$Pv/RT = [(1 + \xi + \xi^2)/(1 - \xi)^3] - (a/RTv) \quad (1)$$

where $\xi = \beta/v$ and β is the hard-sphere volume, $(\frac{1}{6} N_A \pi r^3)$. The second term represents a uniform attractive potential field.

Assuming constant "a" and "β" parameters implies that the configurational $C_V = 0$. Recently, Blinowska, Herrington, and Staveley [9] have taken into account the fact that these parameters are not constant over a range of temperatures. To avoid evaluation of temperature and density dependencies in the present calculations, the parameters "a" and "β" were evaluated from the pure fluid properties at each temperature of interest. The "a" parameter was evaluated from the configurational internal energy (the configurational internal energy of an ideal gas is zero); thus, "β", the hard-sphere volume is the only unknown in equation (1).

In applying their equations, Snider and Herrington used the equimolar G^E (excess Gibbs energy) at one temperature to determine the value of the cross parameter, "a_{12}". Sacrificing mixture data in any form in the present calculations was not possible. Thus, a different scheme had to be devised.

In correlating deviations from the geometric mean combining rule for the characteristic energy parameters [4], the following empirical equation was developed:

$$k_{12} = 0.17(I_1 - I_2)^{1/2} \ln(I_1/I_2) \quad (2),$$

where I is the ionization potential in eV and the subscript one denotes the component with the larger value. The parameter k_{12} is defined as:

$$U_{o_{12}} = (1 - k_{12})\,(U_{o_1}\,U_{o_2})^{1/2} \tag{3}$$

where U_o is the characteristic potential energy parameter. It is anticipated that the deviation parameter k_{12} is always positive.

In comparing predictions of the deviation parameter from equation (2) with observed values for oxygen systems specifically, equation (2) consistently over-predicts the magnitude of k_{12}. This suggests that an effective ionization potential for oxygen, somewhat larger than the observed value of 12.08 eV [10], is necessary to make the predictions for oxygen systems consistent with experiment.

The ionization potential for fluorine is 15.70 - 15.83 eV [11], almost the same as that for argon, 15.79 - 15.94 eV [12]. If one assumes that, in the fluorine-oxygen system, fluorine will be well-behaved and oxygen can be blamed for the unusual behavior noted above, the argon-oxygen system can be used as a model system for the fluorine-oxygen system. This is precisely the assumption made in the present calculations.

In the combining rule used by Miller, Kidnay, and Hiza [3]

$$a_{12} = (1 - k_{12})\,(a_{11}\,a_{22})^{1/2}\,[(r_1 + r_2)/2(r_1\,r_2)^{1/2}]^3 \tag{4}$$

where "r" is the hard-sphere diameter, a k_{12} of 0.015 was selected for the fluorine-oxygen system by examination of the equimolar G^E from argon-oxygen liquid-vapor equilibria data [4].

Since the liquid-vapor equilibria data for argon-oxygen are well represented by the two-suffix Margules equation [13], this framework was used here to establish the liquid phase total vapor pressure and the vapor composition of the fluorine-oxygen system. In this sense, the excess Gibbs energy and the activity coefficient of each component, γ_1 and γ_2, are related to the liquid phase mole fractions, x_1 and x_2, with a single constant, A, by

$$G^E = A\, x_1\, x_2 \qquad (5)$$

$$RT \ln \gamma_1 = A\, x_2^2 \qquad (6)$$

$$RT \ln \gamma_2 = A\, x_1^2 \qquad (7)$$

The standard expression for the activity coefficient of each component

$$RT \ln \gamma_1 = RT \ln (y_1 P/x_1 p_{o_1}) + (B_{11} - v_{o_1})(P - p_{o_1}) + P y_2^2\, \delta_{12} \qquad (8)$$

$$RT \ln \gamma_2 = RT \ln (y_2 P/x_2\, p_{o_2}) + (B_{22} - v_{o_2})(P - p_{o_2}) + P\, y_1^2\, \delta_{12} \qquad (9)$$

can then be related to equations (6) and (7) to obtain two equations in two unknowns, i.e. the solution vapor pressure, P, and the vapor phase mole fraction, y_1 where $(y_1 + y_2 = 1)$. B_{11}, v_{o_1}, and p_{o_1}, and the corresponding terms with a subscript two, are the pure component second virial coefficient, saturated liquid molar volume, and vapor pressure respectively. δ_{12} is an excess interaction second virial coefficient term defined by

$$\delta_{12} = 2B_{12} - B_{11} - B_{22} \qquad (10).$$

The second virial coefficients were calculated using

$$B(T/T_c) = v_c \sum_{i=1}^{5} B_i^* (T/T_c)^{(1-i)/4} \tag{11}$$

where B_i^* are the reduced form of the fitted polynomial coefficients B_i of pure fluorine second virial coefficients given by Prydz and Straty [6]. The relationship between the two sets of coefficients is

$$B_i^* = \frac{B_i \left(T_c\right)^{(1-i)/4}}{v_c} \tag{12}$$

Since the reduced polynomial coefficients for pure oxygen are essentially identical to those for fluorine, i.e. two parameter corresponding states is satisfied, the values of B_i^* for fluorine were used. To obtain B_{12} from equation (11), the following mixing rules were used

$$v_c^{1/3} = v_{c12}^{1/3} = \frac{1}{2}(v_{c1}^{1/3} - v_{c2}^{1/3}) \tag{13}$$

and

$$T_c = T_{c12} = (1 - k_{12})(T_{c1} T_{c2})^{1/2} \tag{14}$$

with a value of k_{12} equal to 0.015.

The value of the constant A in equations (5), (6), and (7) was evaluated at each temperature from the equimolar G^E calculated from the Snider-Herrington equations. All pure component parameters were taken from the experimental data [6, 7].

3. RESULTS

The properties of interest were determined for the selected liquid phase compositions at each temperature in both British and S. I. units. The properties along the saturation boundary and those in the compressed liquid are given in S. I. units in tables A-1 and A-2, respectively. The corresponding properties in British units are given in tables B-1 and B-2. All calculations were done on a molar basis, though some of the properties are given on a weight basis for the convenience of the intended user. Fluorine and oxygen molecular weights of 38.00 and 32.00, respectively, were used in these conversions.

The mixture molar volumes, enthalpies, and entropies are the algebraic sum of the mole fraction average of the pure component properties taken from experiment, the excess property of the mixture calculated from the Snider-Herrington equations, and the ideal mixing contribution. This relationship is simply expressed as

$$M_m = x_1 M_1 + x_2 M_2 + M^E + M^{ideal} \tag{15}$$

where M is the property of interest, the subscript m denotes mixture, and the superscript E denotes excess. The last term, the ideal mixing contribution, is zero except for entropy and thus Gibbs energy, the ideal entropy of mixing being $-R\sum_i x_i \ln x_i$. In calculating the heat capacity of the mixture, it was assumed that the excess heat capacity is zero. The pure fluorine properties for the compressed liquid listed here have been corrected for a computational error in the original internal energy and enthalpy values given in reference 6; the saturated liquid properties were correct as given. Revised thermophysical properties tables for fluorine have been prepared by G. C. Straty and L. A. Weber and will be published soon. The reference state for the pure component thermodynamic properties is the ideal gas at zero K.

It is worth noting that the saturated liquid mixture densities (more correctly, specific weights), reported graphically by Schmidt [14] from "proportional interpolation" of the pure fluid properties, differ significantly from the values determined in this study. It is clear that Schmidt's values were determined by weight fraction averaging of the weights per unit volume of the pure saturated liquids. Thus, his mixture values are not consistent with the traditional definition of an ideal liquid mixture, i. e. the mole fraction average of the molar volumes. For a 70 weight % fluorine mixture at 140R, the saturation specific volume taken from Schmidt is approximately 2. 2% lower than the corresponding value from this study (Table B-1). This difference can be accounted for in three parts (approximately): 0. 4% due to the difference in pure fluid properties used, 1. 4% due to the two different methods of averaging, and 0. 4% due to nonideality considerations accounted for in the present study. If the same pure fluid properties were used, for this mixture, Schmidt's method of averaging results in a negative excess molar volume (equation 15) 1. 4% of the ideal while the present calculations result in a positive excess volume 0. 4% of the ideal.

The validity of the calculated results given here can only be assessed in the final analysis by comparison with appropriate experimental data, which are not available at the present time. At a minimum, two kinds of data at a single T - x point for the liquid mixture can satisfy this requirement. These are precise values of the solution vapor pressure and the saturated liquid excess molar volume for the equimolar liquid mixture at a single temperature, preferably far removed from the critical temperatures of the pure components. An additional piece of experimental data which is desirable, but not absolutely necessary, is the vapor phase composition in equilibrium with the equimolar liquid solution. Without this information, it is hoped that these results are a significant improvement over values of the subject properties obtained by simple mole fraction averaging of the pure fluid (molar) properties.

4. ACKNOWLEDGMENTS

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TABLE A-1. THERMODYNAMIC PROPERTIES OF LIQUID FLUORINE-OXYGEN MIXTURES ON THE SATURATION BOUNDARY

TEMPERATURE	WT. FRACTION F2		PRESSURE	VOLUME	ENTHALPY	ENTROPY	C_P
K	LIQUID	VAPOR	10^5 PA	CM^3/MOL	J/MOL	J/MOL-K	J/MOL-K
	0.6000	0.7562	0.00338	23.41	-5963.57	70.86	54.02
	0.7000	0.8146	0.00355	23.19	-5947.42	69.85	54.17
55.0	0.8000	0.8724	0.00372	22.94	-5937.77	68.34	54.32
	0.8800	0.9204	0.00384	22.74	-5935.40	66.66	54.44
	0.9000	0.9329	0.00387	22.68	-5935.63	66.15	54.47
	1.0000	1.0000	0.00401	22.41	-5942.16	62.39	54.63
	0.6000	0.7524	0.01299	23.84	-5692.30	75.58	54.01
	0.7000	0.8132	0.01367	23.61	-5675.20	74.59	54.16
60.0	0.8000	0.8726	0.01432	23.36	-5664.54	73.10	54.31
	0.8800	0.9212	0.01481	23.15	-5661.32	71.43	54.43
	0.9000	0.9338	0.01493	23.10	-5661.32	70.92	54.46
	1.0000	1.0000	0.01550	22.82	-5666.69	67.18	54.62
	0.6000	0.7468	0.03996	24.28	-5419.60	79.95	54.50
	0.7000	0.8100	0.04203	24.05	-5401.21	78.98	54.72
65.0	0.8000	0.8714	0.04401	23.80	-5389.18	77.51	54.96
	0.8800	0.9211	0.04552	23.59	-5384.79	75.86	55.16
	0.9000	0.9337	0.04589	23.53	-5384.50	75.36	55.21
	1.0000	1.0000	0.04769	23.25	-5388.31	71.64	55.46
	0.6000	0.7402	0.10326	24.75	-5145.50	84.01	54.32
	0.7000	0.8059	0.10853	24.51	-5125.62	83.07	54.51
70.0	0.8000	0.8694	0.11356	24.26	-5112.01	81.62	54.70
	0.8800	0.9203	0.11744	24.05	-5106.29	79.99	54.85
	0.9000	0.9332	0.11839	24.00	-5105.65	79.49	54.89
	1.0000	1.0000	0.12302	23.71	-5107.68	75.80	55.10
	0.6000	0.7333	0.23246	25.25	-4869.73	87.81	54.70
	0.7000	0.8014	0.24404	25.01	-4848.26	86.89	54.94
75.0	0.8000	0.8670	0.25514	24.76	-4832.98	85.47	55.18
	0.8800	0.9192	0.26373	24.55	-4825.87	83.85	55.38
	0.9000	0.9323	0.26583	24.49	-4824.88	83.36	55.43
	1.0000	1.0000	0.27612	24.20	-4825.07	79.69	55.69
	0.6000	0.7267	0.46837	25.78	-4592.60	91.39	54.96
	0.7000	0.7971	0.49116	25.55	-4569.39	90.49	55.20
80.0	0.8000	0.8646	0.51308	25.30	-4552.15	89.09	55.46
	0.8800	0.9180	0.53008	25.08	-4543.54	87.49	55.67
	0.9000	0.9315	0.53426	25.02	-4542.16	87.01	55.72
	1.0000	1.0000	0.55473	24.73	-4540.38	83.36	56.00
	0.6000	0.7208	0.86232	26.35	-4313.57	94.75	55.65
	0.7000	0.7932	0.90342	26.12	-4288.44	93.88	55.97
85.0	0.8000	0.8625	0.94315	25.87	-4269.34	92.50	56.31
	0.8800	0.9170	0.97407	25.65	-4259.04	90.93	56.59
	0.9000	0.9307	0.98168	25.60	-4257.09	90.44	56.67
	1.0000	1.0000	1.01909	25.30	-4253.20	86.82	57.03
	0.6000	0.7154	1.47487	26.97	-4031.98	97.96	56.53
	0.7000	0.7895	1.54399	26.73	-4004.77	97.11	56.96
90.0	0.8000	0.8605	1.61112	26.48	-3983.51	95.76	57.40
	0.8800	0.9161	1.66359	26.27	-3971.43	94.20	57.76
	0.9000	0.9300	1.67654	26.21	-3969.16	93.72	57.86
	1.0000	1.0000	1.74034	25.91	-3962.81	90.12	58.33
	0.6000	0.7101	2.37502	27.64	-3746.61	101.03	57.17
	0.7000	0.7850	2.48455	27.41	-3717.20	100.20	57.63
95.0	0.8000	0.8584	2.59143	27.16	-3693.67	98.87	58.10
	0.8800	0.9150	2.67529	26.95	-3679.70	97.33	58.49
	0.9000	0.9291	2.69604	26.89	-3676.96	96.86	58.58
	1.0000	1.0000	2.79849	26.59	-3668.18	93.28	59.09

TABLE A-2. THERMODYNAMIC PROPERTIES OF FLUORINE-OXYGEN MIXTURES IN THE COMPRESSED LIQUID REGION

WT. FRACTION F2 =0.60

PRESSURE 10^5 PA	TEMPERATURE K	VOLUME CM^3/MOL	ENTHALPY J/MOL	ENTROPY J/MOL-K	C_P J/MOL-K
	55.0	23.41	-5962.54	70.86	54.37
	60.0	23.84	-5691.38	75.58	54.78
0.50000	65.0	24.28	-5418.43	79.94	55.79
	70.0	24.75	-5145.23	84.00	54.72
	75.0	25.25	-4869.38	87.81	55.27
	55.0	23.40	-5954.06	70.82	54.30
	60.0	23.82	-5683.02	75.54	54.75
	65.0	24.27	-5410.24	79.90	55.81
	70.0	24.73	-5137.10	83.96	54.72
5.00000	75.0	25.24	-4861.49	87.76	55.32
	80.0	25.76	-4584.94	91.34	55.34
	85.0	26.33	-4306.06	94.71	55.65
	90.0	26.95	-4026.87	97.92	56.44
	95.0	27.62	-3743.31	100.99	57.22
	55.0	23.37	-5925.74	70.70	54.10
	60.0	23.79	-5655.08	75.41	54.65
	65.0	24.23	-5382.64	79.77	55.82
	70.0	24.69	-5110.01	83.82	54.68
20.00000	75.0	25.18	-4835.14	87.61	55.44
	80.0	25.71	-4559.37	91.17	55.33
	85.0	26.26	-4282.46	94.53	55.62
	90.0	26.87	-4003.78	97.73	56.06
	95.0	27.52	-3721.97	100.78	56.88
	55.0	23.34	-5888.12	70.54	53.83
	60.0	23.75	-5617.75	75.24	54.57
	65.0	24.18	-5345.81	79.60	55.10
	70.0	24.63	-5073.81	83.63	54.62
40.00000	75.0	25.12	-4799.98	87.42	55.06
	80.0	25.63	-4525.19	90.96	55.26
	85.0	26.18	-4249.50	94.31	55.30
	90.0	26.76	-3972.55	97.48	55.69
	95.0	27.39	-3692.57	100.51	56.30
	60.0	23.71	-5580.47	75.08	54.49
	65.0	24.13	-5309.12	79.43	55.12
	70.0	24.58	-5037.55	83.45	54.55
60.00000	75.0	25.05	-4764.56	87.22	55.07
	80.0	25.55	-4490.39	90.76	55.16
	85.0	26.09	-4216.18	94.09	55.16
	90.0	26.66	-3940.33	97.24	55.40
	95.0	27.27	-3662.58	100.25	55.95

PRESSURE 10^5 PA	TEMPERATURE K	VOLUME CM^3/MOL	ENTHALPY J/MOL	ENTROPY J/MOL-K	C_P J/MOL-K
	55.0	23.41	-5961.58	70.85	54.36
	60.0	23.83	-5690.44	75.57	54.77
1.01325	65.0	24.23	-5417.49	79.94	55.79
	70.0	24.74	-5144.30	84.00	54.72
	75.0	25.25	-4868.48	87.80	55.28
	80.0	25.73	-4591.73	91.38	55.33
	55.0	23.39	-5944.62	70.78	54.23
	60.0	23.81	-5673.62	75.50	54.71
	65.0	24.26	-5401.03	79.86	55.82
	70.0	24.72	-5128.07	83.91	54.70
10.00000	75.0	25.22	-4852.70	87.71	55.36
	80.0	25.74	-4576.41	91.28	55.34
	85.0	26.31	-4298.81	94.65	55.65
	90.0	26.92	-4019.21	97.85	56.30
	95.0	27.59	-3736.20	100.92	57.11
	55.0	23.35	-5907.02	70.62	53.96
	60.0	23.77	-5636.46	75.33	54.60
	65.0	24.21	-5364.30	79.68	55.80
	70.0	24.66	-5091.92	83.72	54.65
30.00000	75.0	25.15	-4817.64	87.51	55.02
	80.0	25.67	-4542.29	91.07	55.30
	85.0	26.22	-4266.04	94.42	55.34
	90.0	26.82	-3988.23	97.60	55.86
	95.0	27.45	-3707.31	100.65	56.49
	55.0	23.32	-5869.60	70.46	53.94
	60.0	23.73	-5599.14	75.16	54.53
	65.0	24.15	-5327.46	79.51	55.12
	70.0	24.61	-5055.68	83.54	54.58
50.00000	75.0	25.03	-4782.32	87.32	55.07
	80.0	25.59	-4508.05	90.86	55.22
	85.0	26.13	-4232.92	94.20	55.24
	90.0	26.71	-3956.74	97.36	55.53
	95.0	27.34	-3677.68	100.38	56.12
	60.0	23.69	-5561.78	75.00	54.45
	65.0	24.11	-5290.76	79.34	55.10
	70.0	24.55	-5019.40	83.36	54.51
70.00000	75.0	25.02	-4746.99	87.13	55.06
	80.0	25.52	-4473.69	90.56	55.10
	85.0	26.05	-4199.49	93.98	55.08
	90.0	26.61	-3924.81	97.12	55.28
	95.0	27.21	-3647.56	100.13	55.79

TABLE A-2. THERMODYNAMIC PROPERTIES OF FLUORINE-OXYGEN MIXTURES IN THE COMPRESSED LIQUID REGION

WT. FRACTION F2 =0.70

PRESSURE 10^5PA	TEMPERATURE K	VOLUME CM^3/MOL	ENTHALPY J/MOL	ENTROPY J/MOL-K	C_P J/MOL-K
	55.0	23.19	-5946.39	69.85	54.57
	60.0	23.61	-5674.30	74.59	55.07
0.50000	65.0	24.05	-5400.01	78.98	56.26
	70.0	24.51	-5125.46	83.05	54.98
	75.0	25.01	-4847.32	86.89	55.61
	55.0	23.18	-5937.99	69.81	54.50
	60.0	23.59	-5666.03	74.55	55.03
	65.0	24.04	-5391.32	78.94	56.29
	70.0	24.50	-5117.41	83.01	54.98
5.00000	75.0	25.00	-4840.12	86.84	55.67
	80.0	25.53	-4561.34	90.44	55.66
	85.0	26.10	-4281.39	93.84	55.99
	90.0	26.71	-3999.33	97.06	56.86
	95.0	27.39	-3714.08	100.16	57.70
	55.0	23.14	-5909.38	69.70	54.27
	60.0	23.56	-5638.40	74.42	54.93
	65.0	24.00	-5364.61	78.81	56.31
	70.0	24.46	-5090.61	82.87	54.96
20.00000	75.0	24.95	-4814.09	86.69	55.84
	80.0	25.48	-4536.60	90.28	55.68
	85.0	26.03	-4257.86	93.66	55.99
	90.0	26.64	-3977.17	96.88	56.46
	95.0	27.30	-3693.11	99.95	57.35
	55.0	23.11	-5872.78	69.54	53.96
	60.0	23.52	-5601.46	74.26	54.85
	65.0	23.95	-5328.17	78.63	55.49
	70.0	24.40	-5054.81	82.69	54.91
40.00000	75.0	24.89	-4779.38	86.50	55.42
	80.0	25.40	-4502.38	90.07	55.64
	85.0	25.94	-4225.37	93.44	55.65
	90.0	26.53	-3946.48	96.63	56.07
	95.0	27.16	-3664.39	99.68	56.73
	60.0	23.48	-5564.61	74.09	54.77
	65.0	23.90	-5291.92	78.46	55.52
	70.0	24.35	-5019.35	82.51	54.85
60.00000	75.0	24.82	-4744.61	86.30	55.46
	80.0	25.32	-4469.06	89.86	55.55
	85.0	25.86	-4192.51	93.22	55.53
	90.0	26.43	-3915.29	96.39	55.77
	95.0	27.05	-3635.09	99.42	56.37

PRESSURE 10^5PA	TEMPERATURE K	VOLUME CM^3/MOL	ENTHALPY J/MOL	ENTROPY J/MOL-K	C_P J/MOL-K
	55.0	23.13	-5945.43	69.84	54.57
	60.0	23.63	-5673.36	74.58	55.06
1.01325	65.0	24.05	-5399.08	78.98	56.26
	70.0	24.51	-5124.53	83.05	54.98
	75.0	25.01	-4847.03	86.88	55.62
	80.0	25.55	-4568.54	90.48	55.65
	55.0	23.17	-5928.65	69.77	54.42
	60.0	23.58	-5656.71	74.51	54.99
	65.0	24.02	-5382.81	78.90	56.30
	70.0	24.48	-5108.48	82.95	54.97
10.00000	75.0	24.98	-4831.43	86.79	55.74
	80.0	25.51	-4553.42	90.39	55.68
	85.0	26.08	-4273.96	93.77	56.00
	90.0	26.63	-3992.32	97.00	56.71
	95.0	27.36	-3707.13	100.09	57.58
	55.0	23.12	-5891.49	69.62	54.11
	60.0	23.54	-5619.98	74.34	54.88
	65.0	23.98	-5346.48	78.72	56.30
	70.0	24.43	-5072.72	82.78	54.94
30.00000	75.0	24.92	-4796.83	86.59	55.36
	80.0	25.43	-4519.75	90.17	55.67
	85.0	25.99	-4241.68	93.55	55.68
	90.0	26.59	-3961.89	96.75	56.25
	95.0	27.23	-3678.84	99.82	56.92
	55.0	23.09	-5854.53	69.45	54.10
	60.0	23.50	-5583.08	74.18	54.81
	65.0	23.93	-5310.04	78.54	55.51
	70.0	24.38	-5036.89	82.60	54.88
50.00000	75.0	24.85	-4761.95	86.40	55.45
	80.0	25.36	-4485.98	89.96	55.60
	85.0	25.90	-4209.03	93.32	55.60
	90.0	26.48	-3930.94	96.51	55.91
	95.0	27.11	-3649.80	99.55	56.54
	60.0	23.45	-5546.12	74.01	54.73
	65.0	23.88	-5273.79	78.37	55.51
	70.0	24.32	-5001.02	82.42	54.81
70.00000	75.0	24.73	-4727.07	86.21	55.46
	80.0	25.29	-4452.10	89.76	55.49
	85.0	25.82	-4176.07	93.11	55.46
	90.0	26.33	-3893.53	96.27	55.65
	95.0	26.93	-3620.25	99.29	56.22

TABLE A-2. THERMODYNAMIC PROPERTIES OF FLUORINE-OXYGEN MIXTURES IN THE COMPRESSED LIQUID REGION

WT. FRACTION F2 =0.80

PRESSURE 10^5 PA	TEMPERATURE K	VOLUME CM^3/MOL	ENTHALPY J/MOL	ENTROPY J/MOL-K	C_P J/MOL-K
0.50000	55.0	22.94	-5936.73	68.34	54.79
	60.0	23.36	-5663.65	73.10	55.36
	65.0	23.80	-5387.34	77.51	56.75
	70.0	24.26	-5111.36	81.60	55.25
	75.0	24.76	-4832.64	85.47	55.96
5.00000	55.0	22.93	-5928.43	68.31	54.71
	60.0	23.35	-5655.47	73.06	55.33
	65.0	23.79	-5379.05	77.47	56.78
	70.0	24.25	-5103.09	81.57	55.25
	75.0	24.75	-4824.33	85.42	56.04
	80.0	25.28	-4544.83	89.04	56.00
	85.0	25.85	-4263.03	92.46	56.35
	90.0	26.46	-3978.71	95.71	57.30
	95.0	27.14	-3690.68	98.84	58.19
20.00000	55.0	22.90	-5900.72	68.19	54.44
	60.0	23.32	-5628.15	72.93	55.22
	65.0	23.76	-5352.33	77.34	56.83
	70.0	24.21	-5077.48	81.43	55.24
	75.0	24.70	-4799.22	85.27	56.26
	80.0	25.22	-4519.91	88.88	56.05
	85.0	25.78	-4239.25	92.28	56.37
	90.0	26.39	-3956.46	95.53	56.87
	95.0	27.05	-3673.16	98.62	57.83
40.00000	55.0	22.87	-5863.95	68.03	54.10
	60.0	23.28	-5591.62	72.77	55.14
	65.0	23.70	-5316.39	77.17	55.88
	70.0	24.15	-5042.08	81.24	55.21
	75.0	24.64	-4764.96	85.08	55.80
	80.0	25.15	-4486.66	88.67	56.03
	85.0	25.69	-4207.23	92.06	56.01
	90.0	26.29	-3926.30	95.28	56.46
	95.0	26.92	-3642.01	98.35	57.17
60.00000	60.0	23.23	-5555.19	72.60	55.06
	65.0	23.66	-5281.08	77.00	55.94
	70.0	24.10	-5006.63	81.06	55.16
	75.0	24.57	-4730.54	84.88	55.86
	80.0	25.08	-4453.31	88.46	55.96
	85.0	25.61	-4174.33	91.84	55.91
	90.0	26.18	-3895.63	95.04	56.16
	95.0	26.80	-3613.28	98.09	56.81

PRESSURE 10^5 PA	TEMPERATURE K	VOLUME CM^3/MOL	ENTHALPY J/MOL	ENTROPY J/MOL-K	C_P J/MOL-K
1.01325	55.0	22.94	-5935.79	68.33	54.78
	60.0	23.36	-5662.72	73.09	55.36
	65.0	23.80	-5387.02	77.51	56.75
	70.0	24.26	-5111.04	81.61	55.25
	75.0	24.76	-4831.76	85.46	55.97
	80.0	25.30	-4551.45	89.08	55.98
10.00000	55.0	22.92	-5919.19	68.27	54.62
	60.0	23.34	-5646.24	73.02	55.28
	65.0	23.73	-5370.93	77.43	56.81
	70.0	24.23	-5095.16	81.52	55.25
	75.0	24.73	-4816.34	85.37	56.12
	80.0	25.25	-4536.52	88.99	56.03
	85.0	25.83	-4255.11	92.40	56.36
	90.0	26.44	-3971.33	95.65	57.14
	95.0	27.11	-3683.88	98.76	58.07
30.00000	55.0	22.83	-5882.46	68.11	54.27
	60.0	23.30	-5609.95	72.85	55.17
	65.0	23.73	-5335.01	77.25	56.83
	70.0	24.18	-5053.79	81.33	55.23
	75.0	24.67	-4782.20	85.17	55.72
	80.0	25.19	-4503.29	88.77	56.05
	85.0	25.74	-4223.31	92.17	56.03
	90.0	26.34	-3941.45	95.40	56.65
	95.0	26.98	-3656.18	98.49	57.36
50.00000	55.0	22.85	-5845.99	67.95	54.27
	60.0	23.26	-5573.46	72.69	55.10
	65.0	23.68	-5298.98	77.08	55.92
	70.0	24.13	-5024.36	81.15	55.18
	75.0	24.60	-4747.74	84.98	55.84
	80.0	25.11	-4469.99	88.56	56.00
	85.0	25.65	-4191.12	91.95	55.97
	90.0	26.23	-3911.02	95.16	56.30
	95.0	26.85	-3627.70	98.22	56.98
70.00000	60.0	23.21	-5536.92	72.52	55.02
	65.0	23.64	-5263.17	76.91	55.94
	70.0	24.08	-4988.91	80.97	55.13
	75.0	24.54	-4713.33	84.79	55.88
	80.0	25.04	-4436.59	88.36	55.90
	85.0	25.57	-4159.63	91.73	55.84
	90.0	26.13	-3880.12	94.92	56.04
	95.0	26.74	-3598.72	97.96	56.66

TABLE A-2. THERMODYNAMIC PROPERTIES OF FLUORINE-OXYGEN MIXTURES IN THE COMPRESSED LIQUID REGION

WT. FRACTION F2 =0.88

PRESSURE 10^5 PA	TEMPERATURE K	VOLUME CM^3/MOL	ENTHALPY J/MOL	ENTROPY J/MOL-K	C_P J/MOL-K
0.50000	55.0	22.74	-5934.36	66.66	54.96
	60.0	23.15	-5660.42	71.43	55.61
	65.0	23.59	-5383.51	75.86	57.15
	70.0	24.05	-5106.33	79.97	55.47
	75.0	24.55	-4825.51	83.85	56.26
1.01325	55.0	22.74	-5933.42	66.65	54.96
	60.0	23.15	-5659.51	71.42	55.60
	65.0	23.59	-5382.61	75.86	57.15
	70.0	24.04	-5105.42	79.97	55.47
	75.0	24.55	-4824.64	83.84	56.26
	80.0	25.09	-4542.81	87.48	56.25
5.00000	55.0	22.73	-5926.13	66.62	54.88
	60.0	23.14	-5652.33	71.39	55.57
	65.0	23.58	-5375.62	75.82	57.19
	70.0	24.03	-5098.43	79.93	55.48
	75.0	24.54	-4817.88	83.80	56.35
	80.0	25.06	-4536.26	87.44	56.28
	85.0	25.63	-4252.32	90.89	56.64
	90.0	26.25	-3966.71	94.16	57.66
	95.0	26.93	-3676.30	97.30	58.60
10.00000	55.0	22.72	-5916.97	66.58	54.78
	60.0	23.13	-5643.16	71.35	55.53
	65.0	23.57	-5366.67	75.78	57.22
	70.0	24.02	-5089.67	79.88	55.48
	75.0	24.52	-4809.37	83.75	56.44
	80.0	25.04	-4528.03	87.39	56.32
	85.0	25.61	-4245.00	90.83	56.66
	90.0	26.22	-3959.44	94.09	57.49
	95.0	26.89	-3670.11	97.22	58.48
20.00000	55.0	22.70	-5898.67	66.50	54.59
	60.0	23.11	-5625.26	71.27	55.46
	65.0	23.55	-5348.93	75.69	57.26
	70.0	24.00	-5072.15	79.79	55.48
	75.0	24.49	-4792.42	83.65	56.60
	80.0	25.01	-4511.59	87.28	56.35
	85.0	25.56	-4229.32	90.71	56.69
	90.0	26.17	-3944.78	93.97	57.20
	95.0	26.83	-3656.63	97.08	58.23
30.00000	55.0	22.68	-5880.60	66.42	54.40
	60.0	23.09	-5607.22	71.18	55.41
	65.0	23.52	-5331.07	75.60	57.26
	70.0	23.97	-5054.61	79.70	55.47
	75.0	24.45	-4775.59	83.55	56.01
	80.0	24.97	-4495.14	87.18	56.36
	85.0	25.52	-4213.57	90.60	56.32
	90.0	26.12	-3929.98	93.84	56.98
	95.0	26.76	-3642.87	96.95	57.73
40.00000	55.0	22.67	-5862.25	66.35	54.22
	60.0	23.07	-5589.05	71.10	55.38
	65.0	23.49	-5313.10	75.52	56.21
	70.0	23.94	-5037.06	79.61	55.46
	75.0	24.42	-4758.52	83.46	56.11
	80.0	24.94	-4478.69	87.07	56.36
	85.0	25.48	-4197.67	90.49	56.31
	90.0	26.07	-3915.04	93.72	56.79
	95.0	26.70	-3628.92	96.81	57.54
50.00000	55.0	22.65	-5844.52	66.26	54.41
	60.0	23.05	-5571.07	71.02	55.35
	65.0	23.47	-5295.36	75.43	56.26
	70.0	23.92	-5019.51	79.52	55.44
	75.0	24.39	-4741.48	83.36	56.17
	80.0	24.90	-4462.22	86.96	56.33
	85.0	25.44	-4181.74	90.38	56.28
	90.0	26.02	-3899.96	93.60	56.62
	95.0	26.65	-3614.83	96.68	57.34
60.00000	60.0	23.03	-5552.37	70.94	55.30
	65.0	23.45	-5277.64	75.35	56.29
	70.0	23.89	-5001.94	79.43	55.41
	75.0	24.36	-4724.45	83.26	56.20
	80.0	24.86	-4445.73	86.86	56.30
	85.0	25.40	-4165.62	90.27	56.23
	90.0	25.97	-3884.77	93.48	56.48
	95.0	26.59	-3600.62	96.55	57.18
70.00000	60.0	23.01	-5534.86	70.86	55.26
	65.0	23.43	-5259.91	75.26	56.29
	70.0	23.87	-4984.36	79.34	55.39
	75.0	24.33	-4707.43	83.17	56.22
	80.0	24.82	-4429.20	86.76	56.24
	85.0	25.35	-4143.61	90.16	56.16
	90.0	25.92	-3863.47	93.35	56.36
	95.0	26.53	-3586.28	96.42	57.02

TABLE A-2. THERMODYNAMIC PROPERTIES OF FLUORINE-OXYGEN MIXTURES IN THE COMPRESSED LIQUID REGION

WT. FRACTION F2 =0.90

PRESSURE 10^5PA	TEMPERATURE K	VOLUME CM^3/MOL	ENTHALPY J/MOL	ENTROPY J/MOL-K	C_P J/MOL-K
0.50000	55.0	22.68	-5934.58	66.15	55.01
	60.0	23.10	-5660.43	70.92	55.67
	65.0	23.53	-5383.21	75.36	57.25
	70.0	24.00	-5105.71	79.47	55.53
	75.0	24.49	-4824.51	83.36	56.33
5.00000	55.0	22.67	-5926.37	66.11	54.92
	60.0	23.09	-5652.35	70.88	55.63
	65.0	23.52	-5375.33	75.32	57.30
	70.0	23.98	-5097.83	79.43	55.54
	75.0	24.48	-4816.90	83.31	56.42
	80.0	25.00	-4534.88	86.96	56.36
	85.0	25.58	-4251.03	90.40	56.71
	90.0	26.19	-3964.46	93.68	57.75
	95.0	26.87	-3674.07	96.82	58.70
20.00000	55.0	22.64	-5898.98	65.99	54.63
	60.0	23.06	-5625.35	70.76	55.52
	65.0	23.49	-5348.60	75.19	57.37
	70.0	23.95	-5071.61	79.29	55.54
	75.0	24.43	-4791.50	83.16	56.69
	80.0	24.95	-4510.28	86.80	56.43
	85.0	25.50	-4227.60	90.22	56.77
	90.0	26.12	-3942.61	93.49	57.29
	95.0	26.76	-3653.98	96.61	58.33
40.00000	55.0	22.61	-5862.64	65.84	54.25
	60.0	23.02	-5589.22	70.59	55.44
	65.0	23.44	-5312.95	75.01	56.29
	70.0	23.88	-5036.60	79.11	55.53
	75.0	24.37	-4757.69	82.97	56.19
	80.0	24.88	-4477.47	86.58	56.44
	85.0	25.42	-4196.03	90.00	56.39
	90.0	26.01	-3912.37	93.24	56.87
	95.0	26.65	-3626.38	96.34	57.63
60.00000	60.0	22.98	-5553.23	70.43	55.37
	65.0	23.40	-5277.58	74.84	56.38
	70.0	23.83	-5001.56	78.93	55.48
	75.0	24.31	-4723.71	82.77	56.28
	80.0	24.81	-4444.60	86.38	56.38
	85.0	25.34	-4164.07	89.78	56.31
	90.0	25.91	-3882.30	93.00	56.56
	95.0	26.53	-3598.19	96.08	57.27

PRESSURE 10^5PA	TEMPERATURE K	VOLUME CM^3/MOL	ENTHALPY J/MOL	ENTROPY J/MOL-K	C_P J/MOL-K
1.01325	55.0	22.69	-5933.65	66.14	55.00
	60.0	23.10	-5659.52	70.92	55.66
	65.0	23.53	-5382.31	75.36	57.25
	70.0	23.99	-5104.80	79.47	55.53
	75.0	24.49	-4823.64	83.35	56.34
	80.0	25.02	-4541.42	87.00	56.32
10.00000	55.0	22.66	-5917.23	66.07	54.82
	60.0	23.08	-5643.20	70.84	55.59
	65.0	23.51	-5366.41	75.28	57.33
	70.0	23.97	-5089.09	79.38	55.54
	75.0	24.46	-4808.41	83.26	56.52
	80.0	24.98	-4526.67	86.91	56.39
	85.0	25.56	-4243.23	90.34	56.74
	90.0	26.17	-3957.21	93.61	57.58
	95.0	26.84	-3667.41	96.75	58.58
30.00000	55.0	22.62	-5880.96	65.91	54.43
	60.0	23.04	-5607.35	70.67	55.47
	65.0	23.47	-5330.88	75.10	57.37
	70.0	23.91	-5054.11	79.20	55.53
	75.0	24.40	-4774.72	83.06	56.08
	80.0	24.91	-4493.88	86.69	56.44
	85.0	25.46	-4211.89	90.11	56.39
	90.0	26.07	-3927.86	93.36	57.06
	95.0	26.71	-3640.28	96.48	57.82
50.00000	55.0	22.59	-5844.97	65.75	54.45
	60.0	23.00	-5571.28	70.51	55.41
	65.0	23.42	-5295.26	74.92	56.35
	70.0	23.86	-5019.09	79.02	55.50
	75.0	24.34	-4740.69	82.87	56.25
	80.0	24.84	-4461.04	86.48	56.42
	85.0	25.38	-4180.15	89.89	56.36
	90.0	25.96	-3897.94	93.12	56.70
	95.0	26.59	-3612.34	96.21	57.44
70.00000	60.0	22.96	-5535.16	70.35	55.33
	65.0	23.38	-5253.89	74.75	56.38
	70.0	23.81	-4984.04	78.84	55.45
	75.0	24.28	-4706.74	82.68	56.31
	80.0	24.77	-4428.12	86.28	56.33
	85.0	25.30	-4148.11	89.67	56.24
	90.0	25.86	-3867.55	92.88	56.44
	95.0	26.47	-3583.91	95.95	57.11

TABLE A-2. THERMODYNAMIC PROPERTIES OF FLUORINE-OXYGEN MIXTURES IN THE COMPRESSED LIQUID REGION

WT. FRACTION F2 =1.00

PRESSURE 10^5 PA	TEMPERATURE K	VOLUME CM^3/MOL	ENTHALPY J/MOL	ENTROPY J/MOL-K	C_P J/MOL-K
0.50000	55.0	22.41	-5941.30	62.39	55.24
	60.0	22.82	-5665.31	67.18	55.99
	65.0	23.25	-5386.38	71.64	57.78
	70.0	23.71	-5107.36	75.78	55.82
	75.0	24.20	-4824.68	79.69	56.71
5.00000	55.0	22.40	-5933.20	62.35	55.14
	60.0	22.81	-5657.32	67.14	55.95
	65.0	23.24	-5379.21	71.60	57.83
	70.0	23.69	-5100.07	75.74	55.83
	75.0	24.19	-4817.16	79.64	56.82
	80.0	24.71	-4533.18	83.31	56.72
	85.0	25.28	-4247.11	86.78	57.09
	90.0	25.89	-3958.19	90.08	58.22
	95.0	26.57	-3665.35	93.25	59.23
20.00000	55.0	22.37	-5906.17	62.23	54.82
	60.0	22.78	-5631.16	67.02	55.83
	65.0	23.21	-5352.95	71.47	57.92
	70.0	23.66	-5074.12	75.60	55.85
	75.0	24.14	-4792.07	79.49	57.14
	80.0	24.66	-4508.98	83.15	56.82
	85.0	25.21	-4224.01	86.60	57.18
	90.0	25.82	-3936.72	89.89	57.73
	95.0	26.48	-3645.67	93.03	58.85
40.00000	55.0	22.34	-5870.02	62.08	54.40
	60.0	22.74	-5595.54	66.85	55.75
	65.0	23.16	-5317.64	71.30	56.72
	70.0	23.60	-5039.51	75.42	55.85
	75.0	24.08	-4758.70	79.30	56.59
	80.0	24.59	-4476.50	82.94	56.86
	85.0	25.13	-4192.39	86.38	56.78
	90.0	25.72	-3907.58	89.64	57.29
	95.0	26.35	-3618.59	92.76	58.11
60.00000	55.0	22.30	-5834.56	61.91	54.41
	60.0	22.70	-5559.36	66.69	55.68
	65.0	23.12	-5282.67	71.13	56.83
	70.0	23.55	-5004.38	75.24	55.81
	75.0	24.02	-4725.16	79.10	56.72
	80.0	24.52	-4444.08	82.73	56.82
	85.0	25.05	-4161.53	86.16	56.72
	90.0	25.62	-3877.30	89.40	56.98
	95.0	26.24	-3590.32	92.50	57.74

PRESSURE 10^5 PA	TEMPERATURE K	VOLUME CM^3/MOL	ENTHALPY J/MOL	ENTROPY J/MOL-K	C_P J/MOL-K
1.01325	55.0	22.41	-5940.38	62.38	55.23
	60.0	22.82	-5664.90	67.18	55.98
	65.0	23.25	-5386.09	71.64	57.78
	70.0	23.70	-5106.97	75.78	55.82
	75.0	24.20	-4823.82	79.68	56.72
	80.0	24.73	-4539.64	83.35	56.68
10.00000	55.0	22.39	-5924.18	62.31	55.03
	60.0	22.80	-5648.94	67.10	55.90
	65.0	23.23	-5370.59	71.56	57.87
	70.0	23.68	-5091.42	75.69	55.84
	75.0	24.17	-4808.77	79.59	56.94
	80.0	24.69	-4525.07	83.26	56.77
	85.0	25.26	-4239.42	86.72	57.13
	90.0	25.87	-3951.07	90.01	58.04
	95.0	26.54	-3653.82	93.17	59.11
30.00000	55.0	22.35	-5888.14	62.15	54.60
	60.0	22.76	-5613.36	66.93	55.78
	65.0	23.19	-5335.41	71.38	57.93
	70.0	23.63	-5056.82	75.51	55.85
	75.0	24.11	-4775.52	79.39	56.46
	80.0	24.62	-4492.69	83.04	56.85
	85.0	25.17	-4208.53	86.49	56.77
	90.0	25.77	-3922.22	89.76	57.49
	95.0	26.41	-3632.24	92.90	58.30
50.00000	55.0	22.32	-5852.64	61.99	54.63
	60.0	22.72	-5577.70	66.77	55.72
	65.0	23.14	-5300.15	71.21	56.79
	70.0	23.58	-5022.20	75.33	55.83
	75.0	24.05	-4741.92	79.20	56.67
	80.0	24.55	-4460.30	82.83	56.85
	85.0	25.08	-4177.23	86.27	56.76
	90.0	25.67	-3892.80	89.52	57.12
	95.0	26.30	-3604.81	92.63	57.91
70.00000	55.0	22.28	-5815.45	61.83	54.20
	60.0	22.68	-5542.01	66.61	55.64
	65.0	23.10	-5265.20	71.04	56.84
	70.0	23.53	-4987.56	75.15	55.79
	75.0	23.98	-4708.42	79.01	56.76
	80.0	24.48	-4427.84	82.63	56.77
	85.0	25.01	-4145.79	86.05	56.66
	90.0	25.57	-3862.89	89.28	56.86
	95.0	26.18	-3575.90	92.37	57.58

TABLE B-1. THERMODYNAMIC PROPERTIES OF LIQUID FLUORINE-OXYGEN MIXTURES ON THE SATURATION BOUNDARY

TEMPERATURE	WT. FRACTION F2		PRESSURE	VOLUME	ENTHALPY	ENTROPY	C_P
R	LIQUID	VAPOR	PSIA	FT^3/LB	BTU/LB	BTU/LB/R	BTU/LB/R
	0.6000	0.7552	0.0577	0.01063	-72.215	0.4828	0.3661
	0.7000	0.8139	0.0606	0.01034	-70.761	0.4677	0.3609
100.0	0.8000	0.8720	0.0634	0.01005	-69.391	0.4495	0.3556
	0.8800	0.9203	0.0656	0.00982	-68.359	0.4322	0.3514
	0.9000	0.9328	0.0660	0.00976	-68.111	0.4274	0.3503
	1.0000	1.0000	0.0685	0.00946	-66.930	0.3959	0.3451
	0.6000	0.7514	0.2461	0.01084	-68.543	0.5178	0.3639
	0.7000	0.8127	0.2590	0.01055	-67.140	0.5022	0.3583
110.0	0.8000	0.8725	0.2712	0.01026	-65.820	0.4836	0.3526
	0.8800	0.9213	0.2805	0.01002	-64.828	0.4659	0.3481
	0.9000	0.9338	0.2828	0.00996	-64.590	0.4609	0.3470
	1.0000	1.0000	0.2937	0.00966	-63.458	0.4290	0.3413
	0.6000	0.7447	0.8092	0.01107	-64.850	0.5499	0.3667
	0.7000	0.8088	0.8511	0.01078	-63.494	0.5339	0.3615
120.0	0.8000	0.8708	0.8910	0.01047	-62.219	0.5149	0.3564
	0.8800	0.9208	0.9216	0.01023	-61.264	0.4969	0.3522
	0.9000	0.9336	0.9291	0.01017	-61.034	0.4919	0.3511
	1.0000	1.0000	0.9655	0.00986	-59.948	0.4595	0.3459
	0.6000	0.7371	2.1809	0.01132	-61.135	0.5797	0.3688
	0.7000	0.8039	2.2912	0.01101	-59.822	0.5633	0.3639
130.0	0.8000	0.8683	2.3966	0.01071	-58.592	0.5440	0.3588
	0.8800	0.9198	2.4780	0.01046	-57.672	0.5257	0.3549
	0.9000	0.9328	2.4980	0.01040	-57.451	0.5206	0.3539
	1.0000	1.0000	2.5952	0.01008	-56.408	0.4878	0.3489
	0.6000	0.7296	5.0370	0.01157	-57.397	0.6073	0.3707
	0.7000	0.7990	5.2846	0.01127	-56.126	0.5907	0.3657
140.0	0.8000	0.8656	5.5225	0.01096	-54.939	0.5710	0.3609
	0.8800	0.9185	5.7067	0.01071	-54.053	0.5524	0.3569
	0.9000	0.9319	5.7519	0.01064	-53.841	0.5473	0.3560
	1.0000	1.0000	5.9731	0.01032	-52.840	0.5142	0.3511
	0.6000	0.7227	10.2958	0.01185	-53.634	0.6332	0.3740
	0.7000	0.7945	10.7897	0.01154	-52.406	0.6163	0.3694
150.0	0.8000	0.8631	11.2663	0.01123	-51.259	0.5964	0.3648
	0.8800	0.9174	11.6369	0.01097	-50.404	0.5776	0.3611
	0.9000	0.9309	11.7281	0.01091	-50.200	0.5723	0.3601
	1.0000	1.0000	12.1755	0.01058	-49.240	0.5390	0.3555
	0.6000	0.7166	19.0933	0.01216	-49.837	0.6576	0.3809
	0.7000	0.7904	19.9913	0.01184	-48.648	0.6404	0.3770
160.0	0.8000	0.8609	20.8626	0.01152	-47.541	0.6203	0.3731
	0.8800	0.9163	21.5430	0.01126	-46.718	0.6013	0.3699
	0.9000	0.9301	21.7108	0.01120	-46.522	0.5960	0.3691
	1.0000	1.0000	22.5372	0.01086	-45.600	0.5623	0.3652
	0.6000	0.7107	32.7573	0.01249	-45.987	0.6808	0.3863
	0.7000	0.7864	34.2707	0.01217	-44.837	0.6634	0.3826
170.0	0.8000	0.8586	35.7466	0.01184	-43.767	0.6430	0.3789
	0.8800	0.9152	36.9040	0.01158	-42.975	0.6238	0.3759
	0.9000	0.9292	37.1904	0.01151	-42.787	0.6184	0.3752
	1.0000	1.0000	38.6038	0.01118	-41.903	0.5845	0.3715
	0.6000	0.7049	52.7445	0.01286	-42.067	0.7030	0.3923
	0.7000	0.7824	55.1428	0.01253	-40.953	0.6854	0.3892
180.0	0.8000	0.8563	57.4945	0.01220	-39.921	0.6647	0.3857
	0.8800	0.9140	59.3467	0.01194	-39.158	0.6453	0.3829
	0.9000	0.9283	59.8061	0.01187	-38.977	0.6399	0.3822
	1.0000	1.0000	62.0800	0.01152	-38.131	0.6058	0.3787

TABLE B-2. THERMODYNAMIC PROPERTIES OF FLUORINE-OXYGEN MIXTURES IN THE COMPRESSED LIQUID REGION

WT. FRACTION F2 =0.60

PRESSURE PSIA	TEMPERATURE R	VOLUME FT^3/LB	ENTHALPY BTU/LB	ENTROPY BTU/LB/R	C_P BTU/LB/R
8.000	100.0	0.01063	-72.203	0.4828	0.3695
	110.0	0.01084	-68.532	0.5178	0.3699
	120.0	0.01107	-64.840	0.5499	0.3726
	130.0	0.01132	-61.125	0.5797	0.3722
	140.0	0.01157	-57.395	0.6073	0.3729
14.696	100.0	0.01063	-72.192	0.4828	0.3694
	110.0	0.01084	-68.522	0.5177	0.3700
	120.0	0.01107	-64.830	0.5499	0.3726
	130.0	0.01132	-61.115	0.5796	0.3722
	140.0	0.01157	-57.385	0.6073	0.3729
	150.0	0.01185	-53.630	0.6332	0.3753
30.000	100.0	0.01063	-72.169	0.4827	0.3693
	110.0	0.01084	-68.499	0.5177	0.3700
	120.0	0.01107	-64.807	0.5498	0.3727
	130.0	0.01131	-61.092	0.5795	0.3722
	140.0	0.01157	-57.363	0.6072	0.3729
	150.0	0.01185	-53.603	0.6331	0.3753
	160.0	0.01215	-49.827	0.6576	0.3795
50.000	100.0	0.01063	-72.137	0.4826	0.3692
	110.0	0.01084	-68.467	0.5176	0.3700
	120.0	0.01107	-64.776	0.5497	0.3727
	130.0	0.01131	-61.063	0.5795	0.3722
	140.0	0.01157	-57.333	0.6071	0.3730
	150.0	0.01185	-53.581	0.6330	0.3753
	160.0	0.01215	-49.801	0.6575	0.3793
	170.0	0.01248	-45.972	0.6807	0.3870
100.000	100.0	0.01062	-72.058	0.4824	0.3688
	110.0	0.01084	-68.389	0.5174	0.3700
	120.0	0.01106	-64.699	0.5495	0.3729
	130.0	0.01131	-60.988	0.5793	0.3722
	140.0	0.01156	-57.261	0.6069	0.3729
	150.0	0.01184	-53.510	0.6327	0.3753
	160.0	0.01214	-49.735	0.6572	0.3788
	170.0	0.01248	-45.912	0.6804	0.3865
	180.0	0.01284	-42.025	0.7027	0.3933
200.000	100.0	0.01062	-71.900	0.4820	0.3682
	110.0	0.01083	-68.233	0.5170	0.3700
	120.0	0.01106	-64.545	0.5491	0.3732
	130.0	0.01130	-60.839	0.5788	0.3722
	140.0	0.01155	-57.116	0.6064	0.3729
	150.0	0.01183	-53.371	0.6322	0.3753
	160.0	0.01213	-49.605	0.6566	0.3778
	170.0	0.01245	-45.791	0.6797	0.3836
	180.0	0.01282	-41.917	0.7019	0.3917
300.000	100.0	0.01061	-71.742	0.4817	0.3676
	110.0	0.01082	-68.077	0.5166	0.3701
	120.0	0.01105	-64.392	0.5486	0.3733
	130.0	0.01129	-60.689	0.5783	0.3722
	140.0	0.01154	-56.971	0.6059	0.3729
	150.0	0.01181	-53.232	0.6317	0.3753
	160.0	0.01211	-49.474	0.6560	0.3757
	170.0	0.01244	-45.663	0.6791	0.3828
	180.0	0.01279	-41.808	0.7012	0.3902
400.000	100.0	0.01060	-71.584	0.4813	0.3670
	110.0	0.01082	-67.922	0.5162	0.3701
	120.0	0.01104	-64.231	0.5483	0.3713
	130.0	0.01127	-60.540	0.5779	0.3722
	140.0	0.01153	-56.825	0.6054	0.3728
	150.0	0.01180	-53.092	0.6312	0.3751
	160.0	0.01210	-49.341	0.6555	0.3751
	170.0	0.01241	-45.545	0.6785	0.3820
	180.0	0.01277	-41.697	0.7005	0.3888
500.000	100.0	0.01060	-71.425	0.4809	0.3663
	110.0	0.01081	-67.766	0.5158	0.3702
	120.0	0.01103	-64.077	0.5479	0.3717
	130.0	0.01127	-60.390	0.5774	0.3721
	140.0	0.01152	-56.680	0.6050	0.3728
	150.0	0.01179	-52.950	0.6307	0.3737
	160.0	0.01208	-49.207	0.6549	0.3749
	170.0	0.01239	-45.421	0.6779	0.3812
	180.0	0.01275	-41.585	0.6998	0.3873
1000.000	100.0	0.01057	-70.637	0.4791	0.3642
	110.0	0.01078	-66.985	0.5138	0.3698
	120.0	0.01099	-63.310	0.5459	0.3724
	130.0	0.01122	-59.641	0.5753	0.3717
	140.0	0.01147	-55.950	0.6027	0.3718
	150.0	0.01172	-52.244	0.6282	0.3730
	160.0	0.01200	-48.532	0.6522	0.3729
	170.0	0.01230	-44.790	0.6749	0.3775
	180.0	0.01263	-41.006	0.6966	0.3814

TABLE B-2. THERMODYNAMIC PROPERTIES OF FLUORINE-OXYGEN MIXTURES IN THE COMPRESSED LIQUID REGION

WT. FRACTION F2 =0.70

PRESSURE PSIA	TEMPERATURE R	VOLUME FT^3/LB	ENTHALPY BTU/LB	ENTROPY BTU/LB/R	C_P BTU/LB/R
8.000	100.0	0.01034	-70.743	0.4677	0.3647
	110.0	0.01055	-67.130	0.5022	0.3653
	120.0	0.01078	-63.484	0.5340	0.3683
	130.0	0.01102	-59.813	0.5633	0.3677
	140.0	0.01127	-56.126	0.5907	0.3684
30.000	100.0	0.01034	-70.716	0.4676	0.3645
	110.0	0.01055	-67.096	0.5021	0.3653
	120.0	0.01078	-63.451	0.5338	0.3685
	130.0	0.01101	-59.781	0.5632	0.3677
	140.0	0.01127	-56.095	0.5906	0.3684
	150.0	0.01154	-52.382	0.6162	0.3709
	160.0	0.01184	-48.633	0.6404	0.3754
100.000	100.0	0.01034	-70.609	0.4674	0.3640
	110.0	0.01055	-66.990	0.5018	0.3654
	120.0	0.01077	-63.347	0.5336	0.3687
	130.0	0.01101	-59.679	0.5629	0.3678
	140.0	0.01126	-55.996	0.5903	0.3685
	150.0	0.01153	-52.286	0.6159	0.3710
	160.0	0.01183	-48.551	0.6400	0.3746
	170.0	0.01216	-44.765	0.6630	0.3829
	180.0	0.01252	-40.914	0.6850	0.3899
300.000	100.0	0.01033	-70.302	0.4666	0.3626
	110.0	0.01053	-66.687	0.5011	0.3656
	120.0	0.01075	-63.048	0.5327	0.3694
	130.0	0.01098	-59.383	0.5621	0.3679
	140.0	0.01123	-55.714	0.5893	0.3686
	150.0	0.01151	-52.017	0.6149	0.3711
	160.0	0.01180	-48.298	0.6389	0.3712
	170.0	0.01212	-44.531	0.6618	0.3790
	180.0	0.01247	-40.707	0.6836	0.3869
500.000	100.0	0.01031	-69.994	0.4659	0.3612
	110.0	0.01052	-66.385	0.5003	0.3658
	120.0	0.01074	-62.741	0.5320	0.3675
	130.0	0.01097	-59.039	0.5611	0.3679
	140.0	0.01122	-55.432	0.5884	0.3687
	150.0	0.01148	-51.743	0.6139	0.3695
	160.0	0.01177	-48.040	0.6377	0.3705
	170.0	0.01208	-44.293	0.6606	0.3774
	180.0	0.01243	-40.494	0.6823	0.3839

PRESSURE PSIA	TEMPERATURE R	VOLUME FT^3/LB	ENTHALPY BTU/LB	ENTROPY BTU/LB/R	C_P BTU/LB/R
14.696	100.0	0.01034	-70.739	0.4676	0.3647
	110.0	0.01055	-67.120	0.5021	0.3653
	120.0	0.01078	-63.474	0.5339	0.3684
	130.0	0.01101	-59.803	0.5633	0.3677
	140.0	0.01127	-56.116	0.5907	0.3685
	150.0	0.01154	-52.403	0.6163	0.3708
50.000	100.0	0.01034	-70.685	0.4675	0.3644
	110.0	0.01055	-67.066	0.5020	0.3654
	120.0	0.01077	-63.421	0.5338	0.3685
	130.0	0.01101	-59.752	0.5631	0.3677
	140.0	0.01127	-56.066	0.5905	0.3685
	150.0	0.01154	-52.355	0.6161	0.3709
	160.0	0.01184	-48.614	0.6403	0.3752
	170.0	0.01216	-44.823	0.6633	0.3835
200.000	100.0	0.01033	-70.455	0.4670	0.3633
	110.0	0.01054	-66.839	0.5014	0.3655
	120.0	0.01076	-63.197	0.5332	0.3691
	130.0	0.01099	-59.534	0.5625	0.3679
	140.0	0.01125	-55.855	0.5898	0.3685
	150.0	0.01152	-52.152	0.6153	0.3710
	160.0	0.01181	-48.425	0.6395	0.3735
	170.0	0.01214	-44.650	0.6624	0.3797
	180.0	0.01249	-40.811	0.6844	0.3884
400.000	100.0	0.01032	-70.148	0.4663	0.3619
	110.0	0.01053	-66.537	0.5007	0.3657
	120.0	0.01074	-62.891	0.5324	0.3671
	130.0	0.01098	-59.244	0.5616	0.3680
	140.0	0.01123	-55.573	0.5888	0.3686
	150.0	0.01149	-51.881	0.6143	0.3710
	160.0	0.01178	-48.170	0.6383	0.3707
	170.0	0.01210	-44.413	0.6611	0.3782
	180.0	0.01245	-40.601	0.6830	0.3853
1000.000	100.0	0.01029	-69.228	0.4641	0.3589
	110.0	0.01049	-65.627	0.4983	0.3655
	120.0	0.01070	-61.996	0.5300	0.3686
	130.0	0.01092	-58.372	0.5590	0.3678
	140.0	0.01116	-54.724	0.5861	0.3678
	150.0	0.01142	-51.060	0.6113	0.3691
	160.0	0.01169	-47.388	0.6351	0.3688
	170.0	0.01199	-43.684	0.6576	0.3738
	180.0	0.01231	-39.338	0.6790	0.3779

TABLE B-2. THERMODYNAMIC PROPERTIES OF FLUORINE-OXYGEN MIXTURES IN THE COMPRESSED LIQUID REGION

WT. FRACTION F2 =0.80

PRESSURE PSIA	TEMPERATURE R	VOLUME FT^3/LB	ENTHALPY BTU/LB	ENTROPY BTU/LB/R	C_P BTU/LB/R
	100.0	0.01005	-69.373	0.4496	0.3600
	110.0	0.01026	-65.810	0.4836	0.3607
8.000	120.0	0.01047	-62.210	0.5149	0.3641
	130.0	0.01071	-58.582	0.5440	0.3633
	140.0	0.01096	-54.939	0.5710	0.3639
	100.0	0.01005	-69.347	0.4495	0.3598
	110.0	0.01026	-65.777	0.4835	0.3607
	120.0	0.01047	-62.179	0.5148	0.3643
30.000	130.0	0.01071	-58.551	0.5439	0.3634
	140.0	0.01095	-54.908	0.5709	0.3639
	150.0	0.01123	-51.237	0.5963	0.3665
	160.0	0.01152	-47.532	0.6202	0.3712
	100.0	0.01005	-69.242	0.4492	0.3592
	110.0	0.01025	-65.674	0.4832	0.3608
	120.0	0.01047	-62.077	0.5146	0.3646
	130.0	0.01070	-58.453	0.5436	0.3635
100.000	140.0	0.01095	-54.812	0.5706	0.3641
	150.0	0.01122	-51.144	0.5959	0.3667
	160.0	0.01151	-47.448	0.6198	0.3704
	170.0	0.01183	-43.700	0.6425	0.3794
	180.0	0.01219	-39.884	0.6644	0.3866
	100.0	0.01004	-68.944	0.4484	0.3577
	110.0	0.01024	-65.380	0.4825	0.3611
	120.0	0.01045	-61.787	0.5137	0.3654
	130.0	0.01068	-58.171	0.5427	0.3637
300.000	140.0	0.01093	-54.539	0.5696	0.3643
	150.0	0.01119	-50.882	0.5950	0.3670
	160.0	0.01148	-47.204	0.6187	0.3668
	170.0	0.01180	-43.474	0.6413	0.3752
	180.0	0.01215	-39.686	0.6630	0.3835
	100.0	0.01002	-68.645	0.4477	0.3562
	110.0	0.01023	-65.087	0.4817	0.3615
	120.0	0.01044	-61.487	0.5131	0.3634
	130.0	0.01066	-57.890	0.5418	0.3638
500.000	140.0	0.01091	-54.265	0.5687	0.3645
	150.0	0.01117	-50.615	0.5940	0.3653
	160.0	0.01145	-46.954	0.6176	0.3662
	170.0	0.01176	-43.245	0.6402	0.3737
	180.0	0.01210	-39.482	0.6616	0.3804

PRESSURE PSIA	TEMPERATURE R	VOLUME FT^3/LB	ENTHALPY BTU/LB	ENTROPY BTU/LB/R	C_P BTU/LB/R
	100.0	0.01005	-69.369	0.4495	0.3600
	110.0	0.01026	-65.800	0.4836	0.3607
14.696	120.0	0.01047	-62.200	0.5149	0.3641
	130.0	0.01071	-58.573	0.5439	0.3634
	140.0	0.01096	-54.929	0.5710	0.3639
	150.0	0.01123	-51.257	0.5964	0.3665
	100.0	0.01005	-69.317	0.4494	0.3596
	110.0	0.01025	-65.748	0.4834	0.3607
	120.0	0.01047	-62.149	0.5147	0.3643
50.000	130.0	0.01071	-58.523	0.5438	0.3634
	140.0	0.01095	-54.881	0.5708	0.3640
	150.0	0.01122	-51.211	0.5962	0.3665
	160.0	0.01152	-47.508	0.6201	0.3710
	170.0	0.01184	-43.755	0.6428	0.3800
	100.0	0.01004	-69.093	0.4488	0.3585
	110.0	0.01024	-65.528	0.4828	0.3609
	120.0	0.01046	-61.931	0.5142	0.3650
	130.0	0.01069	-58.312	0.5431	0.3636
200.000	140.0	0.01093	-54.676	0.5702	0.3642
	150.0	0.01121	-51.013	0.5954	0.3669
	160.0	0.01149	-47.326	0.6192	0.3693
	170.0	0.01181	-43.588	0.6419	0.3759
	180.0	0.01217	-39.786	0.6637	0.3851
	100.0	0.01003	-68.795	0.4481	0.3569
	110.0	0.01023	-65.234	0.4821	0.3613
	120.0	0.01045	-61.632	0.5134	0.3629
	130.0	0.01067	-58.031	0.5423	0.3638
400.000	140.0	0.01092	-54.402	0.5692	0.3644
	150.0	0.01118	-50.751	0.5944	0.3670
	160.0	0.01146	-47.079	0.6182	0.3663
	170.0	0.01177	-43.360	0.6407	0.3744
	180.0	0.01212	-39.585	0.6623	0.3820
	100.0	0.01000	-67.302	0.4460	0.3536
	110.0	0.01019	-64.350	0.4798	0.3613
	120.0	0.01040	-60.764	0.5111	0.3648
	130.0	0.01062	-57.185	0.5397	0.3639
1000.000	140.0	0.01086	-53.579	0.5665	0.3638
	150.0	0.01111	-49.955	0.5915	0.3652
	160.0	0.01138	-46.323	0.6150	0.3647
	170.0	0.01167	-42.659	0.6372	0.3700
	180.0	0.01199	-38.950	0.6584	0.3744

TABLE B-2. THERMODYNAMIC PROPERTIES OF FLUORINE-OXYGEN MIXTURES IN THE COMPRESSED LIQUID REGION

WT. FRACTION F2 =0.88

PRESSURE PSIA	TEMPERATURE R	VOLUME FT^3/LB	ENTHALPY BTU/LB	ENTROPY BTU/LB/R	C_P BTU/LB/R
	100.0	0.00982	-68.348	0.4323	0.3562
	110.0	0.01002	-64.813	0.4659	0.3569
8.000	120.0	0.01023	-61.255	0.4969	0.3607
	130.0	0.01046	-57.662	0.5257	0.3598
	140.0	0.01071	-54.052	0.5525	0.3603
	100.0	0.00982	-68.316	0.4322	0.3560
	110.0	0.01002	-64.787	0.4658	0.3570
	120.0	0.01023	-61.223	0.4968	0.3609
30.000	130.0	0.01046	-57.631	0.5256	0.3598
	140.0	0.01070	-54.022	0.5524	0.3603
	150.0	0.01097	-50.384	0.5775	0.3631
	160.0	0.01126	-46.710	0.6012	0.3679
	100.0	0.00981	-68.214	0.4319	0.3554
	110.0	0.01001	-64.686	0.4655	0.3571
	120.0	0.01022	-61.125	0.4966	0.3613
	130.0	0.01045	-57.535	0.5253	0.3600
100.000	140.0	0.01070	-53.923	0.5521	0.3605
	150.0	0.01096	-50.293	0.5772	0.3632
	160.0	0.01125	-46.628	0.6008	0.3670
	170.0	0.01157	-42.911	0.6233	0.3766
	180.0	0.01192	-39.124	0.6450	0.3840
	100.0	0.00981	-67.923	0.4312	0.3537
	110.0	0.01000	-64.393	0.4648	0.3575
	120.0	0.01021	-60.842	0.4957	0.3622
	130.0	0.01044	-57.261	0.5245	0.3603
300.000	140.0	0.01068	-53.662	0.5511	0.3609
	150.0	0.01094	-50.038	0.5761	0.3637
	160.0	0.01122	-46.391	0.5997	0.3632
	170.0	0.01153	-42.692	0.6221	0.3721
	180.0	0.01188	-38.933	0.6437	0.3808
	100.0	0.00979	-67.632	0.4305	0.3521
	110.0	0.00999	-64.113	0.4640	0.3579
	120.0	0.01020	-60.543	0.4951	0.3601
	130.0	0.01042	-56.985	0.5236	0.3605
500.000	140.0	0.01066	-53.395	0.5502	0.3613
	150.0	0.01091	-49.779	0.5752	0.3620
	160.0	0.01119	-46.149	0.5986	0.3627
	170.0	0.01149	-42.469	0.6209	0.3706
	180.0	0.01183	-38.735	0.6423	0.3777

PRESSURE PSIA	TEMPERATURE R	VOLUME FT^3/LB	ENTHALPY BTU/LB	ENTROPY BTU/LB/R	C_P BTU/LB/R
	100.0	0.00982	-68.338	0.4322	0.3562
	110.0	0.01002	-64.809	0.4658	0.3570
14.696	120.0	0.01023	-61.245	0.4969	0.3608
	130.0	0.01046	-57.652	0.5256	0.3598
	140.0	0.01071	-54.043	0.5525	0.3603
	150.0	0.01097	-50.403	0.5775	0.3629
	100.0	0.00982	-68.287	0.4321	0.3558
	110.0	0.01001	-64.758	0.4657	0.3571
	120.0	0.01023	-61.195	0.4968	0.3610
50.000	130.0	0.01046	-57.604	0.5255	0.3598
	140.0	0.01070	-53.996	0.5523	0.3604
	150.0	0.01097	-50.358	0.5773	0.3631
	160.0	0.01125	-46.687	0.6011	0.3677
	170.0	0.01158	-42.964	0.6237	0.3771
	100.0	0.00981	-68.069	0.4315	0.3546
	110.0	0.01010	-64.543	0.4651	0.3573
	120.0	0.01022	-60.983	0.4961	0.3618
	130.0	0.01044	-57.398	0.5249	0.3602
200.000	140.0	0.01069	-53.796	0.5516	0.3607
	150.0	0.01095	-50.165	0.5766	0.3634
	160.0	0.01123	-46.510	0.6002	0.3659
	170.0	0.01155	-42.802	0.6227	0.3728
	180.0	0.01190	-39.029	0.6444	0.3824
	100.0	0.00980	-67.777	0.4308	0.3529
	110.0	0.01000	-64.256	0.4644	0.3577
	120.0	0.01021	-60.689	0.4955	0.3594
	130.0	0.01043	-57.123	0.5240	0.3605
400.000	140.0	0.01067	-53.529	0.5507	0.3610
	150.0	0.01092	-49.910	0.5757	0.3637
	160.0	0.01120	-46.270	0.5991	0.3627
	170.0	0.01151	-42.581	0.6215	0.3713
	180.0	0.01185	-38.835	0.6429	0.3792
	100.0	0.00976	-66.906	0.4287	0.3494
	110.0	0.00996	-63.393	0.4622	0.3578
	120.0	0.01016	-59.842	0.4932	0.3518
	130.0	0.01038	-56.299	0.5215	0.3607
1000.000	140.0	0.01061	-52.727	0.5480	0.3606
	150.0	0.01085	-49.134	0.5728	0.3621
	160.0	0.01112	-45.534	0.5961	0.3613
	170.0	0.01141	-41.900	0.6181	0.3670
	180.0	0.01172	-38.021	0.6391	0.3715

TABLE B-2. THERMODYNAMIC PROPERTIES OF FLUORINE-OXYGEN MIXTURES IN THE COMPRESSED LIQUID REGION

WT. FRACTION F2 =0.90

PRESSURE PSIA	TEMPERATURE R	VOLUME FT^3/LB	ENTHALPY BTU/LB	ENTROPY BTU/LB/R	C_P BTU/LB/R
8.000	100.0	0.00976	-68.099	0.4274	0.3552
	110.0	0.00996	-64.583	0.4609	0.3560
	120.0	0.01017	-61.025	0.4919	0.3599
	130.0	0.01040	-57.441	0.5206	0.3588
	140.0	0.01064	-53.833	0.5473	0.3594
30.000	100.0	0.00976	-68.068	0.4273	0.3551
	110.0	0.00996	-64.549	0.4608	0.3561
	120.0	0.01017	-60.994	0.4918	0.3601
	130.0	0.01040	-57.411	0.5204	0.3589
	140.0	0.01064	-53.810	0.5472	0.3594
	150.0	0.01091	-50.180	0.5722	0.3622
	160.0	0.01120	-46.514	0.5959	0.3671
100.000	100.0	0.00975	-67.967	0.4271	0.3544
	110.0	0.00995	-64.449	0.4605	0.3562
	120.0	0.01016	-60.896	0.4915	0.3604
	130.0	0.01039	-57.315	0.5202	0.3591
	140.0	0.01063	-53.718	0.5469	0.3596
	150.0	0.01090	-50.083	0.5719	0.3624
	160.0	0.01118	-46.432	0.5955	0.3662
	170.0	0.01150	-42.723	0.6180	0.3759
	180.0	0.01186	-38.943	0.6396	0.3833
300.000	100.0	0.00974	-67.677	0.4263	0.3527
	110.0	0.00994	-64.163	0.4598	0.3566
	120.0	0.01015	-60.615	0.4907	0.3614
	130.0	0.01038	-57.042	0.5194	0.3595
	140.0	0.01061	-53.452	0.5459	0.3601
	150.0	0.01087	-49.835	0.5709	0.3629
	160.0	0.01115	-46.197	0.5944	0.3624
	170.0	0.01147	-42.505	0.6168	0.3713
	180.0	0.01181	-38.754	0.6383	0.3801
500.000	100.0	0.00973	-67.383	0.4256	0.3511
	110.0	0.00993	-63.878	0.4591	0.3570
	120.0	0.01014	-60.322	0.4901	0.3593
	130.0	0.01036	-56.769	0.5185	0.3597
	140.0	0.01059	-53.187	0.5450	0.3604
	150.0	0.01085	-49.578	0.5700	0.3611
	160.0	0.01112	-45.955	0.5933	0.3618
	170.0	0.01143	-42.284	0.6157	0.3699
	180.0	0.01176	-38.553	0.6369	0.3770

PRESSURE PSIA	TEMPERATURE R	VOLUME FT^3/LB	ENTHALPY BTU/LB	ENTROPY BTU/LB/R	C_P BTU/LB/R
14.696	100.0	0.00976	-68.090	0.4273	0.3552
	110.0	0.00996	-64.571	0.4608	0.3561
	120.0	0.01017	-61.016	0.4919	0.3599
	130.0	0.01040	-57.432	0.5205	0.3589
	140.0	0.01064	-53.831	0.5473	0.3594
	150.0	0.01091	-50.199	0.5723	0.3620
50.000	100.0	0.00976	-68.039	0.4272	0.3549
	110.0	0.00995	-64.520	0.4607	0.3561
	120.0	0.01017	-60.966	0.4917	0.3601
	130.0	0.01040	-57.383	0.5204	0.3590
	140.0	0.01064	-53.784	0.5471	0.3595
	150.0	0.01090	-50.154	0.5722	0.3622
	160.0	0.01119	-46.491	0.5958	0.3668
	170.0	0.01151	-42.776	0.6184	0.3765
200.000	100.0	0.00975	-67.822	0.4267	0.3536
	110.0	0.00995	-64.306	0.4601	0.3564
	120.0	0.01016	-60.755	0.4911	0.3610
	130.0	0.01038	-57.179	0.5197	0.3593
	140.0	0.01062	-53.585	0.5465	0.3599
	150.0	0.01088	-49.963	0.5714	0.3626
	160.0	0.01117	-46.315	0.5950	0.3651
	170.0	0.01148	-42.615	0.6175	0.3720
	180.0	0.01183	-38.849	0.6390	0.3817
400.000	100.0	0.00974	-67.533	0.4260	0.3519
	110.0	0.00994	-64.021	0.4594	0.3568
	120.0	0.01014	-60.463	0.4905	0.3586
	130.0	0.01037	-56.906	0.5189	0.3596
	140.0	0.01060	-53.320	0.5455	0.3602
	150.0	0.01086	-49.710	0.5704	0.3629
	160.0	0.01114	-46.076	0.5939	0.3618
	170.0	0.01145	-42.395	0.6162	0.3706
	180.0	0.01179	-38.657	0.6376	0.3785
1000.000	100.0	0.00971	-66.666	0.4239	0.3483
	110.0	0.00990	-63.164	0.4572	0.3570
	120.0	0.01010	-59.620	0.4881	0.3610
	130.0	0.01032	-56.087	0.5164	0.3600
	140.0	0.01035	-52.523	0.5429	0.3599
	150.0	0.01079	-48.938	0.5675	0.3613
	160.0	0.01105	-45.345	0.5907	0.3605
	170.0	0.01134	-41.719	0.6128	0.3663
	180.0	0.01156	-38.047	0.6338	0.3708

TABLE B-2. THERMODYNAMIC PROPERTIES OF FLUORINE-OXYGEN MIXTURES IN THE COMPRESSED LIQUID REGION

WT. FRACTION F2 =1.00

PRESSURE PSIA	TEMPERATURE R	VOLUME FT^3/LB	ENTHALPY BTU/LB	ENTROPY BTU/LB/R	C_P BTU/LB/R
8.000	100.0	0.00946	-66.920	0.3959	0.3505
	110.0	0.00966	-63.449	0.4290	0.3514
	120.0	0.00986	-59.939	0.4595	0.3556
	130.0	0.01009	-56.397	0.4878	0.3544
	140.0	0.01032	-52.838	0.5142	0.3549
30.000	100.0	0.00946	-66.889	0.3958	0.3503
	110.0	0.00966	-63.419	0.4288	0.3515
	120.0	0.00986	-59.909	0.4594	0.3558
	130.0	0.01008	-56.368	0.4877	0.3545
	140.0	0.01032	-52.810	0.5141	0.3549
	150.0	0.01058	-49.220	0.5389	0.3578
	160.0	0.01086	-45.592	0.5623	0.3629
100.000	100.0	0.00946	-66.792	0.3956	0.3497
	110.0	0.00965	-63.321	0.4286	0.3516
	120.0	0.00986	-59.813	0.4592	0.3563
	130.0	0.01008	-56.275	0.4875	0.3547
	140.0	0.01032	-52.720	0.5138	0.3552
	150.0	0.01057	-49.134	0.5385	0.3580
	160.0	0.01085	-45.514	0.5619	0.3620
	170.0	0.01116	-41.841	0.5841	0.3724
	180.0	0.01151	-38.093	0.6055	0.3800
300.000	100.0	0.00945	-66.511	0.3948	0.3478
	110.0	0.00964	-63.045	0.4279	0.3521
	120.0	0.00984	-59.541	0.4583	0.3575
	130.0	0.01006	-56.010	0.4866	0.3553
	140.0	0.01029	-52.463	0.5129	0.3558
	150.0	0.01055	-48.889	0.5376	0.3587
	160.0	0.01082	-45.285	0.5608	0.3579
	170.0	0.01113	-41.632	0.5829	0.3675
	180.0	0.01147	-37.917	0.6042	0.3768
500.000	100.0	0.00944	-66.231	0.3941	0.3460
	110.0	0.00963	-62.763	0.4271	0.3527
	120.0	0.00983	-59.255	0.4577	0.3551
	130.0	0.01005	-55.746	0.4858	0.3556
	140.0	0.01028	-52.206	0.5120	0.3563
	150.0	0.01053	-48.638	0.5367	0.3569
	160.0	0.01080	-45.053	0.5597	0.3575
	170.0	0.01109	-41.419	0.5818	0.3661
	180.0	0.01142	-37.731	0.6029	0.3735

PRESSURE PSIA	TEMPERATURE R	VOLUME FT^3/LB	ENTHALPY BTU/LB	ENTROPY BTU/LB/R	C_P BTU/LB/R
14.696	100.0	0.00946	-66.311	0.3958	0.3505
	110.0	0.00966	-63.440	0.4289	0.3515
	120.0	0.00986	-59.930	0.4595	0.3557
	130.0	0.01008	-56.388	0.4878	0.3545
	140.0	0.01032	-52.830	0.5142	0.3549
	150.0	0.01058	-49.238	0.5390	0.3576
50.000	100.0	0.00946	-66.861	0.3957	0.3501
	110.0	0.00965	-63.391	0.4288	0.3515
	120.0	0.00986	-59.882	0.4593	0.3559
	130.0	0.01008	-56.341	0.4877	0.3546
	140.0	0.01032	-52.784	0.5140	0.3551
	150.0	0.01058	-49.195	0.5388	0.3578
	160.0	0.01086	-45.570	0.5622	0.3627
	170.0	0.01117	-41.392	0.5845	0.3729
200.000	100.0	0.00946	-66.652	0.3952	0.3487
	110.0	0.00965	-63.183	0.4282	0.3519
	120.0	0.00985	-59.677	0.4587	0.3569
	130.0	0.01007	-56.143	0.4870	0.3550
	140.0	0.01030	-52.592	0.5134	0.3555
	150.0	0.01056	-49.011	0.5380	0.3584
	160.0	0.01084	-45.400	0.5614	0.3608
	170.0	0.01115	-41.738	0.5836	0.3681
	180.0	0.01149	-38.008	0.6049	0.3784
400.000	100.0	0.00944	-66.371	0.3945	0.3469
	110.0	0.00964	-62.907	0.4275	0.3524
	120.0	0.00984	-59.392	0.4581	0.3544
	130.0	0.01005	-55.878	0.4862	0.3554
	140.0	0.01029	-52.335	0.5124	0.3559
	150.0	0.01053	-48.766	0.5371	0.3598
	160.0	0.01081	-45.170	0.5603	0.3575
	170.0	0.01111	-41.526	0.5824	0.3668
	180.0	0.01145	-37.824	0.6035	0.3751
1000.000	100.0	0.00941	-65.529	0.3924	0.3430
	110.0	0.00960	-62.077	0.4253	0.3527
	120.0	0.00980	-58.575	0.4558	0.3572
	130.0	0.01001	-55.084	0.4838	0.3561
	140.0	0.01023	-51.562	0.5099	0.3559
	150.0	0.01047	-48.018	0.5343	0.3574
	160.0	0.01073	-44.463	0.5572	0.3564
	170.0	0.01101	-40.875	0.5790	0.3626
	180.0	0.01132	-37.240	0.5997	0.3673

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16. ABSTRACT (A 200-word or less factual summary of most significant information. If document includes a significant bibliography or literature survey, mention it here.)

Liquid phase thermodynamic properties and liquid-vapor equilibria of fluorine-oxygen mixtures, for which no experimental data exist, have been calculated. The results are based on excess properties predicted from the Snider-Herrington equations, with an adjusted combining rule, and the corresponding data for the pure fluids. Mixtures considered are 0.6, 0.7, 0.8, 0.88, and 0.9 weight fraction of fluorine from 55 to 90 K up to 70×10^5 Pa. In the compressed liquid, molar volumes, enthalpy, entropy, and constant pressure specific heat were determined. Along the saturation boundary, coexistent vapor compositions and solution vapor pressures were determined as well. Corresponding properties of pure fluorine from experimental data have also been included. Results are tabulated in both British and S.I. units.

17. KEY WORDS (Alphabetical order, separated by semicolons) Calculated thermophysical properties; compressed liquid phase, fluorine-oxygen mixtures, hard-sphere model; liquid-vapor equilibria.

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