UCRL-10886
UC-4 Chemistry
TID-4500 (19th Ed.)

UNIVERSITY OF CALIFORNIA
Lawrence Radiation Laboratory
Berkeley, California

Contract No. W-7405-eng-48

VAPOR-LIQUID EQUILIBRIA FOR AQUEOUS SULFURIC ACID

John Irving Gmitro and Theodore Vermeulen

June 24, 1963

VAPOR-LIQUID EQUILIBRIA FOR AQUEOUS SULFURIC ACID

Contents

VAPOR-LIQUID EQUILIBRIA FOR AQUEOUS SULFURIC ACID

John Irving Gmitro and Theodore Vermeulen

Lawrence Radiation Laboratory and Department of Chemical Engineering
University of California, Berkeley, California

June 24, 1963

ABSTRACT

The composition of the vapor phase over sulfuric acid has not been measured experimentally because of the low volatility of H_2SO_4. A method is described for calculating the partial pressures of H_2O, H_2SO_4, and SO_3 based upon liquid-phase partial-molal thermodynamic quantities. Tables and graphs are provided which give the above partial pressures from -50 to 400°C at thirty-six compositions between 10 and 100 weight-percent acid.

I. INTRODUCTION

The vapor phase over sulfuric acid solutions is composed of water and sulfuric acid, together with sulfur trioxide from the dissociation of the acid:

$$H_2SO_4(g) = H_2O(g) + SO_3(g) \quad (1)$$

In principle, the distribution of these three components at various temperatures and acid concentrations can be determined by either (a) experimental partial-pressure measurements, or (b) calculation of partial pressures from liquid-phase thermodynamic data.

Method (a), although more direct, is not fully applicable to the sulfuric acid system because of the low volatility of H_2SO_4. An idea of the problems involved may be had from the following table (derived from the present study), which gives order-of-magnitude values for the various partial pressures:

Concentration (%w)	Temperature (°C)	Partial pressure (mm Hg) H_2O	H_2SO_4	SO_3
10	25	20	10^{-15}	10^{-23}
	100	7×10^{2}	10^{-10}	10^{-16}
	300	6×10^{4}	2×10^{-3}	10^{-6}
50	25	8	10^{-10}	10^{-17}
	100	3×10^{2}	10^{-6}	10^{-11}
	300	4×10^{4}	5×10^{-1}	10^{-3}
90	25	5×10^{-3}	10^{-4}	10^{-8}
	100	2	6×10^{-2}	10^{-5}
	300	1.8×10^{3}	1.2×10^{2}	4

Experimental difficulties notwithstanding, the total vapor pressure of sulfuric acid, which in most cases is due entirely to the partial pressure of H_2O, was the subject of numerous investigations between 1845 and 1923. Greenewalt,[1] who in 1925 assembled the available data, reviewed 19 separate vapor-pressure determinations. His final result, based essentially on the measurements of Burt[2] and of Daudt,[3] is the accepted standard that appears in today's reference works.

Method (b), the calculational approach to partial pressures, requires two types of thermodynamic data:

(1) pure-component data for two liquids and three gases (H^o_{298}, S^o_{298}, and C^o_p), and

(2) partial molal data for binary solutions ($\overline{H}_{298}$, $\overline{S}_{298}$ or $\overline{F}_{298}$, and $\overline{C}_p$).

This type of approach was first used by Abel[4] in 1946, based in part on work by Bodenstein and Katayama[5] who had measured K_p for Eq. (1) at 300 to 500°C with 85 to 100 %w acid. The calorimetric data available at that time were incomplete, necessitating cross-correlations from various sources in order to determine partial molal quantities. More important, values of C^o_p, H^o_{298}, and S^o_{298} for H_2SO_4(g) were not available. This lack necessitated the use of K_p for Eq. (1) in the calculation of $p_{H_2SO_4}$, which in turn required an extrapolation of Bodenstein and Katayama's high-temperature equilibrium measurements down to 25°C.

Since 1946, additional data have become available which make the calculation of partial pressures via method (b) considerably more reliable. Extremely complete tables of partial molal quantities at 25°C, tested for internal consistency, have been published by Giauque et al.,[6] who give free energies, enthalpies, entropies, and heat capacities at 109 different sulfuric acid concentrations from 8.93 to 100 %w. In addition, Giguère[7] has obtained C^o_p, S^o, $(F^o - H^o_0)/T$, and $(H^o - H^o_0)/T$ for H_2SO_4(g) from spectroscopic data. The later data, when coupled with Bodenstein and Katayama's K_p data, provide a third-law H^o_{298} for H_2SO_4(g) and an equation giving the temperature dependence of K_p from 25 to 500°C.

Based upon these new data, this paper presents a method for calculating the partial pressures of H_2O, H_2SO_4, and SO_3 as functions of temperature and acid concentration. Partial molal heat-capacity values have had to be estimated by smoothing techniques, so that some inaccuracy still remains. Because of this, no correction has been made for nonideal-gas behavior, and 10 000 mm is viewed as the upper limit of applicability of the results.

II. DERIVATION OF EQUATIONS

A. Partial-Pressure Equation

For any component in a multicomponent mixture at equilibrium, the partial molal free energy of the vapor is equal to the partial molal free energy of the liquid:

$$\overline{F}(g) = \overline{F}(\ell) \tag{2}$$

If the pressure is low enough so that the vapor acts as a perfect gas, we obtain

$$F^{o}(g) + RT \ln p = F^{o}(\ell) + RT \ln a, \tag{3}$$

$$\ln p = \frac{F^{o}(\ell) - F^{o}(g)}{RT} + \ln a , \tag{3a}$$

or

$$\ln p = \frac{-\Delta F^{o}}{RT} + \ln a . \tag{3b}$$

Equation (3b) holds at any temperature and composition. The partial pressure under consideration is given by the sum of two terms: a pure-component term, $-\Delta F^{o}/RT$, a function of temperature only; and an activity term, $\ln a$, a function of both temperature and composition. In order to evaluate the pressure, each term must be related to its standard-state value.

The pure-component term is evaluated as follows:

$$\frac{d}{dT}\left(\frac{\Delta F^{o}}{T}\right) = \frac{-\Delta H^{o}}{T^{2}} \tag{4}$$

$$= \frac{-1}{T^{2}}\left\{\Delta H^{o}_{298} + \int_{298}^{T} [\, C^{o}_{p}(g) - C^{o}_{p}(\ell)]\, dT\right\} . \tag{4a*}$$

This integrates to give

$$\frac{-\Delta F^{o}}{RT} = -\left(\frac{\Delta H^{o} - T\Delta S^{o}}{RT}\right)_{298} + \frac{\Delta H^{o}_{298}}{R}\left(\frac{1}{298} - \frac{1}{T}\right) + \frac{1}{R}\int_{298}^{T} \frac{1}{T^{2}}\left\{\int_{298}^{T} [\, C^{o}_{p}(g) - C^{o}_{p}(\ell)]\, dT\right\} dT. \tag{5}$$

*Any coefficient or subscript shown as 298 is actually computed as 298.15°K (25°C).

The activity term is evaluated in a similar manner:

$$\ln a = \frac{\overline{F} - F^{o}}{RT} , \tag{6}$$

$$\frac{d}{dT}\left(\frac{\overline{F} - F^{o}}{T}\right) = \frac{-\overline{L}}{T^{2}} \tag{6a}$$

$$= \frac{-1}{T^{2}} \left\{ \overline{L}_{298} + \int_{298}^{T} [\,\overline{C}_{p} - C_{p}^{o}(\ell)]\ dT \right\} , \tag{6b}$$

$$\ln a = \left(\frac{\overline{F} - F^{o}}{RT}\right)_{298} - \frac{\overline{L}_{298}}{R}\left(\frac{1}{298} - \frac{1}{T}\right) - \frac{1}{R}\int_{298}^{T} \frac{1}{T^{2}}\left\{\int_{298}^{T} [\,\overline{C}_{p} - C_{p}^{o}(\ell)]\,dT\right\} dT . \tag{7}$$

Combining Eqs. (3b), (5), and (7), we obtain

$$\ln p = G_1 + G_2/T + G_3(T) , \tag{8}$$

where

$$G_1 = \frac{(\overline{F} - F^{o})_{298} - \overline{L}_{298} + 298\ \Delta S^{o}_{298}}{298R} ,$$

$$G_2 = \frac{\overline{L}_{298} - \Delta H^{o}_{298}}{R} ,$$

$$G_3(T) = \frac{1}{R} \int_{298}^{T} \frac{1}{T^{2}} \left\{ \int_{298}^{T} [\, C_{p}^{o}(g) - \overline{C}_{p}\,]\ dT \right\} dT .$$

The evaluation of $G_3(T)$ may be made by using heat-capacity functions in a form given in the literature. For the gas, we have

$$C_{p}^{o}(g) = a + bT + cT^{2} , \tag{9}$$

and for the liquid

$$\overline{C}_{p} = (\overline{C}_{p})_{298} + \alpha\,(T - 298) . \tag{10}$$

This gives, upon combining G_1, G_2, and $G_3(T)$:

$$\ln p = A \ln \frac{298}{T} + \frac{B}{T} + C + DT + ET^{2} , \tag{11}$$

where

$$A = \frac{1}{R}\,(-a + \overline{C}_{p,\,298} - 298\,\alpha) ,$$

$$B = \frac{1}{R}\left(-\Delta H^o_{298} + 298\,a + \frac{298^2}{2}\,b + \frac{298^3}{3}\,c + \bar{L}_{298} - 298\,\bar{C}_{p,\,298} + \frac{298^2}{2}\,a\right),$$

$$C = \frac{1}{R}\left(\Delta S^o_{298} - a - 298\,b - \frac{298^2}{2}\,c + C_{p,\,298} + [\,(\bar{F} - F^o)_{298} - \bar{L}_{298}]\,\frac{1}{298}\right),$$

$$D = \frac{1}{2R}\,(b - a)\ ,$$

$$E = \frac{1}{6R}\,c\ .$$

For the sulfuric acid system, partial molal quantities are available for H_2O and for H_2SO_4. Equation (11) was therefore used to calculate p_{H_2O} and $p_{H_2SO_4}$, and the partial pressure of SO_3 was calculated from

$$p_{SO_3} = K_p\, p_{H_2SO_4}/p_{H_2O}\ . \qquad (12)$$

B. Dissociation Constant of $H_2SO_4(g)$

The equilibrium constant for the dissociation of $H_2SO_4(g)$, K_p, may be determined as a function of temperature, as follows.

The equilibrium for Eq. (1) is given by

$$\ln\ K_p = -\,\Delta F^o_{(1)}/RT\ . \qquad (13)$$

The temperature dependence of K_p is obtained by expressing $\Delta F^o_{(1)}$ as a function of temperature:

$$\frac{d}{dT}\left[\frac{\Delta F^o_{(1)}}{T}\right] = -\,\frac{\Delta H^o_{(1)}}{T^2}$$

$$= -\,\frac{1}{T^2}\left\{\,[\,\Delta H^o_{(1)}\,]_{298} + \int_{298}^{T} \Delta C^o_{p(1)}\,dT\right\}. \qquad (14a)$$

The standard free-energy charge for the reaction is therefore given by

$$\frac{\Delta F^o_{(1)}}{T} = \left[\frac{\Delta H^o_{(1)} - T\Delta S^o_{(1)}}{T}\right]_{298} - \left[\Delta H^o_{(1)}\right]_{298}\left(\frac{1}{298} - \frac{1}{T}\right)$$

$$-\int_{298}^{T} \frac{1}{T^2}\left[\int_{298}^{T} \Delta C^o_{p(1)}\,dT\right] dT\ , \qquad (15)$$

and the equilibrium constant by

$$\ln K_p = \frac{\left[\Delta S^o_{(1)}\right]_{298}}{R} - \frac{\left[\Delta H^o_{(1)}\right]_{298}}{RT} + \frac{1}{R}\int_{298}^{T} \frac{1}{T^2}\left[\int_{298}^{T} \Delta C^o_{p(1)} dT\right] dT. \tag{16}$$

Heat-capacity data available in the literature give the following function for $\Delta C^o_{p(1)}$:

$$\Delta C^o_{p(1)} = a' + b'T + c'T^2 + d'T^{-2}. \tag{17}$$

Use of this to evaluate the heat-capacity integral in Eq. (16) results in the following equation for K_p:

$$\ln K_p = J \ln(298/T) + K/T^2 + L/T + M + NT + QT^2, \tag{18}$$

where

$$J = - a'/R,$$

$$K = d'/2R,$$

$$L = \frac{1}{R}\left[-(\Delta H^o_{(1)})_{298} + 298 a' + \frac{298^2}{2} b' + \frac{298^3}{3} c' - \frac{d'}{298}\right],$$

$$M = \frac{1}{R}\left[(\Delta S^o_{(1)})_{298} - a' - 298 b' - \frac{298^2}{2} c' + \frac{1}{2} d'/298^2\right],$$

$$N = b'/2R,$$

$$Q = c'/6R.$$

III. THERMODYNAMIC DATA

A. Pure-Component Properties

The pure-component data required in Eqs. (11) and (18) are listed in Table I.

1. H^o_{298} for $H_2SO_4(g)$

The value of H^o_{298} listed in Table I for $H_2SO_4(g)$ was calculated as follows: Kelley[9] has tabulated values of $(H^o - H^o_{298})$ and $(S^o - S^o_{298})$ at 100°C intervals for $H_2O(g)$ and $SO_3(g)$. These were used to calculate the free-energy function:

$$\frac{F^o - H^o_{298}}{T} = \frac{H^o - H^o_{298}}{T} - (S^o - S^o_{298}) - S^o_{298} . \qquad (19)$$

Giguère's tables[7] of $(F^o - H^o_0)/T$ and $(H^o - H^o_0)/T$ for $H_2SO_4(g)$ were also converted to the same form:

$$\frac{F^o - H^o_{298}}{T} = \frac{F^o - H^o_0}{T} - \frac{298.15}{T} \left(\frac{H^o - H^o_0}{T}\right)_{298} . \qquad (20)$$

This procedure gave the following results:

T	$-(F^o - H^o_{298})/T$		
(°K)	$H_2O(g)$	$H_2SO_4(g)$	$SO_3(g)$
500	46.03	74.32	62.73
600	46.72	76.22	63.93
700	47.41	78.17	65.19
800	48.10	80.11	66.46

These values allow the calculation of $\Delta(F^o - H^o_{298})/T$ for the dissociation of $H_2SO_4(g)$, Eq. (1). In addition, each of Bodenstein and Katayama's K_p determinations[5] represents an individual measurement of $\Delta F^o_{(1)}/T$, since

$$\Delta F^o_{(1)} = -RT \ln K_p . \qquad (21)$$

Table I. Values of thermodynamic properties at 298.15 °K.

Component	Property	State	Value	Units	Reference
SO_3	H^o	g	-94.45	kcal/mole	(8)
	S^o	g	61.24	cal/mole-deg	(8)
	$C_p^{o(a)}$	g	a=13.90 b=6.10×10^{-3} d=-3.22×10^5	cal/mole-deg cal/mole-deg^2 cal-deg/mole	(9)
H_2O	H^o	ℓ	-68.32	kcal/mole	(8)
		g	-57.80	kcal/mole	(8)
	S^o	ℓ	16.72	cal/mole-deg	(8)
		g	45.11	cal/mole-deg	(8)
	$C_p^{o(a)}$	g	a= 7.30 b= 2.46×10^{-3}	cal/mole-deg cal/mole-deg^2	(9)
Vaporization	ΔH^o		10.52	kcal/mole	
	ΔS^o		28.39	cal/mole-deg	
H_2SO_4	H^o	ℓ	-193.91	kcal/mole	(8)
		g	-175.01	kcal/mole	See text
	S^o	ℓ	37.50	cal/mole-deg	(6)
		g	71.93	cal/mole-deg	(7)
	$C_p^{o(a)}$	g	a= 7.86 b= 46.15×10^{-3} c=- 2.612×10^{-5}	cal/mole-deg cal/mole-deg^2 cal/mole-deg^3	See text
Vaporization	ΔH^o		18.90	kcal/mole	From H^o(ℓ, g)
	ΔS^o		34.43	cal/mole-deg	From S^o(ℓ, g)
Dissociation	$\Delta H^o_{(1)}$		22.76	kcal/mole	See text
	$\Delta S^o_{(1)}$		34.42	cal/mole-deg	See text
	$\Delta C^o_{p(1)}$		a= 13.34 b=-37.59×10^{-3} c= 2.612×10^{-5} d=- 3.22×10^5	cal/mole-deg cal/mole-deg^2 cal/mole-deg^3 cal-deg/mole	See text

(a) $C_p^o = a + bT + cT^2 + dT^{-2}$.

By use of Eq. (22), therefore, a value of $[\Delta H^o_{(1)}]_{298}$ for Eq. (1) can be calculated from each K_p data point:

$$[\Delta H^o_{(1)}]_{298} = \frac{1}{T}\left[\frac{\Delta F^o_{(1)}}{T} - \Delta\left(\frac{F-H_{298}}{T}\right)\right]. \tag{22}$$

Then H^o_{298} for $H_2SO_4(g)$ can be calculated from $[\Delta H^o_{(1)}]_{298}$, since H^o_{298} values are known for both $H_2O(g)$ and $SO_3(g)$.

Bodenstein and Katayama measured concentrations rather than partial pressures, and presented their results as log K_c vs temperature. Table II lists values of $\Delta F^o_{(1)}/T$ calculated from their data, by use of the conversion relation

$$\Delta F^o_{(1)}/T = - R \ln K_p , \tag{23}$$

$$= - 2.303\ R \log(K_c RT) . \tag{23a}$$

Application of Eq. (22) at each of these data points gave an average value of 22 760 cal/mole for $[\Delta H^o_{(1)}]_{298}$; the sample standard deviation was 285 cal/mole. As shown in Table I, this procedure gives for $H_2SO_4(g)$:

$$H^o_{298} = - 57.80 - 94.45 - 22.76$$
$$= -175.01 \text{ kcal/mole.}$$

2. C^o_p for $H_2SO_4(g)$

The C^o_p equation for $H_2SO_4(g)$ listed in Table I was selected as an empirical fit to the C^o_p data given in tabular form by Giguère.[7] The match to the data over the region of interest is shown below:

T (°K)	C^o_p, ref. 7	C^o_p, Table I
298.15	19.29	19.29
300	19.35	19.39
400	22.19	22.14
500	24.40	24.40
600	26.08	26.14
700	27.36	27.36

Table II. Bodenstein and Katayama equilibrium data for $H_2SO_4(g) = H_2O(g) + SO_3(g)$.[a]

Run No.	T (°K)	$\Delta F^o_{(1)}/T$ (cal/mole)	Run No.	T (°K)	$\Delta F^o_{(1)}/T$ (cal/mole)	Run No.	T (°K)	$\Delta F^o_{(1)}/T$ (cal/mole)
1	741	-3.75	4	598	3.34	6	633	0.85
	725	-3.27		622	1.98		653	0.75
	682	-1.01		635	0.99		688	-0.66
	653	0.36		668	-0.68		711	-1.78
	621	2.09		701	-2.47		750	-3.12
				717	-3.32		711	-1.78
				682	-1.85		657	0.70
2	646	1.17		596	3.13		629	1.98
	660	0.30						
	664	0.00						
	693	-1.12	5	610	2.87	7	611	3.24
	708	-2.22		635	1.06		629	2.08
	731	-3.35		653	0.20		647	1.12
	756	-4.24		655	0.09		660	0.54
				680	-1.09		689	-1.03
				707	-2.37		714	-1.88
3	613	2.60		710	-2.48		689	-1.03
	627	1.52		747	-4.47		658	0.50
	639	0.99					637	1.55
	652	0.31						
	693	-1.85						
	729	-3.68						
	660	-0.32						
	643	0.68						

[a] Reference 5.

The values of C_p^o, S^o, and free-energy functions given by Giguère were calculated from spectroscopic data. Because of an uncertainty in accounting for the torsional oscillations of the sulfuric acid OH groups, properties were tabulated in reference 7 both with and without the torsional mode included. We have used the values which include the contribution of the torsional oscillations; this gives a probable uncertainty in the $H_2SO_4(g)$ functions of 0.25 cal/mole-deg.

3. Constants in Equations

It is desirable for calculational purposes to separate out the pure-component terms in Eq. (11), since they are constant for all acid compositions. Upon evaluating these terms from the data in Table I, the following equation is obtained for calculating p_{H_2O} and $p_{H_2SO_4}$:

$$\ln p = A \ln(298/T) + B/T + C + DT + ET^2, \qquad (24)$$

where

$$A = A' + \frac{1}{R}(\overline{C}_{p,298} - 298a)$$

$$B = B' + \frac{1}{R}(\overline{L}_{298} - 298\,\overline{C}_{p,298} + \frac{298^2}{2}\,a),$$

$$C = C' + \frac{1}{R}\left\{\overline{C}_{p,298} + [(\overline{F}-F^o)_{298} - \overline{L}_{298}]\frac{1}{298}\right\},$$

$$D = D' - a/2R,$$

$$E = \text{constant}.$$

Term	Units	H_2O value	H_2SO_4 value
A'	Dimensionless	-3.67340	-3.95519
B'	^oK	-4143.5	-7413.3
C'	Dimensionless	10.24353	7.03045
D'	$(^oK)^{-1}$	0.618943×10^{-3}	11.61146×10^{-3}
E	$(^oK)^{-1}$	0	-2.19062×10^{-6}

The constants in the K_p equation, Eq. (18), may be evaluated immediately, since they are all pure-component terms. Upon substitution of the data in Table I, we obtain the following K_p equation for the calculation of p_{SO_3}:

$$\ln K_p = J \ln(298/T) + K/T^2 + L/T + M + NT + QT^2, \qquad (25)$$

where

$J = -6.71464,$

$K = -8.10161\times10^4,$

$L = -9643.04,$

$M = 14.74965,$

$N = -9.4577\times10^{-3},$

$Q = 2.19062\times10^{-6}.$

The fit of this equation to Bodenstein and Katayama's data is shown in Fig. 1. The constants shown for Eqs. (24) and (25) give pressures in units of atmospheres; for results in mm Hg, ln 760 is added to C' and to M. A value of 1.98726 cal/mole-deg was used for R, and 298.15 was used wherever 298 is indicated in Eqs. (11) and (18).

B. Partial Molal Properties

The partial molal properties required in Eq. (24) for the calculation of p_{H_2O} and $p_{H_2SO_4}$ are listed in Table III. These values are from the data of Giauque et al.,[6] who have carried out an extensive research on the thermodynamic properties of aqueous sulfuric acid. Reference 6 represents the final correlation of the available data and gives tables of partial molal properties; the values in Table III were interpolated directly from these results.

Referring to Table III, we see that data are lacking for α below 25%w and for the partial molal heat capacity of water in anhydrous acid. Estimated values of these variables are given in Sec. IV, following evaluation of the bulk of the data.

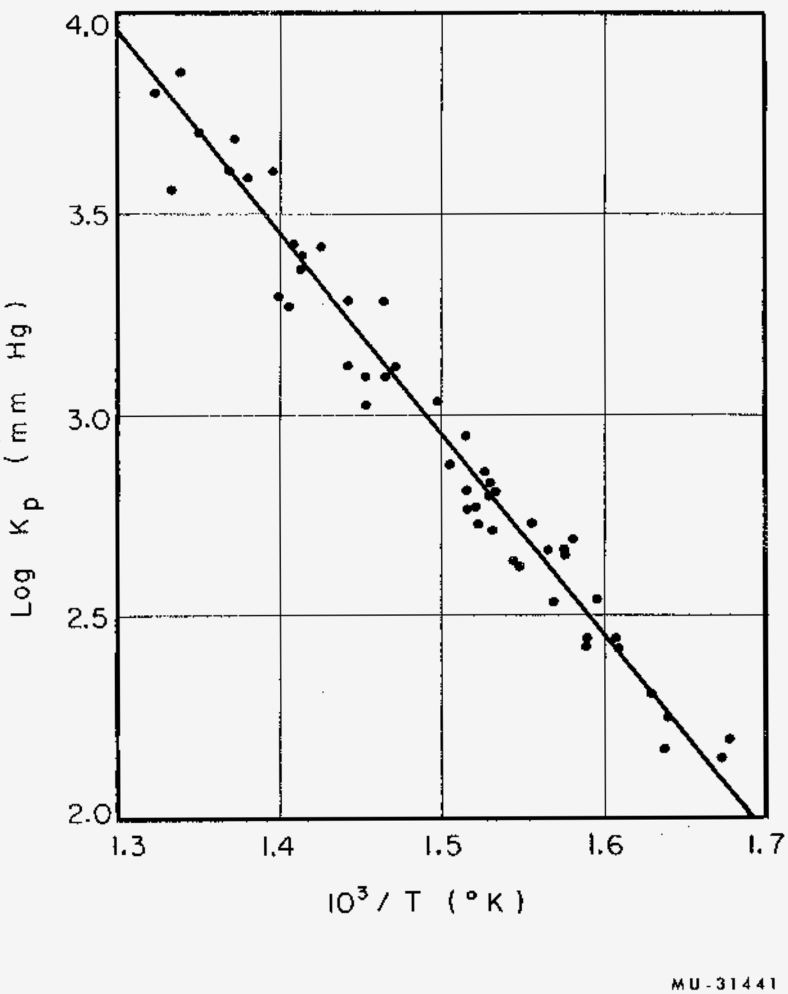


Fig. 1. The fit of Eq. (25) to Bodenstein and Katayama's data.

Table III. Partial molal quantities for sulfuric acid at 298.15 °K (from Giauque[a]).

H_2SO_4		Water				Sulfuric acid			
(% w)	% m	$(\overline{F}_1 - F_1^o)$	$\overline{L}_1$	$C_{p,1}$	a_1	$(\overline{F}_2 - F_2^o)$	$\overline{L}_2$	$\overline{C}_{p,2}$	a_2
10	2.00	- 26.44	- 6.28	17.871		-15624	-17078	22.18	
20	4.39	- 75.10	- 34.0	17.775		-14115	-16279	25.65	
25	5.77	- 114.9	- 71.8	17.780		-13373	-15580	25.70	
30	7.30	- 168.8	- 136.0	18.114	0.0186	-12600	-14659	20.97	-0.0268
35	9.00	- 241.4	- 228.6	18.555	0.0178	-11782	-13618	15.93	-0.0156
40	10.91	- 338.2	- 349.0	18.662	0.0165	-10906	-12527	14.90	-0.0041
45	13.06	- 462.2	- 494.2	18.518	0.0249	-9995	-11457	15.92	-0.0633
50	15.52	- 620.6	- 662.9	17.731	0.0232	-9045	-10445	20.62	-0.0557
55	18.33	- 821.5	- 867.3	16.963	0.0153	-8054	-9437	24.44	-0.0159
60	21.60	-1075.3	-1125.0	16.335	0.0116	-7036	-8405	26.95	-0.0011
65	24.44	-1406.3	-1459	15.173	0.0006	-5962	-7320	30.69	0.0340
70	30.00	-1836	-1903	13.398	-0.0207	-4838	-6158	35.34	0.0895
72	32.08	-2038	-2127	12.570	-0.0296	-4387	-5664	37.17	0.1095
74	34.33	-2261	-2382	11.762	-0.0358	-3940	-5144	38.80	0.1220
76	36.78	-2508	-2683	11.01	-0.0330	-3492	-4601	40.17	0.1171
78	39.44	-2783	-3039	10.33	-0.0182	-3046	-4025	41.27	0.0935
80	42.35	-3090	-3475	9.77	0.0114	-2600	-3394	42.08	0.0509
82	45.56	-3427	-4015	10.36	0.0568	-2170	-2705	41.37	-0.0069
84	49.09	-3789	-4656	13.78	0.1233	-1766	-1994	37.57	-0.0830
86	53.01	-4167	-5319	18.96	0.0666	-1404	-1354	32.65	-0.0270
88	57.39	-4557	-5938	22.13	-0.0120	-1086	-851	29.99	0.0361
90	62.31	-4960	-6419	22.76	-0.0346	-816	-524	29.54	0.0511
91	65.00	-5165	-6627	22.30	-0.0398	-699	-405	29.81	0.0541
92	67.87	-5375	-6816	21.48	-0.0427	-592.8	-309	30.22	0.0557
93	70.93	-5595	-6983	20.44	-0.0436	-495.2	-235.4	30.67	0.0562
94	74.21	-5830	-7139	19.32	-0.0428	-408.5	-176.3	31.10	0.0558
95	77.73	-6090	-7286	18.06	-0.0405	-323.5	-129.6	31.50	0.0551
96	81.51	-6390	-7433	16.64	-0.0368	-248.4	- 92.1	31.86	0.0543
97	85.59	-6741	-7574	15.05	-0.0314	-178.3	- 64.5	32.17	0.0531
98	90.00	-7204	-7712	13.25	-0.024	-114.3	- 44.6	32.43	0.0520
98.48	92.25	-7521	-7777	12.25	-0.019	- 85.3	- 38.9	32.52	0.0516
99	94.79	-7963	-7845	11.03	-0.014	- 54.6	- 33.8	32.61	0.0514
99.5	97.34	-8692	-7919	7.0	-0.008	- 26.00	- 30.6	32.76	0.0509
99.8	98.92	-9624	-8337	- 4.1	-0.003	- 9.32	- 24.2	32.95	0.0509
99.9	99.46	-10342	-9355	-15.3	-0.001	- 3.50	- 16.7	33.04	0.0509
100	100	-12014	-16125		0	0	0	33.20	0.0509

[a]Reference 6.

IV. CALCULATION OF PARTIAL PRESSURES

In the calculation of partial pressures from the equations presented in Sec. II, one depends upon room-temperature heat-capacity measurements on the solutions to predict their high-temperature properties. Inherent in the method is the assumption that the extrapolation of the data will not generate significant errors. In the present case, it has been realized that the thermodynamic properties collected in Sec. III might not give a perfect a priori calculation of partial pressures. Initial calculations tended to bear this out. Results to temperatures near 200°C were satisfactory, but at higher temperatures the calculated partial pressures became progressively more erratic.

To correct the observed inconsistencies, it was decided to adjust α, the temperature coefficient of the partial molal heat capacity. The choice of α as a correction term was somewhat arbitrary. In principle, either α could be changed, or additional nonlinear terms could be added to Eq. (10) to describe assumed heat-capacity—temperature behavior. Either choice, however, requires the assumptions implicit in smoothing the calculated results; after some consideration, it was decided to adjust α. In a few cases, minor adjustment of other functions was also necessary.

The effect of α upon partial pressure can be given by a simplified rearrangement of Eq. (11):

$$\log p = \log(p)_{\alpha=0} - \beta\alpha , \qquad (26)$$

where the factor β is shown in Fig. 2 as a function of temperature. Most of the α values of Table III were originally determined between -20 and +25°C; a small number were based upon data up to 80°C. Above 200°C, where Fig. 2 indicates that α becomes a significant variable in the partial-pressure equation (Eq. (24)), the reported values of α will be seen to be inadequate. By determining a suitable average α for the range of 25 to 400°C, one can significantly alter high-temperature partial pressures without affecting the already satisfactory low-temperature values.

As explained below, α was adjusted so that partial pressures in the 200 to 400°C range were consistent with the low-temperature results and with the sulfuric acid azeotrope and boiling-point data. Cross-plots of log p vs %w, %m, and 1/T were used as guides during the calculation. Smoothed partial pressures were checked on activity-coefficient plots and examined for consistency by using the Gibbs-Duhem equation.

A. Trial Calculations

Figures 3 and 4 show trial values of p_{H_2O} and $p_{H_2SO_4}$, calculated from Eq. (24) and partial molal data listed in Table III. The double sets of curves at 200°C and above indicate results obtained by using (a) α as given in Table III (dashed curves), and (b) α = 0 (solid curves). Below 200°C, results obtained by using α either as in (a) or (b) were practically equivalent. It is not necessary that the partial-pressure curves be smooth, but it is essential that their rise be monotonic; however, it appears significant that the curves at lower temperatures are indeed relatively smooth. Figure 5 shows the values of α listed in Table III. It can be seen that the erratic areas in the calculated partial pressures correspond to the "peaks" and "valleys" in the α curves. For example, following the dashed 400°C curve in Fig. 4, the high value of $p_{H_2SO_4}$ at 47%w, decreasing pressures through 74%w, and extremely high value of $p_{H_2SO_4}$ at 84%w are the respective results of a low α at 46.5%w, increasing values of α to a maximum at 74.5%w, and an abrupt minimum in α at 84.5%w.

The variations in room-temperature α values with concentration, shown in Fig. 5, reflect the differences in heat-capacity behavior of the various hydrated forms of H_2SO_4. Possibly the hydrate compositions are not so distinct at temperatures over 100 to 200°C.

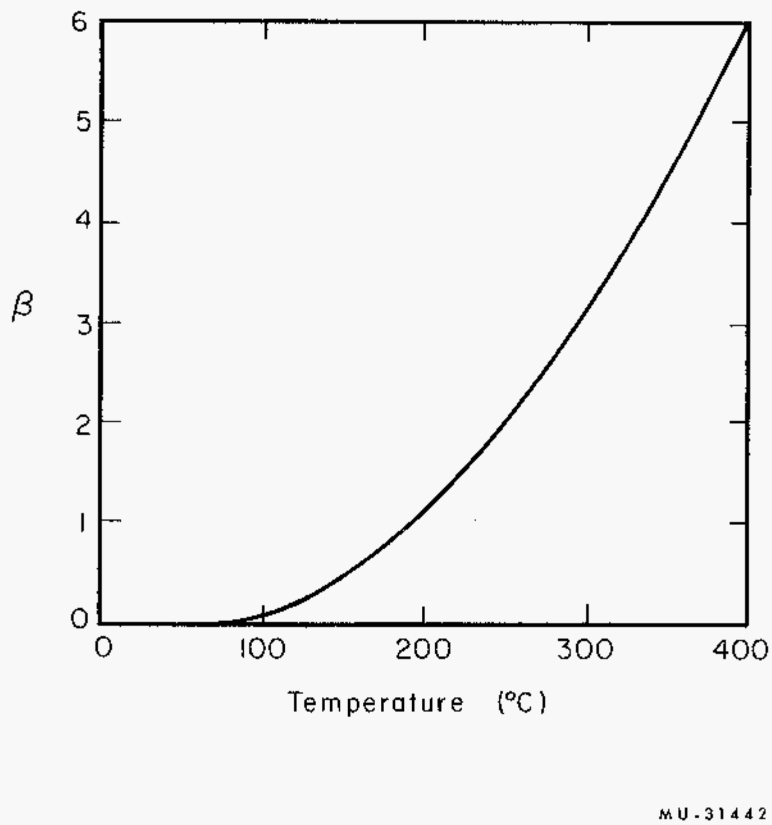
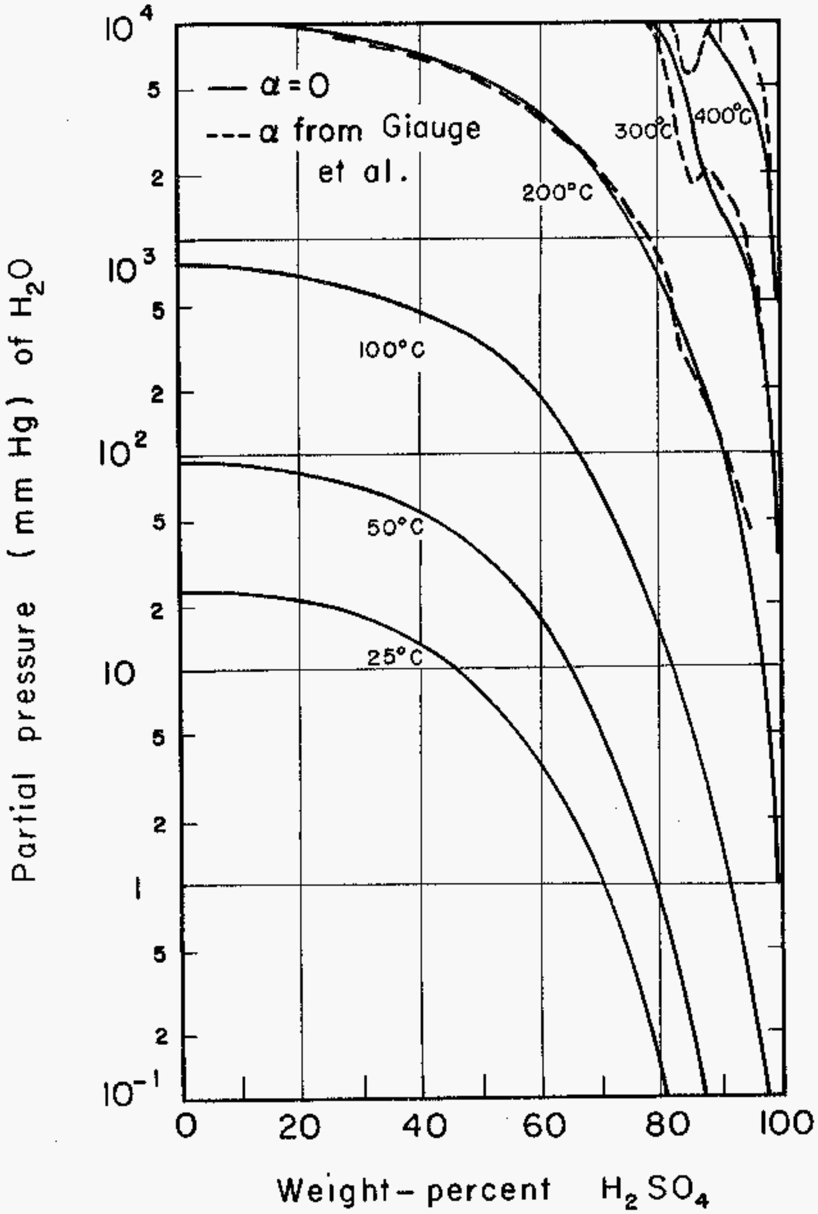


Fig. 2. Values of $\beta = (1/a)\{\log[p/p_{(a=0)}]\}$ from 25 to 400°C.



MU-31443

Fig. 3. Partial pressure of water, trial calculations.

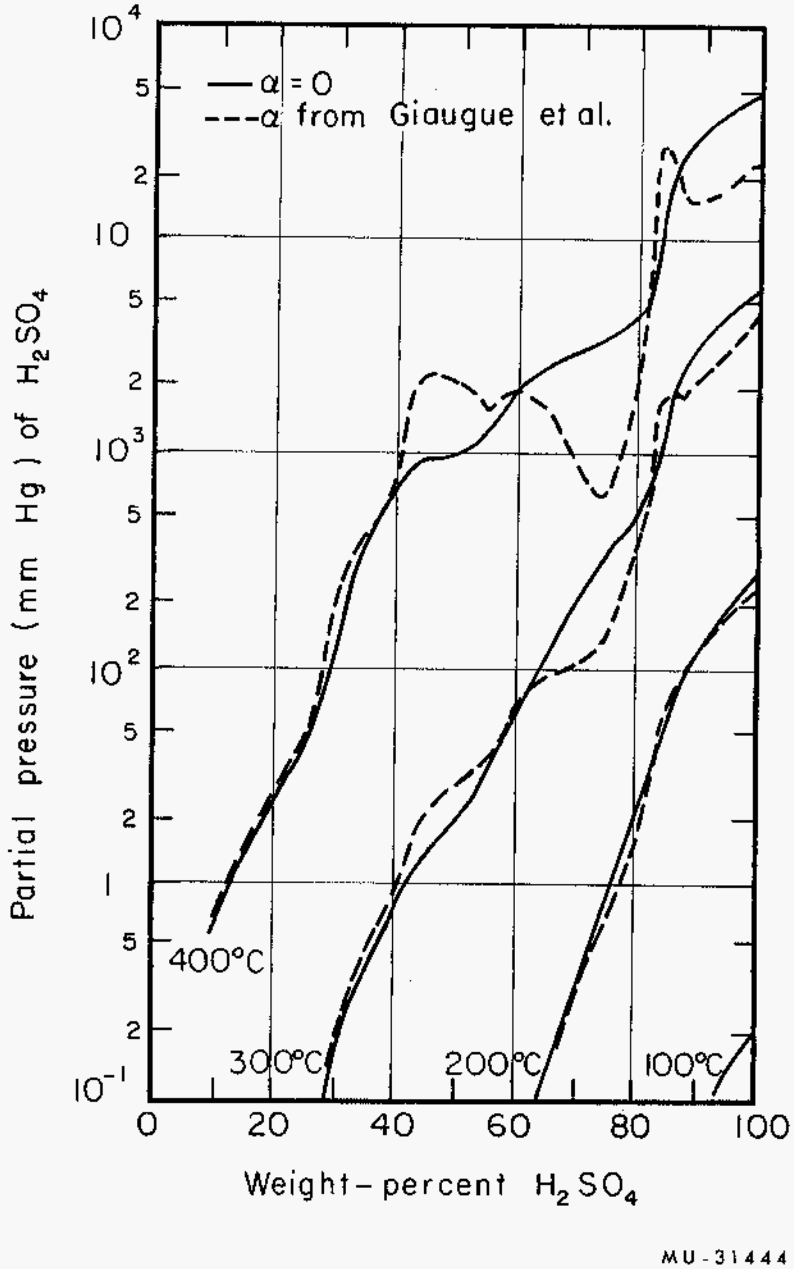


Fig. 4. Partial pressure of sulfuric acid, trial calculations.

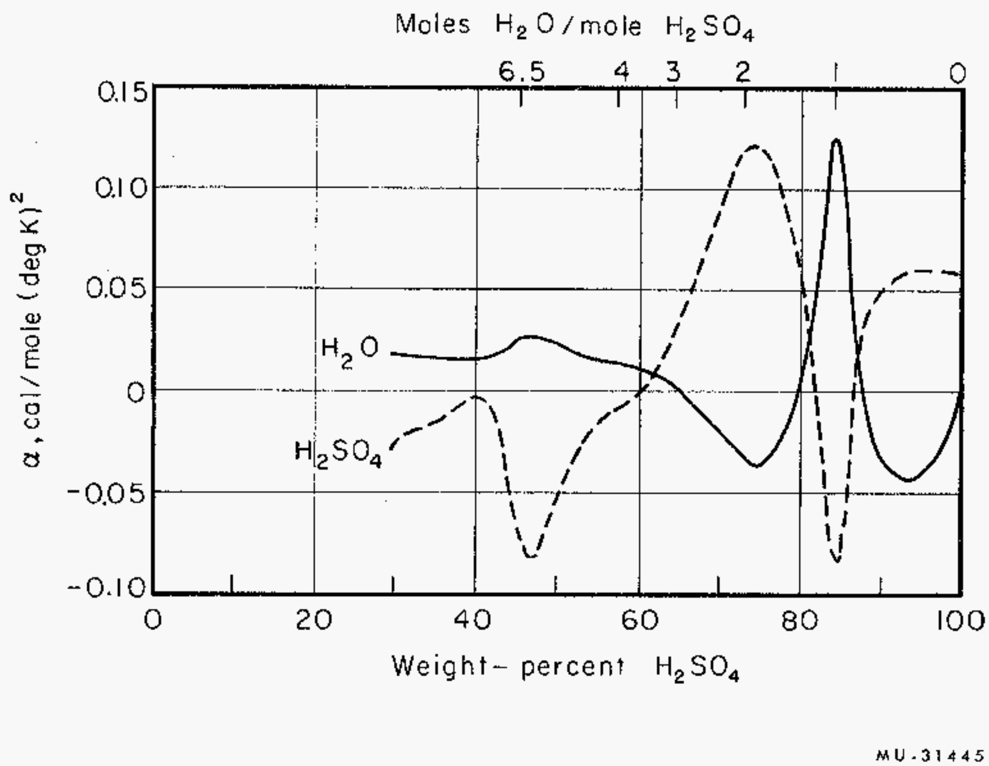


Fig. 5. Temperature coefficient of partial molal heat capacities, measured at 25°C, from Giauque et al.[6]

B. Adjustment of High-Temperature Partial Molal Heat Capacities

The values of α_{H_2O} and $\alpha_{H_2SO_4}$ shown in Fig. 5 were adjusted so that partial pressures above 200°C were consistent with low-temperature results. Calculations were carried out so as to insure agreement with sulfuric acid azeotrope and boiling-point data.

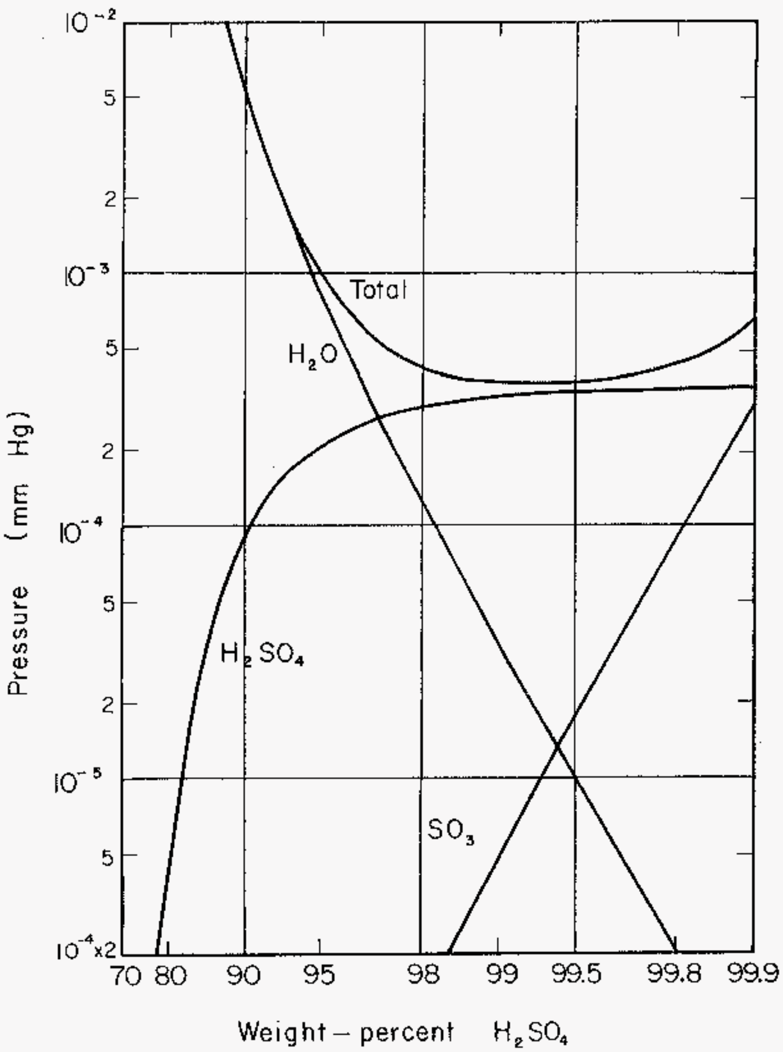
1. Sulfuric Acid Azeotrope

Figure 6 shows the partial-pressure behavior at 25°C [calculated from Eqs. (24) and (25) with the smoothed constants eventually deduced] in the vicinity of the sulfuric acid azeotrope. An abscissa scale of -log [100-(%w)] is used in Fig. 6 in order to expand the azeotrope region. The partial-pressure behavior shown—$p_{H_2SO_4}$ nearly constant, p_{H_2O} decreasing rapidly, and p_{SO_3} increasing rapidly—continues at higher temperatures and pressures. The concentration at which the azeotrope occurs, however, decreases as the pressure increases. This was shown by Kunzler,[10] who obtained the following data on the concentration of constant-boiling sulfuric acid at various pressures:

p (mm Hg)	H_2SO_4 (%w)	p (mm Hg)	H_2SO_4 (%w)
100	98.790	700	98.495
200	98.704	750	98.482
300	98.645	800	98.469
400	98.597	850	98.457
500	98.557	900	98.446
600	98.524	950	98.436
650	98.509	1000	98.426

Interpolation of Kunzler's data gives an azeotrope concentration of 98.479 %w at 760 mm Hg, which was adopted for the present study.

Abel[4] surveyed the available data on the temperature and concentration for the atmospheric-pressure azeotrope; the results of various experimenters are as follows:



MU-31446

Fig. 6. The sulfuric acid azeotrope at 25°C.

t(°C)	H_2SO_4 (%w)	t(°C)	H_2SO_4 (%w)
326	98.39	338	98.5
330	98.33	338	98.5
338	98.3	317	98.54
		331.7	----

In the present calculations, it was decided to base high-temperature partial pressures on a temperature of 326°C for the 1.0-atm azeotrope, as was done by Abel.[4, 11] Although this temperature is rated as the most probable value, it is subject to an uncertainty of at least ±5°C.

At an azeotrope the composition of the liquid is equal to the composition of the vapor (e.g., in mole-% units). Referring to w as the weight-fraction of sulfuric acid at the azeotrope, and using the subscripts 1, 2, and 3 to indicate H_2O, H_2SO_4, and SO_3, respectively, we obtain

$$\frac{18.016w}{98.082 - 80.066w} = \frac{p_2 + p_3}{(p_1 - p_3) \quad + p_2 + p_3} \tag{27}$$

For the 1.0-atm azeotrope, we therefore obtain

$$0.92246 = \frac{p_2+p_3}{p_1+p_2} \ , \tag{28}$$

At this azeotrope we also have

$$760 = p_1+p_2+p_3 \ , \tag{29}$$

$$K_p = p_1 \, p_3/p_2 \ . \tag{30}$$

Since the value of K_p at 326°C can be determined from Eq. (25), the partial pressures at the azeotrope can be determined by combining Eqs. (28), (29), and (30). Eliminating p_2 and p_3, and using $S = 0.92246$, we obtain

$$(p_1)^2 + p_1[K_p(1+S) - 760(1-S)] - 760K_p = 0. \tag{31}$$

Following evaluation of p_1 from Eq. (31), p_2 can be determined by combining Eqs. (29) and (30) with the elimination of p_3:

$$p_2 = \frac{760-p_1}{1+(K_p/p_1)} \tag{32}$$

The α values required to give the correct azeotrope p_1 and p_2 can then be calculated from Eq. (24). This procedure gave the following results for the sulfuric acid azeotrope:

Input conditions	Results
$t = 326°C$, $K_p = 130.2$ mm	$p_1 = 233.1$ mm, $\alpha_1 = 0.0160$,
$P = 760$ mm	$p_2 = 338.1$ mm, $\alpha_2 = 0.1249$,
%w = 98.48	$p_3 = 188.8$ mm.

2. Adjustment of Alpha, 10 to 98.5 %w

Figure 7 shows the values of α calculated in this paper. The method of calculation used was suggested by the property of α mentioned in Sec. IV: a change in α strongly affects high-temperature partial pressures without altering low-temperature values. The procedure used was as follows:

(a) Partial pressures from 25 to 400°C were calculated at temperature intervals of 25°C, with $\alpha = 0$ at all weight-percents.

(b) Starting at 25°C, pressures were plotted on log p-vs-concentration and log p-vs-1/T coordinates. At each 25°C interval, pressures at $\alpha = 0$ were checked against pressures calculated from Eq. (26), by using α equal to the azeotrope value. Up to 150°C there was no appreciable difference.

(c) At 150°C the difference between the pressures calculated with $\alpha = 0$ and α equal to the azeotrope value was noticeable. The effect was a parallel (downward) shift of the pressure curve; no irregularities were visible. At subsequent 25°C intervals, pressures were calculated from Eq. (26) by using the appropriate β and with α equal to the azeotrope value.

(d) By 200°C, irregularities occurred in the pressure curves at acid concentrations where α reaches a maximum or a minimum. Referring to Fig. 7, these values were 90, 82, and 40 %w for both H_2O and H_2SO_4. Irregularities were smoothed visually and the α required to give the smoothed pressure was calculated from Eq. (26). These new α values were then used for the next temperature interval.

(e) The procedure of raising the temperature by 25°C and using the α from the previous step to predict pressures at that temperature was continued. At 400°C the pressure curves on the two coordinate systems were viewed as a whole, and any discrepancies corrected. At temperatures over 200°C the net effect on α was to fill in the portions between the maxima and minima in the α curves, Fig. 7.

The above procedure was followed for calculating both α_{H_2O} and $\alpha_{H_2SO_4}$. For ease of interpolation, p_{H_2O} was smoothed on weight-percent coordinates, and $p_{H_2SO_4}$ on mole-percent coordinates.

Figure 8 shows the heat capacity of sulfuric acid at 25°C, as tabulated in reference 6; the partial molal heat capacities are derived from the slope of this curve. The α values shown in Fig. 7 indicate that at 400°C the wave between 15 and 45 %w becomes more pronounced, while the "bump" between 75 and 90 %w is slightly broadened.

3. <u>98.5- to 100-%w Region</u>

In the region between the azeotrope and 100% acid a check of the activity coefficients showed that α adjustments alone would not give consistent results over the complete temperature range. This was especially true in the case of $p_{H_2SO_4}$, which changes very little in the high-weight-percent region. Furthermore, the sulfuric acid heat-capacity data listed in reference 6 show a cusp at 100% H_2SO_4, making the partial molal heat capacity of water indeterminate at that point. Figure 9 shows the portion of the heat-capacity curve (Fig. 8) between 96 and 101 %w. The data points are those of Kunzler and Giauque[12] which Giauque's smoothed values[6] (dashed curve) do not follow very closely. The solid curve coincides with the data listed in reference 6 below 98.5 %w and near 101 %w. Results between these weight-percents were calculated as follows.

For sulfuric acid, values of $(F-F^o)$ were adjusted at 99, 99.5, 99.8, and 99.9 %w so that $p_{H_2SO_4}$ gave Raoult-Law behavior at 25°C

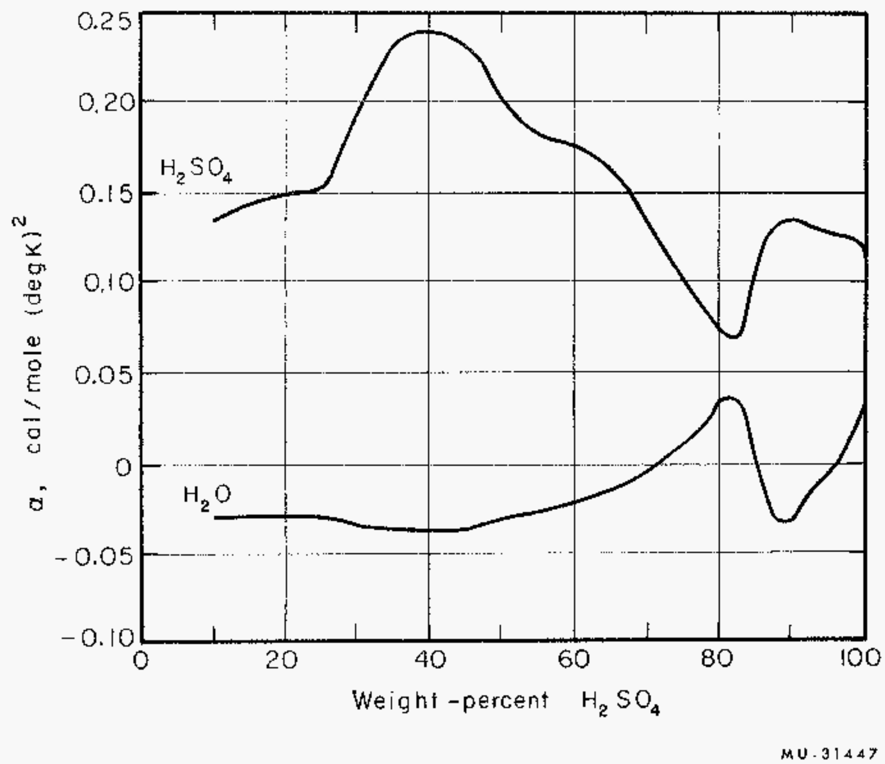


Fig. 7. Average temperature coefficient of partial molal heat capacities, between 25 and 400°C.

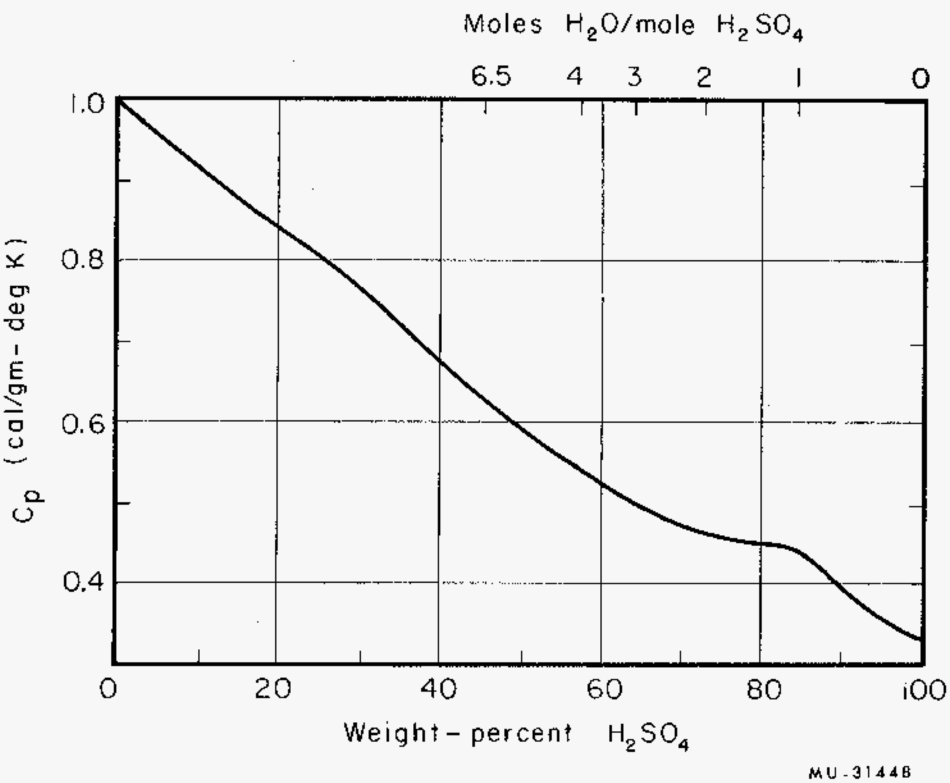


Fig. 8. The heat capacity of aqueous sulfuric acid at 25°C.

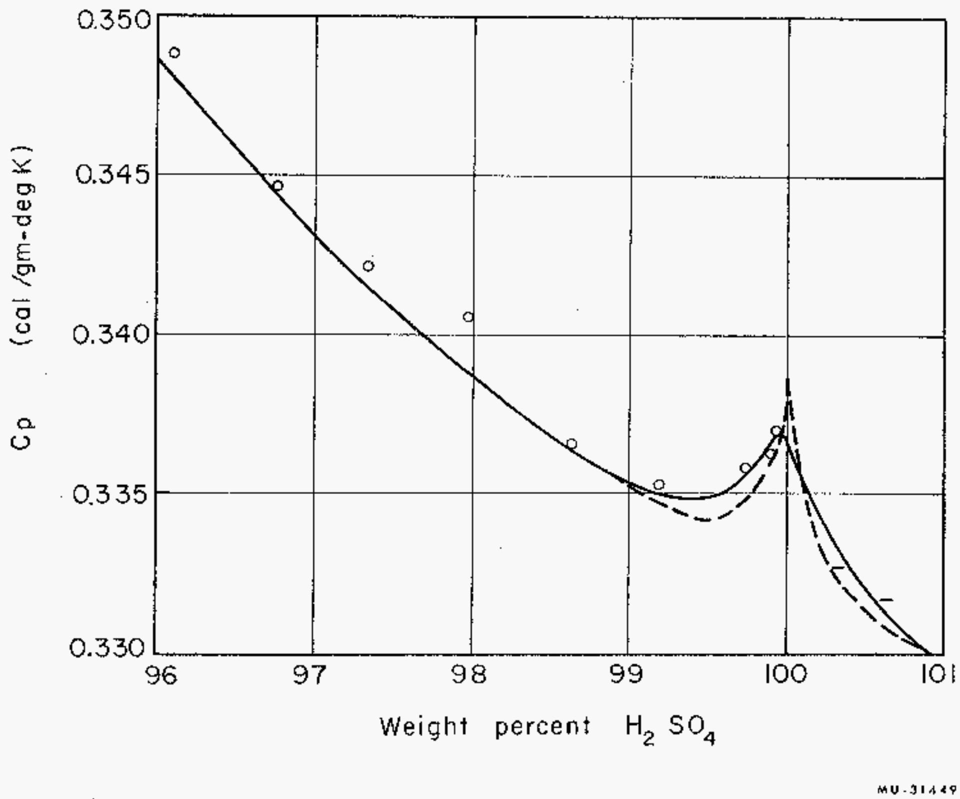


Fig. 9. The heat capacity of aqueous sulfuric acid near 100% H_2SO_4.

(based on two ions formed per molecule of H_2SO_4 added, as indicated by Young and Walrafen.[13]) Then $\bar{L}$, $\bar{C}_p$, and α were adjusted to give consistent $p_{H_2SO_4}$ behavior at high temperatures; at the same time, $\bar{C}_p$ and α at 100% were varied to give smooth activity-coefficient behavior between 98.5 and 100 %w. Referring to Fig. 9, this procedure gave a heat capacity at 100%, along with the 100% intercepts of the slopes of the heat-capacity curve taken at 99, 99.5, 99.8, and 99.9 %w.

Values of p_{H_2O} between 98.5 and 100 %w were then calculated by assuming various heat-capacity curves through this region. Partial molal heat capacities were calculated from the 100% intercepts determined above, and the assumed heat capacity; then p_{H_2O} was calculated by assuming values of α. New heat-capacity curves and alphas were assumed until consistent values of p_{H_2O} were obtained at 99, 99.5, 99.8, and 99.9 %w. The heat-capacity curve was chosen so that these pressures, when extrapolated, gave an acceptable boiling point at 100% acid. Then $\bar{C}_p$ and α for H_2O were fitted to the resulting 100% pressures.

This procedure resulted in the heat-capacity curve shown in Fig. 9 for the 98.5- to 99.9-%w region and for the intercept and slope at 100%. The calculated value of $(\bar{C}_p)_{H_2O}$ for 100% was large and positive, indicating that the peak in the heat-capacity curve occurs below 100%. The portions of the curve between 99.9 to 100 %w and 100 to 101 %w were drawn by assuming a Gaussian-type variation around the 100% value.

The values of the partial molal properties for the 98.5- to 100-%w region are shown in Table IV, below. The 100% values give an anhydrous-acid boiling point of 272°C, within the 270 to 280°C range given in the literature.[14]

Table IV. Partial molal properties of sulfuric acid.

H_2SO_4 (% w)	Water $(\bar{F}-F^o)$	Water $\bar{L}$	Water $\bar{C}_p$	Water α	Sulfuric acid $(\bar{F}-F^o)$	Sulfuric acid $\bar{L}$	Sulfuric acid $\bar{C}_p$	Sulfuric acid α
10.0	-26.4	-6.3	17.871	-0.0300	-15624.0	-17078.0	22.180	0.1340
20.0	-75.1	-34.0	17.775	-0.0300	-14115.0	-16279.0	25.650	0.1490
25.0	-114.9	-71.8	17.780	-0.0300	-13373.0	-15580.0	25.700	0.1530
30.0	-168.8	-136.0	18.114	-0.0340	-12600.0	-14659.0	20.970	0.1930
35.0	-241.4	-228.6	18.555	-0.0370	-11782.0	-13618.0	15.930	0.2330
40.0	-338.2	-349.0	18.662	-0.0370	-10906.0	-12527.0	14.900	0.2390
45.0	-462.2	-494.2	18.518	-0.0370	-9995.0	-11457.0	15.920	0.2340
50.0	-620.6	-662.9	17.731	-0.0315	-9045.0	-10445.0	20.620	0.2010
55.0	-821.5	-867.3	16.963	-0.0275	-8054.0	-9437.0	24.440	0.1820
60.0	-1075.3	-1125.0	16.335	-0.0230	-7036.0	-8405.0	26.950	0.1760
65.0	-1406.3	-1459.0	15.173	-0.0150	-5962.0	-7320.0	30.690	0.1610
70.0	-1836.0	-1903.0	13.398	-0.0040	-4838.0	-6158.0	35.340	0.1340
72.0	-2038.0	-2127.0	12.570	0.0020	-4387.0	-5664.0	37.170	0.1210
74.0	-2261.0	-2382.0	11.762	0.0080	-3940.0	-5144.0	38.800	0.1100
76.0	-2508.0	-2683.0	11.010	0.0150	-3492.0	-4601.0	40.170	0.0970
78.0	-2783.0	-3039.0	10.330	0.0230	-3046.0	-4025.0	41.270	0.0860
80.0	-3090.0	-3475.0	9.770	0.0330	-2600.0	-3394.0	42.080	0.0740
82.0	-3427.0	-4015.0	10.360	0.0360	-2170.0	-2705.0	41.370	0.0690
84.0	-3789.0	-4656.0	13.780	0.0190	-1766.0	-1994.0	37.570	0.0890
86.0	-4167.0	-5319.0	18.960	-0.0145	-1404.0	-1354.0	32.650	0.1190
88.0	-4557.0	-5938.0	22.130	-0.0320	-1086.0	-851.0	29.990	0.1330
90.0	-4960.0	-6419.0	22.760	-0.0330	-816.0	-524.0	29.540	0.1360
91.0	-5165.0	-6627.0	22.300	-0.0290	-699.0	-405.0	29.810	0.1350
92.0	-5375.0	-6816.0	21.480	-0.0230	-592.8	-309.0	30.220	0.1330
93.0	-5595.0	-6983.0	20.440	-0.0160	-495.2	-235.4	30.670	0.1310
94.0	-5830.0	-7139.0	19.320	-0.0100	-408.5	-176.3	31.100	0.1290
95.0	-6090.0	-7286.0	18.060	-0.0060	-323.5	-129.6	31.500	0.1282
96.0	-6390.0	-7433.0	16.640	-0.0015	-248.4	-92.1	31.860	0.1268
97.0	-6741.0	-7574.0	15.050	0.0040	-178.3	-64.5	32.170	0.1261
98.0	-7204.0	-7712.0	13.250	0.0130	-114.3	-44.6	32.430	0.1252
98.5	-7521.0	-7777.0	12.250	0.0160	-85.3	-38.9	32.520	0.1249
99.0	-7963.0	-7845.0	10.470	0.0200	-56.6	-26.7	32.650	0.1241
99.5	-8692.0	-7919.0	5.330	0.0260	-28.0	-13.8	32.870	0.1224
99.8	-9624.0	-8337.0	-6.400	0.0774	-11.3	-7.6	33.080	0.1206
99.9	-10342.0	-9355.0	-12.680	0.1281	-5.5	-3.9	33.090	0.1205
100.0	-12014.0	-16125.0	35.000	-0.0489	-0.	-0.	33.030	0.1210

C. Results

Table IV lists the thermodynamic properties used in the calculation of p_{H_2O} and $p_{H_2SO_4}$. The values shown are identical with those given in Table III, except for the new values of α (Fig. 7) and the other changes indicated above for the 99-to 100-%w region. Partial pressures calculated from Eqs. (24) and (25), and the data in Table IV, are shown in Figs. 10, 11, and 12. Complete tables of partial pressures appear in the Appendix, together with the Fortran program used for the calculation.

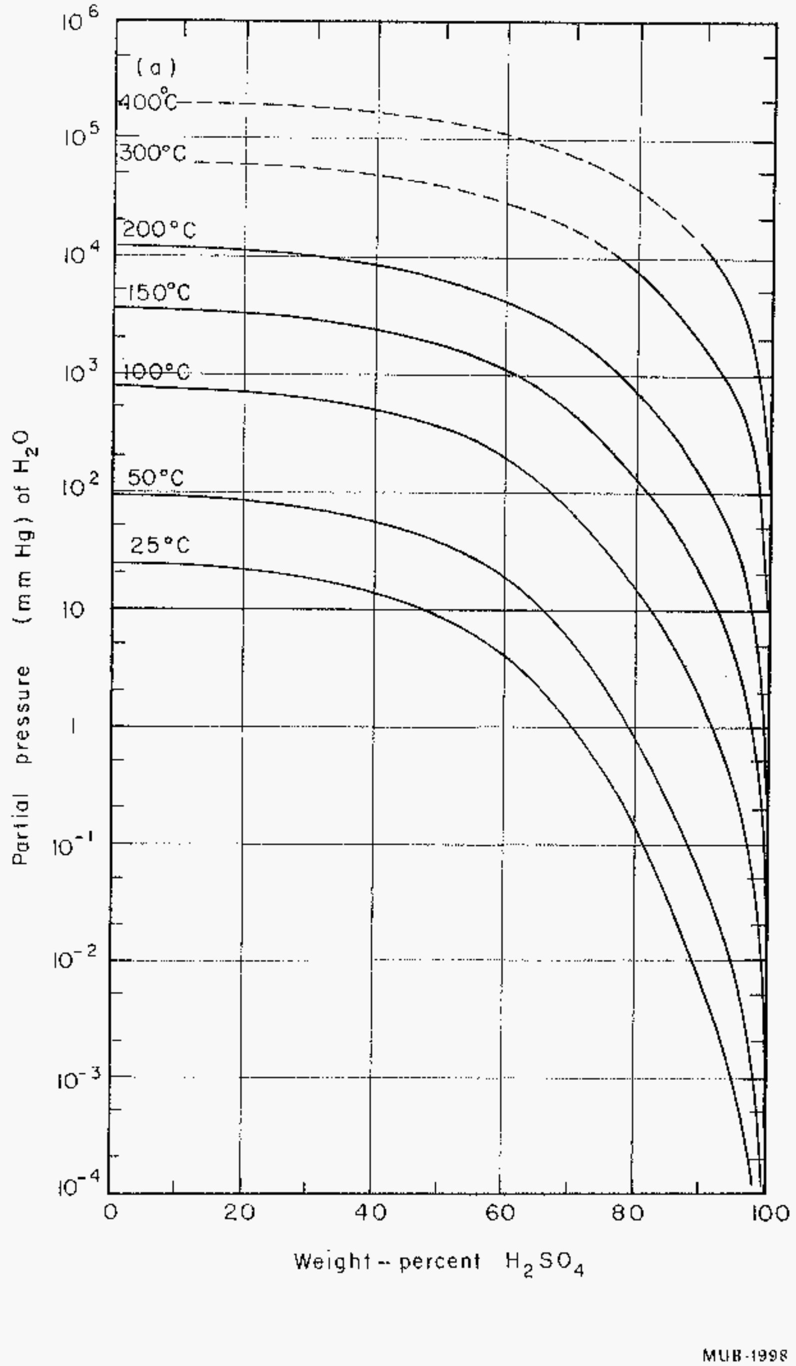


Fig. 10. The partial pressure of H_2O over aqueous sulfuric acid.

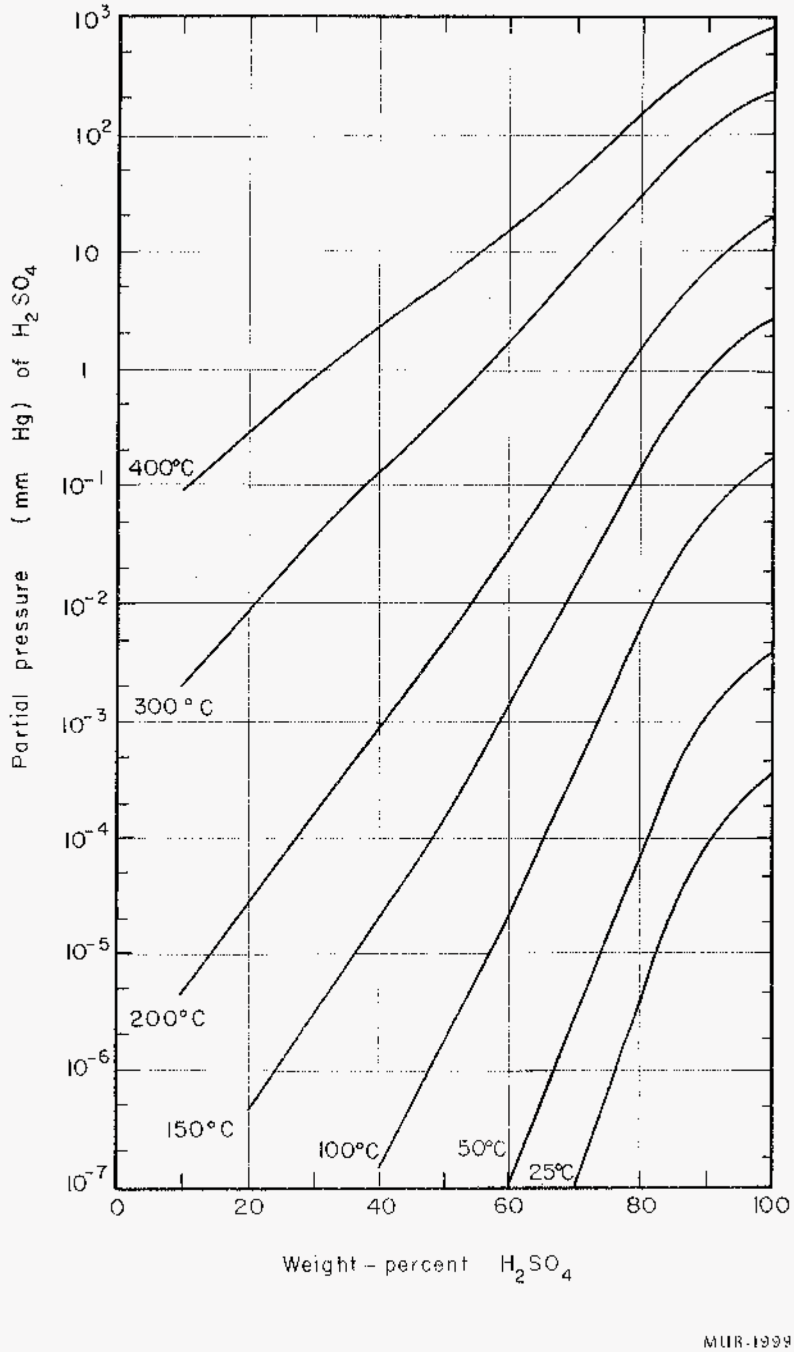


Fig. 11. The partial pressure of H_2SO_4 over aqueous sulfuric acid.

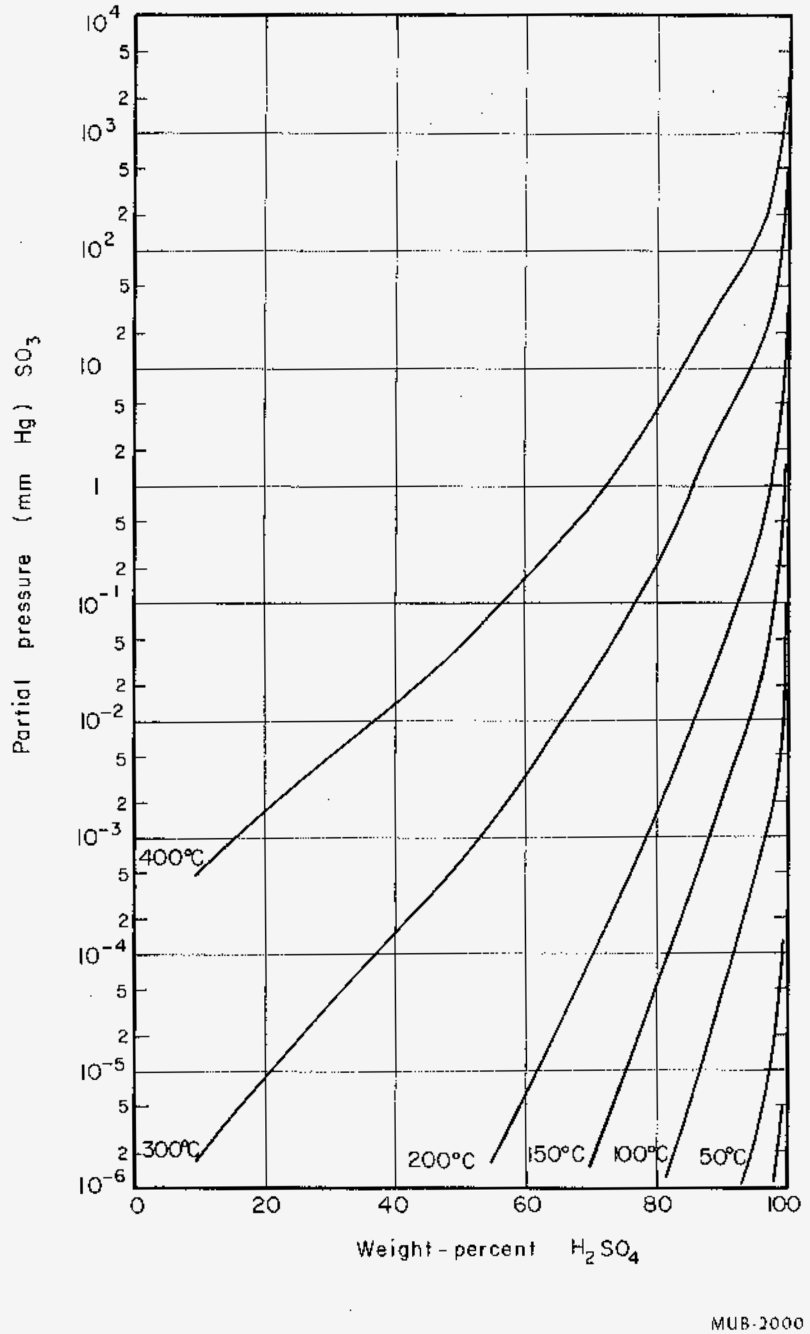


Fig. 12. The partial pressure of SO_3 over aqueous sulfuric acid.

V. DISCUSSION AND CONCLUSIONS

The partial pressures presented above agree in form with those reported by Greenewalt[1] and Abel.[4] In both cases the closest agreement occurs at low temperatures and low acid concentrations where the observable vapor pressure is predominantly due to p_{H_2O}.

At higher temperatures Greenewalt's total-pressure correlations gave slightly higher pressures than those reported here. A complete comparison of his results was not possible, since his correlations were terminated at 1 atm.

Abel used a K_p equation and an azeotrope composition different from those used in this work. His results, while not directly comparable to those presented here, show the same trends in vapor-pressure behavior as do Figs. 10, 11, and 12. At 25°C, however, his calculated pressures are not in agreement with the thermodynamic data now available.

By referring to the method just described for adjusting α, it becomes apparent that p_{H_2O} is the most accurate of the calculated vapor pressures. For this calculation we have the pure-component vapor-pressure data to aid in adjusting α in the low-%w range, with the azeotrope data for calculating α in the high-%w region. To test the reliability of $p_{H_2SO_4}$, for which we have only azeotrope data, the Gibbs-Duhem equation was applied in the form suggested by Redlich and Kister,[15] assuming that the sulfuric acid system acts as a H_2O/H_2SO_4 binary. This assumption appears satisfactory except above 99%m, where it would have a negligible effect. Figure 13 shows the result of this test at 200°C; the positive (left-hand) area is 86.5 units and the negative (right-hand) area is 87.5 units, which indicates that $p_{H_2SO_4}$ may be a trifle high in the low-weight-percent region. This uncertainty appears to lie within the accuracy of the present calculations, and has not been further adjusted.

Regardless of the calculational method used for α, pressures calculated at low temperatures (where α is not a significant variable) are as accurate as the available thermodynamic data allow. Changes

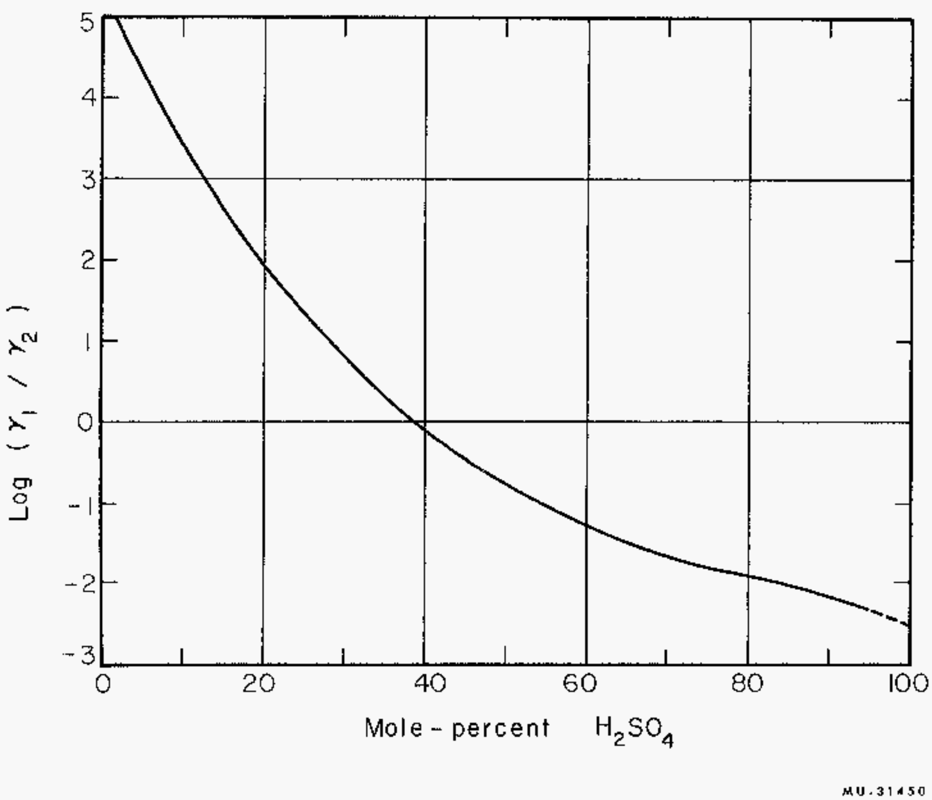


Fig. 13. Thermodynamic-consistency test at 200°C.

in α, to correct the high-temperature pressures, affected the results up to 100°C by no more than 2%.

The relative accuracy of the partial pressures calculated in different temperature and composition regions, estimated qualitatively from the foregoing considerations, is shown in Table V.

It is felt that the real utility of the results presented here depends not upon their absolute accuracy but rather upon their internal consistency and upon the versatility of the calculational method. When additional data become available, particularly in the 1.0-atm azeotrope region, they may be incorporated into the general framework of the calculation and the effect upon calculated results determined.

Table V. Estimated mean uncertainty in partial-pressure values.

Temperature range	0-150°C		150-300°C		300-400°C	
Composition range, %w	10-80	80-100	10-80	80-100	10-80	80-100
Water	± 4%	8	8	16	12	24
Sulfuric acid	±10%	4	20	8	30	12
Sulfur trioxide	±12%	9	22	18	32	27

ACKNOWLEDGMENT

This work reported herein was carried out at the Lawrence Radiation Laboratory under the auspices of the U. S. Atomic Energy Commission.

NOTATION

Superscripts

o (lower-case "oh")	Refers to values at standard state
- (overscore)	Refers to partial molal quantity

Subscripts

1	Refers to H_2O
2	Refers to H_2SO_4
3	Refers to SO_3
298	Refers to property at 298.15°K
0(zero)	Refers to property at 0 °K
(1)	Refers to property for Eq. (1), the dissociation of $H_2SO_4(g)$

Thermodynamic Functions

F	Free energy
H	Enthalpy
S	Entropy
C_p	Heat capacity
a	Activity
γ	Activity coefficient

Partial Molal Functions

$(\bar{F}-F^o)$	Relative partial molal free energy
$\bar{L}$	Partial molal enthalpy
$\bar{C}_p$	Partial molal heat capacity
α	Temperature coefficient of $\bar{C}_p$, $\alpha = d\,\bar{C}_p/dT$

Other Symbols

p	Partial pressure
P	Total pressure
t	Temperature, °C
T	Temperature, °K
K_p	Equilibrium constant for the dissociation of H_2SO_4(g)
R	Gas constant, 1.98726 cal/mole-deg
ℓ	Refers to liquid state
g	Refers to gas state
%w	Weight-fraction ×100
%m	Mole-fraction ×100

APPENDIX

Tables A-I through A-III present the detailed results calculated from Eqs. (24) and (25) and the partial molal properties listed in Table IV.

Table A-I contains the low-temperature results; i. e., those results unaffected by changes in α. Partial and total pressures at 5°C intervals between -50 and +100°C are tabulated for the 36 weight-percents shown in Table IV.

Table A-II presents generalized results from 0 to 400°C. Partial pressures of H_2O, H_2SO_4, and SO_3 plus the total pressure are shown in Subtables IIA, IIB, IIC, and IID, respectively. Tabulated pressures are rounded to four significant figures and terminated at 10^4 and 10^{-4} mm Hg.

Table A-III is included as a quick reference source and summary of results. Abbreviated lists of partial pressures are presented in Subtables IIIA, IIIB, and IIIC. Pressures are rounded to three significant figures and are terminated at 10^4 and 10^{-2} mm Hg; results are shown from -50 to 390°C.

Tables A-IV and A-V are included to aid in interpolation among the above tables. Table A-IV lists the values of the constants in Eq. (24) at the weight-percents used in Tables A-I and A-II; Table A-V shows values of K_p from -50 to 390°C.

The Fortran listing of the program used to calculate the pressures listed in Table A-II is included as Table A-VI. Similar programs were written to produce Tables A-I and A-III.

TABLE A-I. VAPOR PRESSURES, MM HG, FOR LOW TEMPERATURE RANGE.

DEG C	10.0 WT PCT H2O	10.0 WT PCT H2SO4	10.0 WT PCT SO3	10.0 WT PCT TOTAL	20.0 WT PCT H2O	20.0 WT PCT H2SO4	20.0 WT PCT SO3	20.0 WT PCT TOTAL
-50	.4501E-01	.1730E-23	.4823E-34	.4501E-01	.4090E-01	.3235E-22	.9922E-33	.4090E-01
-45	.7877E-01	.1021E-22	.5003E-33	.7877E-01	.7166E-01	.1854E-21	.9988E-32	.7166E-01
-40	.1342E-00	.5587E-22	.4712E-32	.1342E-00	.1222E-00	.9863E-21	.9136E-31	.1222E-00
-35	.2230E-00	.2849E-21	.4054E-31	.2230E-00	.2033E-00	.4892E-20	.7637E-30	.2033E-00
-30	.3619E-00	.1360E-20	.3203E-30	.3619E-00	.3302E-00	.2273E-19	.5866E-29	.3302E-00
-25	.5746E 00	.6097E-20	.2335E-29	.5746E 00	.5248E 00	.9923E-19	.4161E-28	.5248E 00
-20	.8938E 00	.2578E-19	.1579E-28	.8938E 00	.8171E 00	.4087E-18	.2738E-27	.8171E 00
-15	.1364E 01	.1031E-18	.9936E-28	.1364E 01	.1248E 01	.1593E-17	.1678E-26	.1248E 01
-10	.2043E 01	.3913E-18	.5845E-27	.2043E 01	.1871E 01	.5896E-17	.9619E-26	.1871E 01
-5	.3010E 01	.1413E-17	.3226E-26	.3010E 01	.2759E 01	.2077E-16	.5174E-25	.2759E 01
0	.4363E 01	.4869E-17	.1676E-25	.4363E 01	.4003E 01	.6985E-16	.2621E-24	.4003E 01
5	.6231E 01	.1604E-16	.8219E-25	.6231E 01	.5721E 01	.2248E-15	.1254E-23	.5721E 01
10	.8771E 01	.5069E-16	.3818E-24	.8771E 01	.8060E 01	.6935E-15	.5683E-23	.8060E 01
15	.1218E 02	.1538E-15	.1684E-23	.1218E 02	.1120E 02	.2056E-14	.2447E-22	.1120E 02
20	.1670E 02	.4494E-15	.7069E-23	.1670E 02	.1537E 02	.5870E-14	.1003E-21	.1537E 02
25	.2263E 02	.1266E-14	.2832E-22	.2263E 02	.2085E 02	.1616E-13	.3925E-21	.2085E 02
30	.3032E 02	.3446E-14	.1085E-21	.3032E 02	.2795E 02	.4302E-13	.1469E-20	.2795E 02
35	.4018E 02	.9074E-14	.3982E-21	.4018E 02	.3707E 02	.1108E-12	.5270E-20	.3707E 02
40	.5270E 02	.2316E-13	.1404E-20	.5270E 02	.4866E 02	.2766E-12	.1816E-19	.4866E 02
45	.6846E 02	.5735E-13	.4758E-20	.6846E 02	.6325E 02	.6701E-12	.6018E-19	.6325E 02
50	.8811E 02	.1380E-12	.1554E-19	.8811E 02	.8147E 02	.1578E-11	.1923E-18	.8147E 02
55	.1124E 03	.3231E-12	.4900E-19	.1124E 03	.1040E 03	.3617E-11	.5928E-18	.1040E 03
60	.1422E 03	.7369E-12	.1493E-18	.1422E 03	.1317E 03	.8077E-11	.1767E-17	.1317E 03
65	.1786E 03	.1639E-11	.4403E-18	.1786E 03	.1655E 03	.1759E-10	.5100E-17	.1655E 03
70	.2225E 03	.3559E-11	.1259E-17	.2225E 03	.2063E 03	.3741E-10	.1427E-16	.2063E 03
75	.2752E 03	.7551E-11	.3491E-17	.2752E 03	.2553E 03	.7775E-10	.3874E-16	.2553E 03
80	.3380E 03	.1567E-10	.9410E-17	.3380E 03	.3139E 03	.1581E-09	.1022E-15	.3139E 03
85	.4125E 03	.3184E-10	.2467E-16	.4125E 03	.3833E 03	.3147E-09	.2624E-15	.3833E 03
90	.5003E 03	.6338E-10	.6298E-16	.5003E 03	.4652E 03	.6140E-09	.6561E-15	.4652E 03
95	.6032E 03	.1237E-09	.1567E-15	.6032E 03	.5612E 03	.1175E-08	.1599E-14	.5612E 03
100	.7231E 03	.2370E-09	.3805E-15	.7231E 03	.6732E 03	.2206E-08	.3803E-14	.6732E 03

TABLE A-I, CONTINUED. VAPOR PRESSURES, MM HG, FOR LOW TEMPERATURE RANGE.

DEG C	25.0 WT PCT				30.0 WT PCT			
	H2O	H2SO4	SO3	TOTAL	H2O	H2SO4	SO3	TOTAL
-50	.3743E-01	.1685E-21	.5647E-32	.3743E-01	.3262E-01	.1198E-20	.4608E-31	.3262E-01
-45	.6570E-01	.9324E-21	.5479E-31	.6570E-01	.5753E-01	.6197E-20	.4158E-30	.5753E-01
-40	.1122E-00	.4797E-20	.4838E-30	.1122E-00	.9874E-01	.2994E-19	.3432E-29	.9874E-01
-35	.1870E-00	.2305E-19	.3911E-29	.1870E-00	.1652E-00	.1357E-18	.2605E-28	.1652E-00
-30	.3043E-00	.1038E-18	.2909E-28	.3043E-00	.2699E-00	.5787E-18	.1828E-27	.2699E-00
-25	.4844E-00	.4404E-18	.2001E-27	.4844E-00	.4312E-00	.2332E-17	.1190E-26	.4312E-00
-20	.7553E 00	.1764E-17	.1278E-26	.7553E 00	.6746E 00	.8903E-17	.7224E-26	.6746E 00
-15	.1155E 01	.6692E-17	.7614E-26	.1155E 01	.1035E 01	.3231E-16	.4103E-25	.1035E 01
-10	.1735E 01	.2413E-16	.4246E-25	.1735E 01	.1559E 01	.1117E-15	.2188E-24	.1559E 01
-5	.2561E 01	.8293E-16	.2225E-24	.2561E 01	.2308E 01	.3693E-15	.1100E-23	.2308E 01
0	.3721E 01	.2722E-15	.1099E-23	.3721E 01	.3362E 01	.1169E-14	.5222E-23	.3362E 01
5	.5325E 01	.8559E-15	.5130E-23	.5325E 01	.4822E 01	.3550E-14	.2350E-22	.4822E 01
10	.7511E 01	.2582E-14	.2271E-22	.7511E 01	.6817E 01	.1037E-13	.1005E-21	.6817E 01
15	.1045E 02	.7494E-14	.9558E-22	.1045E 02	.9506E 01	.2920E-13	.4095E-21	.9506E 01
20	.1436E 02	.2095E-13	.3833E-21	.1436E 02	.1309E 02	.7934E-13	.1593E-20	.1309E 02
25	.1949E 02	.5655E-13	.1468E-20	.1949E 02	.1780E 02	.2085E-12	.5928E-20	.1780E 02
30	.2616E 02	.1476E-12	.5384E-20	.2616E 02	.2393E 02	.5305E-12	.2116E-19	.2393E 02
35	.3473E 02	.3730E-12	.1894E-19	.3473E 02	.3182E 02	.1309E-11	.7253E-19	.3182E 02
40	.4563E 02	.9143E-12	.6400E-19	.4563E 02	.4188E 02	.3137E-11	.2393E-18	.4188E 02
45	.5938E 02	.2177E-11	.2082E-18	.5938E 02	.5457E 02	.7311E-11	.7610E-18	.5457E 02
50	.7656E 02	.5039E-11	.6533E-18	.7656E 02	.7045E 02	.1659E-10	.2337E-17	.7045E 02
55	.9783E 02	.1136E-10	.1979E-17	.9783E 02	.9016E 02	.3668E-10	.6936E-17	.9016E 02
60	.1240E 03	.2496E-10	.5801E-17	.1240E 03	.1144E 03	.7914E-10	.1994E-16	.1144E 03
65	.1559E 03	.5351E-10	.1647E-16	.1559E 03	.1440E 03	.1668E-09	.5556E-16	.1440E 03
70	.1945E 03	.1121E-09	.4533E-16	.1945E 03	.1799E 03	.3436E-09	.1503E-15	.1799E 03
75	.2409E 03	.2295E-09	.1212E-15	.2409E 03	.2231E 03	.6927E-09	.3951E-15	.2231E 03
80	.2964E 03	.4599E-09	.3149E-15	.2964E 03	.2747E 03	.1368E-08	.1010E-14	.2747E 03
85	.3622E 03	.9027E-09	.7965E-15	.3622E 03	.3361E 03	.2647E-08	.2517E-14	.3361E 03
90	.4399E 03	.1737E-08	.1963E-14	.4399E 03	.4086E 03	.5024E-08	.6112E-14	.4086E 03
95	.5311E 03	.3279E-08	.4717E-14	.5311E 03	.4938E 03	.9361E-08	.1449E-13	.4938E 03
100	.6375E 03	.6077E-08	.1107E-13	.6375E 03	.5932E 03	.1713E-07	.3353E-13	.5932E 03

TABLE A-I, CONTINUED. VAPOR PRESSURES, MM HG, FOR LOW TEMPERATURE RANGE.

DEG C	35.0 WT PCT H2O	35.0 WT PCT H2SO4	35.0 WT PCT SO3	35.0 WT PCT TOTAL	40.0 WT PCT H2O	40.0 WT PCT H2SO4	40.0 WT PCT SO3	40.0 WT PCT TOTAL
-50	.2705E-01	.9913E-20	.4598E-30	.2705E-01	.2140E-01	.8301E-19	.4865E-29	.2140E-01
-45	.4803E-01	.4758E-19	.3825E-29	.4803E-01	.3824E-01	.3758E-18	.3794E-28	.3824E-01
-40	.8293E-01	.2144E-18	.2927E-28	.8293E-01	.6643E-01	.1602E-17	.2730E-27	.6643E-01
-35	.1395E-00	.9104E-18	.2070E-27	.1395E-00	.1124E-00	.6452E-17	.1821E-26	.1124E-00
-30	.2292E-00	.3655E-17	.1359E-26	.2292E-00	.1857E-00	.2463E-16	.1131E-25	.1857E-00
-25	.3680E-00	.1391E-16	.8321E-26	.3680E-00	.2997E-00	.8935E-16	.6561E-25	.2997E-00
-20	.5784E 00	.5038E-16	.4767E-25	.5784E 00	.4735E-00	.3090E-15	.3572E-24	.4735E-00
-15	.8914E 00	.1740E-15	.2565E-24	.8914E 00	.7331E 00	.1021E-14	.1831E-23	.7331E 00
-10	.1348E 01	.5742E-15	.1300E-23	.1348E 01	.1114E 01	.3232E-14	.8858E-23	.1114E 01
-5	.2004E 01	.1817E-14	.6230E-23	.2004E 01	.1663E 01	.9822E-14	.4059E-22	.1663E 01
0	.2929E 01	.5518E-14	.2829E-22	.2929E 01	.2441E 01	.2871E-13	.1766E-21	.2441E 01
5	.4216E 01	.1613E-13	.1221E-21	.4216E 01	.3528E 01	.8086E-13	.7316E-21	.3528E 01
10	.5979E 01	.4544E-13	.5020E-21	.5979E 01	.5023E 01	.2199E-12	.2891E-20	.5023E 01
15	.8363E 01	.1236E-12	.1970E-20	.8363E 01	.7053E 01	.5782E-12	.1093E-19	.7053E 01
20	.1155E 02	.3253E-12	.7401E-20	.1155E 02	.9772E 01	.1472E-11	.3958E-19	.9772E 01
25	.1575E 02	.8291E-12	.2665E-19	.1575E 02	.1337E 02	.3637E-11	.1377E-18	.1337E 02
30	.2122E 02	.2050E-11	.9220E-19	.2122E 02	.1808E 02	.8724E-11	.4604E-18	.1808E 02
35	.2829E 02	.4924E-11	.3069E-18	.2829E 02	.2418E 02	.2035E-10	.1484E-17	.2418E 02
40	.3731E 02	.1150E-10	.9847E-18	.3731E 02	.3200E 02	.4622E-10	.4614E-17	.3200E 02
45	.4873E 02	.2616E-10	.3050E-17	.4873E 02	.4191E 02	.1023E-09	.1387E-16	.4191E 02
50	.6305E 02	.5802E-10	.9133E-17	.6305E 02	.5438E 02	.2210E-09	.4034E-16	.5438E 02
55	.8083E 02	.1255E-09	.2648E-16	.8083E 02	.6992E 02	.4663E-09	.1137E-15	.6992E 02
60	.1028E 03	.2653E-09	.7441E-16	.1028E 03	.8912E 02	.9618E-09	.3110E-15	.8912E 02
65	.1296E 03	.5482E-09	.2030E-15	.1296E 03	.1127E 03	.1941E-08	.8264E-15	.1127E 03
70	.1621E 03	.1109E-08	.5379E-15	.1621E 03	.1413E 03	.3836E-08	.2136E-14	.1413E 03
75	.2014E 03	.2195E-08	.1387E-14	.2014E 03	.1760E 03	.7432E-08	.5373E-14	.1760E 03
80	.2484E 03	.4261E-08	.3482E-14	.2484E 03	.2176E 03	.1412E-07	.1317E-13	.2176E 03
85	.3043E 03	.8114E-08	.8522E-14	.3043E 03	.2672E 03	.2633E-07	.3150E-13	.2672E 03
90	.3705E 03	.1516E-07	.2035E-13	.3705E 03	.3259E 03	.4823E-07	.7357E-13	.3259E 03
95	.4482E 03	.2784E-07	.4745E-13	.4482E 03	.3952E 03	.8684E-07	.1679E-12	.3952E 03
100	.5392E 03	.5022E-07	.1081E-12	.5392E 03	.4764E 03	.1537E-06	.3746E-12	.4764E 03

TABLE A-I, CONTINUED. VAPOR PRESSURES, MM HG, FOR LOW TEMPERATURE RANGE.

DEG C	45.0 WT PCT H2O	45.0 WT PCT H2SO4	45.0 WT PCT SO3	45.0 WT PCT TOTAL	50.0 WT PCT H2O	50.0 WT PCT H2SO4	50.0 WT PCT SO3	50.0 WT PCT TOTAL
-50	.1604E-01	.6899E-18	.5395E-28	.1604E-01	.1140E-01	.5347E-17	.5882E-27	.1140E-01
-45	.2885E-01	.2976E-17	.3981E-27	.2885E-01	.2061E-01	.2240E-16	.4197E-26	.2061E-01
-40	.5045E-01	.1210E-16	.2716E-26	.5045E-01	.3621E-01	.8850E-16	.2767E-25	.3621E-01
-35	.8591E-01	.4659E-16	.1721E-25	.8591E-01	.6196E-01	.3307E-15	.1694E-24	.6196E-01
-30	.1427E-00	.1703E-15	.1017E-24	.1427E-00	.1035E-00	.1173E-14	.9665E-24	.1035E-00
-25	.2317E-00	.5923E-15	.5626E-24	.2317E-00	.1688E-00	.3960E-14	.5163E-23	.1688E-00
-20	.3681E-00	.1967E-14	.2925E-23	.3681E-00	.2695E-00	.1276E-13	.2592E-22	.2695E-00
-15	.5730E 00	.6248E-14	.1433E-22	.5730E 00	.4216E-00	.3933E-13	.1225E-21	.4216E-00
-10	.8752E 00	.1004E-13	.6642E-22	.8752E 00	.6472E 00	.1163E-12	.5486E-21	.6472E 00
-5	.1313E 01	.5576E-13	.2919E-21	.1313E 01	.9758E 00	.3305E-12	.2328E-20	.9758E 00
0	.1937E 01	.1573E-12	.1219E-20	.1937E 01	.1447E 01	.9047E-12	.9393E-20	.1447E 01
5	.2812E 01	.4279E-12	.4856E-20	.2812E 01	.2111E 01	.2390E-11	.3613E-19	.2111E 01
10	.4022E 01	.1125E-11	.1848E-19	.4022E 01	.3034E 01	.6100E-11	.1328E-18	.3034E 01
15	.5673E 01	.2863E-11	.6729E-19	.5673E 01	.4300E 01	.1508E-10	.4674E-18	.4300E 01
20	.7894E 01	.7065E-11	.2351E-18	.7894E 01	.6013E 01	.3614E-10	.1579E-17	.6013E 01
25	.1085E 02	.1692E-10	.7896E-18	.1085E 02	.8303E 01	.8410E-10	.5127E-17	.8303E 01
30	.1473E 02	.3940E-10	.2553E-17	.1473E 02	.1133E 02	.1903E-09	.1603E-16	.1133E 02
35	.1977E 02	.8929E-10	.7961E-17	.1977E 02	.1528E 02	.4193E-09	.4838E-16	.1528E 02
40	.2626E 02	.1971E-09	.2398E-16	.2626E 02	.2039E 02	.9004E-09	.1411E-15	.2039E 02
45	.3453E 02	.4246E-09	.6985E-16	.3453E 02	.2693E 02	.1887E-08	.3979E-15	.2693E 02
50	.4497E 02	.8930E-09	.1971E-15	.4497E 02	.3523E 02	.3861E-08	.1088E-14	.3523E 02
55	.5802E 02	.1836E-08	.5394E-15	.5802E 02	.4565E 02	.7728E-08	.2886E-14	.4565E 02
60	.7421E 02	.3691E-08	.1434E-14	.7421E 02	.5865E 02	.1513E-07	.7437E-14	.5865E 02
65	.9414E 02	.7268E-08	.3704E-14	.9414E 02	.7473E 02	.2903E-07	.1864E-13	.7473E 02
70	.1185E 03	.1402E-07	.9313E-14	.1185E 03	.9445E 02	.5461E-07	.4549E-13	.9445E 02
75	.1480E 03	.2654E-07	.2281E-13	.1480E 03	.1185E 03	.1008E-06	.1082E-12	.1185E 03
80	.1835E 03	.4928E-07	.5450E-13	.1835E 03	.1475E 03	.1825E-06	.2511E-12	.1475E 03
85	.2260E 03	.8988E-07	.1271E-12	.2260E 03	.1825E 03	.3248E-06	.5691E-12	.1825E 03
90	.2766E 03	.1611E-06	.2895E-12	.2766E 03	.2242E 03	.5684E-06	.1261E-11	.2242E 03
95	.3364E 03	.2839E-06	.6449E-12	.3364E 03	.2737E 03	.9785E-06	.2731E-11	.2737E 03
100	.4067E 03	.4924E-06	.1406E-11	.4067E 03	.3322E 03	.1658E-05	.5795E-11	.3322E 03

TABLE A-I, CONTINUED. VAPOR PRESSURES, MM HG, FOR LOW TEMPERATURE RANGE.

DEG C	55.0 WT PCT				60.0 WT PCT			
	H2O	H2SO4	SO3	TOTAL	H2O	H2SO4	SO3	TOTAL
-50	.7384E-02	.4561E-16	.7750E-26	.7384E-02	.4230E-02	.4290E-15	.1273E-24	.4230E-02
-45	.1344E-01	.1848E-15	.5310E-25	.1344E-01	.7773E-02	.1668E-14	.8284E-24	.7773E-02
-40	.2377E-01	.7060E-15	.3363E-24	.2377E-01	.1388E-01	.6122E-14	.4991E-23	.1388E-01
-35	.4094E-01	.2552E-14	.1978E-23	.4094E-01	.2415E-01	.2128E-13	.2796E-22	.2415E-01
-30	.6882E-01	.8759E-14	.1085E-22	.6882E-01	.4097E-01	.7030E-13	.1463E-21	.4097E-01
-25	.1130E-00	.2862E-13	.5573E-22	.1130E-00	.6790E-01	.2213E-12	.7175E-21	.6790E-01
-20	.1816E-00	.8929E-13	.2691E-21	.1816E-00	.1101E-00	.6659E-12	.3311E-20	.1101E-00
-15	.2860E-00	.2666E-12	.1225E-20	.2860E-00	.1749E-00	.1919E-11	.1442E-19	.1749E-00
-10	.4419E-00	.7640E-12	.5278E-20	.4419E-00	.2725E-00	.5312E-11	.5951E-19	.2725E-00
-5	.6705E 00	.2105E-11	.2157E-19	.6705E 00	.4170E-00	.1415E-10	.2332E-18	.4170E-00
0	.1000E 01	.5586E-11	.8388E-19	.1000E 01	.6271E 00	.3633E-10	.8701E-18	.6271E 00
5	.1469E 01	.1431E-10	.3111E-18	.1469E 01	.9282E 00	.9014E-10	.3100E-17	.9282E 00
10	.2124E 01	.3546E-10	.1103E-17	.2124E 01	.1353E 01	.2164E-09	.1056E-16	.1353E 01
15	.3028E 01	.8509E-10	.3746E-17	.3028E 01	.1944E 01	.5035E-09	.3453E-16	.1944E 01
20	.4259E 01	.1981E-09	.1222E-16	.4259E 01	.2755E 01	.1137E-08	.1084E-15	.2755E 01
25	.5915E 01	.4479E-09	.3833E-16	.5915E 01	.3854E 01	.2497E-08	.3279E-15	.3854E 01
30	.8116E 01	.9853E-09	.1159E-15	.8116E 01	.5327E 01	.5336E-08	.9560E-15	.5327E 01
35	.1101E 02	.2111E-08	.3380E-15	.1101E 02	.7277E 01	.1111E-07	.2692E-14	.7277E 01
40	.1477E 02	.4410E-08	.9535E-15	.1477E 02	.9833E 01	.2258E-07	.7336E-14	.9833E 01
45	.1962E 02	.8994E-08	.2604E-14	.1962E 02	.1315E 02	.4482E-07	.1936E-13	.1315E 02
50	.2581E 02	.1792E-07	.6894E-14	.2581E 02	.1741E 02	.8698E-07	.4959E-13	.1741E 02
55	.3362E 02	.3494E-07	.1772E-13	.3362E 02	.2283E 02	.1652E-06	.1234E-12	.2283E 02
60	.4342E 02	.6669E-07	.4426E-13	.4342E 02	.2967E 02	.3073E-06	.2986E-12	.2967E 02
65	.5561E 02	.1247E-06	.1076E-12	.5561E 02	.3823E 02	.5606E-06	.7034E-12	.3823E 02
70	.7064E 02	.2288E-06	.2548E-12	.7064E 02	.4886E 02	.1003E-05	.1616E-11	.4886E 02
75	.8905E 02	.4119E-06	.5885E-12	.8905E 02	.6196E 02	.1763E-05	.3620E-11	.6196E 02
80	.1114E 03	.7283E-06	.1326E-11	.1114E 03	.7799E 02	.3045E-05	.7924E-11	.7799E 02
85	.1385E 03	.1266E-05	.2921E-11	.1385E 03	.9747E 02	.5170E-05	.1695E-10	.9747E 02
90	.1710E 03	.2164E-05	.6292E-11	.1710E 03	.1210E 03	.8639E-05	.3549E-10	.1210E 03
95	.2097E 03	.3640E-05	.1326E-10	.2097E 03	.1492E 03	.1421E-04	.7276E-10	.1492E 03
100	.2556E 03	.6030E-05	.2738E-10	.2556E 03	.1829E 03	.2303E-04	.1462E-09	.1829E 03

TABLE A-I, CONTINUED. VAPOR PRESSURES, MM HG, FOR LOW TEMPERATURE RANGE.

DEG C	65.0 WT PCT H2O	65.0 WT PCT H2SO4	65.0 WT PCT SO3	65.0 WT PCT TOTAL	70.0 WT PCT H2O	70.0 WT PCT H2SO4	70.0 WT PCT SO3	70.0 WT PCT TOTAL
-50	.2067E-02	.4417E-14	.2681E-23	.2067E-02	.8163E-03	.5024E-13	.7721E-22	.8163E-03
-45	.3841E-02	.1653E-13	.1661E-22	.3841E-02	.1539E-02	.1811E-12	.4543E-21	.1539E-02
-40	.6939E-02	.5841E-13	.9530E-22	.6939E-02	.2819E-02	.6167E-12	.2476E-20	.2819E-02
-35	.1220E-01	.1956E-12	.5087E-21	.1220E-01	.5029E-02	.1990E-11	.1256E-19	.5029E-02
-30	.2093E-01	.6230E-12	.2537E-20	.2093E-01	.8748E-02	.6108E-11	.5952E-19	.8748E-02
-25	.3507E-01	.1892E-11	.1187E-19	.3507E-01	.1486E-01	.1788E-10	.2647E-18	.1486E-01
-20	.5749E-01	.5492E-11	.5229E-19	.5749E-01	.2471E-01	.5004E-10	.1109E-17	.2471E-01
-15	.9231E-01	.1528E-10	.2176E-18	.9231E-01	.4022E-01	.1343E-09	.4389E-17	.4022E-01
-10	.1454E-00	.4086E-10	.8582E-18	.1454E-00	.6420E-01	.3464E-09	.1647E-16	.6420E-01
-5	.2247E-00	.1052E-09	.3216E-17	.2247E-00	.1006E-00	.8607E-09	.5878E-16	.1006E-00
0	.3415E-00	.2612E-09	.1149E-16	.3415E-00	.1550E-00	.2063E-08	.2000E-15	.1550E-00
5	.5106E 00	.6269E-09	.3919E-16	.5106E 00	.2348E-00	.4783E-08	.6503E-15	.2348E-00
10	.7517E 00	.1457E-08	.1280E-15	.7517E 00	.3502E-00	.1074E-07	.2026E-14	.3502E-00
15	.1091E 01	.3283E-08	.4013E-15	.1091E 01	.5148E 00	.2340E-07	.6059E-14	.5148E 00
20	.1561E 01	.7186E-08	.1210E-14	.1561E 01	.7462E 00	.4952E-07	.1743E-13	.7462E 00
25	.2205E 01	.1530E-07	.3512E-14	.2205E 01	.1067E 01	.1020E-06	.4835E-13	.1067E 01
30	.3076E 01	.3171E-07	.9840E-14	.3076E 01	.1508E 01	.2046E-06	.1295E-12	.1508E 01
35	.4241E 01	.6409E-07	.2665E-13	.4241E 01	.2105E 01	.4004E-06	.3354E-12	.2105E 01
40	.5782E 01	.1265E-06	.6986E-13	.5782E 01	.2905E 01	.7653E-06	.8415E-12	.2905E 01
45	.7800E 01	.2438E-06	.1776E-12	.7800E 01	.3966E 01	.1430E-05	.2048E-11	.3966E 01
50	.1042E 02	.4598E-06	.4381E-12	.1042E 02	.5360E 01	.2615E-05	.4843E-11	.5360E 01
55	.1378E 02	.8492E-06	.1051E-11	.1378E 02	.7173E 01	.4685E-05	.1114E-10	.7173E 01
60	.1806E 02	.1537E-05	.2452E-11	.1806E 02	.9509E 01	.8230E-05	.2494E-10	.9509E 01
65	.2347E 02	.2728E-05	.5577E-11	.2347E 02	.1249E 02	.1419E-04	.5447E-10	.1249E 02
70	.3024E 02	.4754E-05	.1237E-10	.3024E 02	.1628E 02	.2402E-04	.1161E-09	.1628E 02
75	.3866E 02	.8139E-05	.2679E-10	.3866E 02	.2104E 02	.3996E-04	.2417E-09	.2104E 02
80	.4904E 02	.1370E-04	.5669E-10	.4904E 02	.2698E 02	.6539E-04	.4920E-09	.2698E 02
85	.6177E 02	.2268E-04	.1173E-09	.6177E 02	.3433E 02	.1053E-03	.9805E-09	.3433E 02
90	.7726E 02	.3696E-04	.2378E-09	.7726E 02	.4339E 02	.1671E-03	.1914E-08	.4339E 02
95	.9599E 02	.5932E-04	.4722E-09	.9599E 02	.5446E 02	.2611E-03	.3663E-08	.5446E 02
100	.1185E 03	.9385E-04	.9193E-09	.1185E 03	.6791E 02	.4024E-03	.6879E-08	.6791E 02

TABLE A-I, CONTINUED. VAPOR PRESSURES, MM HG, FOR LOW TEMPERATURE RANGE.

DEG C	72.0 WT PCT H2O	72.0 WT PCT H2SO4	72.0 WT PCT SO3	72.0 WT PCT TOTAL	74.0 WT PCT H2O	74.0 WT PCT H2SO4	74.0 WT PCT SO3	74.0 WT PCT TOTAL
-50	.5231E-03	.1353E-12	.3245E-21	.5231E-03	.3177E-03	.3695E-12	.1459E-20	.3177E-03
-45	.9933E-03	.4800E-12	.1865E-20	.9933E-03	.6088E-03	.1287E-11	.8160E-20	.6088E-03
-40	.1833E-02	.1608E-11	.9930E-20	.1833E-02	.1134E-02	.4234E-11	.4228E-19	.1134E-02
-35	.3294E-02	.5108E-11	.4920E-19	.3294E-02	.2054E-02	.1321E-10	.2040E-18	.2054E-02
-30	.5771E-02	.1543E-10	.2278E-18	.5771E-02	.3631E-02	.3919E-10	.9200E-18	.3631E-02
-25	.9877E-02	.4444E-10	.9902E-18	.9877E-02	.6268E-02	.1109E-09	.3896E-17	.6268E-02
-20	.1653E-01	.1225E-09	.4054E-17	.1653E-01	.1058E-01	.3005E-09	.1555E-16	.1058E-01
-15	.2711E-01	.3236E-09	.1569E-16	.2711E-01	.1749E-01	.7807E-09	.5867E-16	.1749E-01
-10	.4358E-01	.8219E-09	.5758E-16	.4358E-01	.2835E-01	.1950E-08	.2100E-15	.2835E-01
-5	.6877E-01	.2011E-08	.2010E-15	.6877E-01	.4510E-01	.4693E-08	.7152E-15	.4510E-01
0	.1066E-00	.4749E-08	.6689E-15	.1066E-00	.7049E-01	.1091E-07	.2324E-14	.7049E-01
5	.1627E-00	.1085E-07	.2128E-14	.1627E-00	.1084E-00	.2452E-07	.7222E-14	.1084E-00
10	.2443E-00	.2400E-07	.6490E-14	.2443E-00	.1640E-00	.5340E-07	.2151E-13	.1640E-00
15	.3614E-00	.5153E-07	.1901E-13	.3614E-00	.2444E-00	.1129E-06	.6158E-13	.2444E-00
20	.5273E 00	.1075E-06	.5357E-13	.5273E 00	.3593E-00	.2320E-06	.1697E-12	.3593E-00
25	.7591E 00	.2183E-06	.1456E-12	.7591E 00	.5210E 00	.4642E-06	.4510E-12	.5210E 00
30	.1079E 01	.4319E-06	.3820E-12	.1079E 01	.7459E 00	.9052E-06	.1158E-11	.7459E 00
35	.1516E 01	.8339E-06	.9701E-12	.1516E 01	.1055E 01	.1723E-05	.2879E-11	.1055E 01
40	.2105E 01	.1573E-05	.2387E-11	.2105E 01	.1475E 01	.3203E-05	.6936E-11	.1475E 01
45	.2891E 01	.2900E-05	.5699E-11	.2891E 01	.2040E 01	.5826E-05	.1622E-10	.2040E 01
50	.3929E 01	.5235E-05	.1322E-10	.3929E 01	.2792E 01	.1038E-04	.3689E-10	.2792E 01
55	.5289E 01	.9259E-05	.2985E-10	.5289E 01	.3782E 01	.1811E-04	.8163E-10	.3782E 01
60	.7052E 01	.1606E-04	.6564E-10	.7052E 01	.5075E 01	.3100E-04	.1761E-09	.5075E 01
65	.9318E 01	.2734E-04	.1408E-09	.9318E 01	.6748E 01	.5211E-04	.3704E-09	.6748E 01
70	.1221E 02	.4573E-04	.2947E-09	.1221E 02	.8895E 01	.8607E-04	.7613E-09	.8895E 01
75	.1586E 02	.7519E-04	.6031E-09	.1586E 02	.1163E 02	.1398E-03	.1529E-08	.1163E 02
80	.2045E 02	.1216E-03	.1207E-08	.2045E 02	.1508E 02	.2234E-03	.3007E-08	.1508E 02
85	.2616E 02	.1936E-03	.2366E-08	.2616E 02	.1940E 02	.3514E-03	.5789E-08	.1940E 02
90	.3323E 02	.3037E-03	.4543E-08	.3323E 02	.2479E 02	.5448E-03	.1093E-07	.2479E 02
95	.4192E 02	.4694E-03	.8557E-08	.4192E 02	.3144E 02	.8327E-03	.2023E-07	.3144E 02
100	.5252E 02	.7157E-03	.1582E-07	.5253E 02	.3962E 02	.1255E-02	.3678E-07	.3962E 02

TABLE A-I, CONTINUED. VAPOR PRESSURES, MM HG, FOR LOW TEMPERATURE RANGE.

DEG C	76.0 WT PCT H2O	76.0 WT PCT H2SO4	76.0 WT PCT SO3	76.0 WT PCT TOTAL	78.0 WT PCT H2O	78.0 WT PCT H2SO4	78.0 WT PCT SO3	78.0 WT PCT TOTAL
-50	.1804E-03	.1029E-11	.7155E-20	.1804E-03	.9464E-04	.2932E-11	.3887E-19	.9464E-04
-45	.3497E-03	.3512E-11	.3878E-19	.3497E-03	.1860E-03	.9779E-11	.2030E-18	.1860E-03
-40	.6583E-03	.1133E-10	.1948E-18	.6583E-03	.3550E-03	.3084E-10	.9832E-18	.3550E-03
-35	.1206E-02	.3465E-10	.9115E-18	.1206E-02	.6594E-03	.9228E-10	.4440E-17	.6594E-03
-30	.2155E-02	.1009E-09	.3990E-17	.2155E-02	.1194E-02	.2629E-09	.1877E-16	.1194E-02
-25	.3758E-02	.2802E-09	.1641E-16	.3758E-02	.2109E-02	.7151E-09	.7463E-16	.2109E-02
-20	.6410E-02	.7450E-09	.6361E-16	.6410E-02	.3643E-02	.1863E-08	.2799E-15	.3643E-02
-15	.1070E-01	.1900E-08	.2333E-15	.1070E-01	.6158E-02	.4658E-08	.9942E-15	.6158E-02
-10	.1752E-01	.4663E-08	.8124E-15	.1752E-01	.1020E-01	.1121E-07	.3354E-14	.1020E-01
-5	.2815E-01	.1103E-07	.2692E-14	.2815E-01	.1658E-01	.2601E-07	.1078E-13	.1658E-01
0	.4442E-01	.2519E-07	.8517E-14	.4442E-01	.2647E-01	.5831E-07	.3308E-13	.2647E-01
5	.6892E-01	.5568E-07	.2578E-13	.6892E-01	.4154E-01	.1266E-06	.9725E-13	.4154E-01
10	.1053E-00	.1193E-06	.7486E-13	.1053E-00	.6413E-01	.2664E-06	.2744E-12	.6413E-01
15	.1583E-00	.2481E-06	.2089E-12	.1583E-00	.9750E-01	.5447E-06	.7447E-12	.9750E-01
20	.2348E-00	.5019E-06	.5617E-12	.2348E-00	.1461E-00	.1083E-05	.1948E-11	.1461E-00
25	.3434E-00	.9887E-06	.1457E-11	.3434E-00	.2159E-00	.2099E-05	.4921E-11	.2159E-00
30	.4958E-00	.1899E-05	.3655E-11	.4958E-00	.3148E-00	.3967E-05	.1202E-10	.3148E-00
35	.7071E 00	.3560E-05	.8877E-11	.7071E 00	.4534E-00	.7321E-05	.2847E-10	.4534E-00
40	.9967E 00	.6525E-05	.2091E-10	.9967E 00	.6451E 00	.1321E-04	.6542E-10	.6452E 00
45	.1389E 01	.1170E-04	.4784E-10	.1389E 01	.9076E 00	.2334E-04	.1461E-09	.9076E 00
50	.1916E 01	.2055E-04	.1064E-09	.1916E 01	.1263E 01	.4039E-04	.3174E-09	.1263E 01
55	.2615E 01	.3537E-04	.2306E-09	.2615E 01	.1739E 01	.6855E-04	.6720E-09	.1739E 01
60	.3535E 01	.5976E-04	.4871E-09	.3536E 01	.2372E 01	.1142E-03	.1388E-08	.2372E 01
65	.4735E 01	.9914E-04	.1004E-08	.4735E 01	.3203E 01	.1869E-03	.2799E-08	.3203E 01
70	.6286E 01	.1617E-03	.2023E-08	.6286E 01	.4287E 01	.3008E-03	.5519E-08	.4288E 01
75	.8274E 01	.2593E-03	.3987E-08	.8274E 01	.5688E 01	.4761E-03	.1065E-07	.5689E 01
80	.1080E 02	.4093E-03	.7690E-08	.1080E 02	.7485E 01	.7422E-03	.2013E-07	.7485E 01
85	.1399E 02	.6363E-03	.1453E-07	.1399E 02	.9770E 01	.1140E-02	.3729E-07	.9771E 01
90	.1799E 02	.9750E-03	.2694E-07	.1799E 02	.1265E 02	.1725E-02	.6778E-07	.1266E 02
95	.2297E 02	.1473E-02	.4901E-07	.2297E 02	.1627E 02	.2577E-02	.1210E-06	.1627E 02
100	.2912E 02	.2197E-02	.8757E-07	.2912E 02	.2077E 02	.3798E-02	.2122E-06	.2078E 02

TABLE A-I, CONTINUED. VAPOR PRESSURES, MM HG, FOR LOW TEMPERATURE RANGE.

DEG C	80.0 WT PCT H2O	80.0 WT PCT H2SO4	80.0 WT PCT SO3	80.0 WT PCT TOTAL	82.0 WT PCT H2O	82.0 WT PCT H2SO4	82.0 WT PCT SO3	82.0 WT PCT TOTAL
-50	.4487E-04	.8673E-11	.2425E-18	.4487E-04	.1848E-04	.2685E-10	.1823E-17	.1848E-04
-45	.8981E-04	.2816E-10	.1211E-17	.8981E-04	.3806E-04	.8411E-10	.8532E-17	.3806E-04
-40	.1745E-03	.8653E-10	.5613E-17	.1745E-03	.7597E-04	.2497E-09	.3721E-16	.7597E-04
-35	.3297E-03	.2525E-09	.2429E-16	.3297E-03	.1473E-03	.7051E-09	.1518E-15	.1473E-03
-30	.6070E-03	.7018E-09	.9856E-16	.6070E-03	.2780E-03	.1900E-08	.5824E-15	.2780E-03
-25	.1090E-02	.1864E-08	.3763E-15	.1090E-02	.5113E-03	.4897E-08	.2108E-14	.5113E-03
-20	.1913E-02	.4745E-08	.1357E-14	.1913E-02	.9178E-03	.1211E-07	.7222E-14	.9178E-03
-15	.3285E-02	.1160E-07	.4641E-14	.3285E-02	.1610E-02	.2880E-07	.2351E-13	.1610E-02
-10	.5526E-02	.2731E-07	.1509E-13	.5526E-02	.2765E-02	.6604E-07	.7290E-13	.2765E-02
-5	.9114E-02	.6202E-07	.4677E-13	.9114E-02	.4653E-02	.1462E-06	.2160E-12	.4653E-02
0	.1476E-01	.1362E-06	.1386E-12	.1476E-01	.7679E-02	.3135E-06	.6131E-12	.7679E-02
5	.2348E-01	.2897E-06	.3938E-12	.2348E-01	.1244E-01	.6514E-06	.1671E-11	.1245E-01
10	.3675E-01	.5980E-06	.1075E-11	.3675E-01	.1982E-01	.1315E-05	.4381E-11	.1982E-01
15	.5662E-01	.1199E-05	.2824E-11	.5662E-01	.3106E-01	.2581E-05	.1108E-10	.3106E-01
20	.8594E-01	.2342E-05	.7159E-11	.8594E-01	.4791E-01	.4935E-05	.2707E-10	.4791E-01
25	.1286E-00	.4455E-05	.1754E-10	.1286E-00	.7281E-01	.9206E-05	.6400E-10	.7282E-01
30	.1898E-00	.8273E-05	.4160E-10	.1898E-00	.1091E-00	.1677E-04	.1467E-09	.1091E-00
35	.2766E-00	.1501E-04	.9568E-10	.2766E-00	.1613E-00	.2987E-04	.3265E-09	.1613E-00
40	.3982E-00	.2664E-04	.2137E-09	.3982E-00	.2354E-00	.5209E-04	.7067E-09	.2355E-00
45	.5665E 00	.4630E-04	.4643E-09	.5665E 00	.3394E-00	.8899E-04	.1489E-08	.3395E-00
50	.7969E 00	.7887E-04	.9822E-09	.7970E 00	.4837E-00	.1491E-03	.3060E-08	.4839E-00
55	.1109E 01	.1318E-03	.2026E-08	.1109E 01	.6817E 00	.2453E-03	.6135E-08	.6819E 00
60	.1528E 01	.2163E-03	.4080E-08	.1528E 01	.9505E 00	.3965E-03	.1202E-07	.9509E 00
65	.2085E 01	.3489E-03	.8028E-08	.2085E 01	.1312E 01	.6302E-03	.2305E-07	.1312E 01
70	.2818E 01	.5536E-03	.1546E-07	.2818E 01	.1793E 01	.9857E-03	.4326E-07	.1794E 01
75	.3774E 01	.8643E-03	.2913E-07	.3775E 01	.2427E 01	.1518E-02	.7958E-07	.2429E 01
80	.5012E 01	.1329E-02	.5382E-07	.5014E 01	.3257E 01	.2304E-02	.1436E-06	.3259E 01
85	.6602E 01	.2015E-02	.9755E-07	.6604E 01	.4332E 01	.3448E-02	.2544E-06	.4336E 01
90	.8626E 01	.3012E-02	.1736E-06	.8629E 01	.5715E 01	.5091E-02	.4428E-06	.5721E 01
95	.1119E 02	.4442E-02	.3034E-06	.1119E 02	.7481E 01	.7421E-02	.7579E-06	.7488E 01
100	.1440E 02	.6469E-02	.5215E-06	.1441E 02	.9717E 01	.1068E-01	.1276E-05	.9727E 01

TABLE A-I, CONTINUED. VAPOR PRESSURES, MM HG, FOR LOW TEMPERATURE RANGE.

DEG C	84.0 WT PCT H2O	H2SO4	SO3	TOTAL	86.0 WT PCT H2O	H2SO4	SO3	TOTAL
-50	.6373E-05	.8791E-10	.1731E-16	.6373E-05	.2007E-05	.2660E-09	.1662E-15	.2007E-05
-45	.1374E-04	.2616E-09	.7348E-16	.1374E-04	.4576E-05	.7504E-09	.6331E-15	.4577E-05
-40	.2864E-04	.7403E-09	.2926E-15	.2864E-04	.1004E-04	.2022E-08	.2279E-14	.1004E-04
-35	.5782E-04	.1999E-08	.1097E-14	.5783E-04	.2126E-04	.5216E-08	.7782E-14	.2127E-04
-30	.1133E-03	.5164E-08	.3886E-14	.1133E-03	.4354E-04	.1292E-07	.2529E-13	.4355E-04
-25	.2158E-03	.1280E-07	.1305E-13	.2158E-03	.8641E-04	.3079E-07	.7842E-13	.8644E-04
-20	.4004E-03	.3052E-07	.4172E-13	.4004E-03	.1665E-03	.7079E-07	.2327E-12	.1666E-03
-15	.7246E-03	.7015E-07	.1272E-12	.7246E-03	.3121E-03	.1573E-06	.6624E-12	.3123E-03
-10	.1281E-02	.1557E-06	.3712E-12	.1281E-02	.5700E-03	.3385E-06	.1813E-11	.5703E-03
-5	.2214E-02	.3347E-06	.1039E-11	.2215E-02	.1016E-02	.7065E-06	.4780E-11	.1016E-02
0	.3749E-02	.6973E-06	.2794E-11	.3749E-02	.1769E-02	.1433E-05	.1217E-10	.1770E-02
5	.6222E-02	.1411E-05	.7238E-11	.6224E-02	.3013E-02	.2827E-05	.2995E-10	.3016E-02
10	.1014E-01	.2778E-05	.1810E-10	.1014E-01	.5029E-02	.5438E-05	.7142E-10	.5034E-02
15	.1622E-01	.5327E-05	.4378E-10	.1623E-01	.8231E-02	.1020E-04	.1653E-09	.8241E-02
20	.2552E-01	.9965E-05	.1026E-09	.2553E-01	.1323E-01	.1871E-04	.3716E-09	.1324E-01
25	.3952E-01	.1821E-04	.2332E-09	.3954E-01	.2088E-01	.3354E-04	.8129E-09	.2092E-01
30	.6027E-01	.3252E-04	.5150E-09	.6031E-01	.3243E-01	.5888E-04	.1733E-08	.3249E-01
35	.9060E-01	.5688E-04	.1107E-08	.9066E-01	.4957E-01	.1013E-03	.3603E-08	.4967E-01
40	.1343E-00	.9746E-04	.2318E-08	.1344E-00	.7466E-01	.1710E-03	.7316E-08	.7483E-01
45	.1966E-00	.1638E-03	.4734E-08	.1967E-00	.1108E-00	.2834E-03	.1452E-07	.1111E-00
50	.2840E-00	.2703E-03	.9446E-08	.2843E-00	.1624E-00	.4615E-03	.2821E-07	.1628E-00
55	.4055E-00	.4382E-03	.1842E-07	.4060E-00	.2348E-00	.7390E-03	.5367E-07	.2355E-00
60	.5725E 00	.6987E-03	.3517E-07	.5732E 00	.3354E-00	.1165E-02	1001E-06	.3365E-00
65	.7994E 00	.1096E-02	.6577E-07	.8005E 00	.4735E-00	.1808E-02	.1832E-06	.4753E-00
70	.1105E 01	.1693E-02	.1206E-06	.1106E 01	.6611E 00	.2766E-02	.3292E-06	.6638E 00
75	.1511E 01	.2578E-02	.2170E-06	.1514E 01	.9131E 00	.4171E-02	.5812E-06	.9173E 00
80	.2048E 01	.3870E-02	.3835E-06	.2052E 01	.1249E 01	.6208E-02	.1009E-05	.1255E 01
85	.2750E 01	.5731E-02	.6660E-06	.2756E 01	.1691E 01	.9120E-02	.1724E-05	.1700E 01
90	.3661E 01	.8378E-02	.1138E-05	.3669E 01	.2268E 01	.1323E-01	.2900E-05	.2281E 01
95	.4832E 01	.1210E-01	.1913E-05	.4844E 01	.3016E 01	.1897E-01	.4806E-05	.3035E 01
100	.6327E 01	.1726E-01	.3167E-05	.6344E 01	.3976E 01	.2689E-01	.7851E-05	.4003E 01

TABLE A-I, CONTINUED. VAPOR PRESSURES, MM HG, FOR LOW TEMPERATURE RANGE.

DEG C	88.0 WT PCT H2O	88.0 WT PCT H2SO4	88.0 WT PCT SO3	88.0 WT PCT TOTAL	90.0 WT PCT H2O	90.0 WT PCT H2SO4	90.0 WT PCT SO3	90.0 WT PCT TOTAL
-50	.6722E-06	.6494E-09	.1212E-14	.6728E-06	.2552E-06	.1248E-08	.6135E-14	.2565E-06
-45	.1602E-05	.1767E-08	.4259E-14	.1604E-05	.6244E-06	.3336E-08	.2062E-13	.6277E-06
-40	.3663E-05	.4602E-08	.1422E-13	.3668E-05	.1464E-05	.8539E-08	.6604E-13	.1472E-05
-35	.8061E-05	.1150E-07	.4528E-13	.8073E-05	.3298E-05	.2100E-07	.2020E-12	.3319E-05
-30	.1711E-04	.2766E-07	.1378E-12	.1714E-04	.7162E-05	.4972E-07	.5917E-12	.7212E-05
-25	.3513E-04	.6414E-07	.4019E-12	.3519E-04	.1502E-04	.1136E-06	.1664E-11	.1513E-04
-20	.6987E-04	.1437E-06	.1126E-11	.7001E-04	.3049E-04	.2509E-06	.4504E-11	.3074E-04
-15	.1349E-03	.3117E-06	.3037E-11	.1352E-03	.6004E-04	.5370E-06	.1175E-10	.6058E-04
-10	.2533E-03	.6556E-06	.7902E-11	.2540E-03	.1149E-03	.1115E-05	.2963E-10	.1160E-03
-5	.4633E-03	.1340E-05	.1987E-10	.4646E-03	.2139E-03	.2251E-05	.7231E-10	.2162E-03
0	.8268E-03	.2663E-05	.4838E-10	.8294E-03	.3883E-03	.4422E-05	.1710E-09	.3927E-03
5	.1441E-02	.5158E-05	.1142E-09	.1446E-02	.6881E-03	.8470E-05	.3928E-09	.6966E-03
10	.2458E-02	.9746E-05	.2619E-09	.2468E-02	.1192E-02	.1583E-04	.8773E-09	.1208E-02
15	.4106E-02	.1799E-04	.5840E-09	.4124E-02	.2022E-02	.2892E-04	.1907E-08	.2051E-02
20	.6725E-02	.3247E-04	.1268E-08	.6758E-02	.3360E-02	.5169E-04	.4042E-08	.3411E-02
25	.1081E-01	.5736E-04	.2685E-08	.1087E-01	.5477E-02	.9048E-04	.8362E-08	.5567E-02
30	.1708E-01	.9932E-04	.5550E-08	.1718E-01	.8767E-02	.1552E-03	.1690E-07	.8922E-02
35	.2653E-01	.1687E-03	.1121E-07	.2670E-01	.1379E-01	.2614E-03	.3340E-07	.1406E-01
40	.4056E-01	.2812E-03	.2214E-07	.4085E-01	.2135E-01	.4321E-03	.6464E-07	.2179E-01
45	.6109E-01	.4607E-03	.4283E-07	.6156E-01	.3255E-01	.7022E-03	.1226E-06	.3325E-01
50	.9071E-01	.7421E-03	.8119E-07	.9145E-01	.4888E-01	.1122E-02	.2279E-06	.5000E-01
55	.1329E-00	.1176E-02	.1510E-06	.1340E-00	.7238E-01	.1766E-02	.4159E-06	.7415E-01
60	.1921E-00	.1836E-02	.2755E-06	.1939E-00	.1058E-00	.2736E-02	.7456E-06	.1085E-00
65	.2743E-00	.2824E-02	.4938E-06	.2771E-00	.1526E-00	.4179E-02	.1314E-05	.1568E-00
70	.3871E-00	.4282E-02	.8701E-06	.3914E-00	.2175E-00	.6294E-02	.2277E-05	.2238E-00
75	.5403E 00	.6405E-02	.1508E-05	.5467E 00	.3064E-00	.9354E-02	.3883E-05	.3158E-00
80	.7460E 00	.9457E-02	.2573E-05	.7555E 00	.4270E-00	.1372E-01	.6523E-05	.4408E-00
85	.1020E 01	.1379E-01	.4323E-05	.1033E 01	.5888E 00	.1989E-01	.1080E-04	.6087E 00
90	.1380E 01	.1987E-01	.7157E-05	.1400E 01	.8038E 00	.2849E-01	.1762E-04	.8323E 00
95	.1850E 01	.2830E-01	.1168E-04	.1879E 01	.1087E 01	.4034E-01	.2836E-04	.1127E 01
100	.2459E 01	.3985E-01	.1881E-04	.2499E 01	.1456E 01	.5651E-01	.4506E-04	.1512E 01

TABLE A-I, CONTINUED. VAPOR PRESSURES, MM HG, FOR LOW TEMPERATURE RANGE.

DEG C	91.0 WT PCT H2O	H2SO4	SO3	TOTAL	92.0 WT PCT H2O	H2SO4	SO3	TOTAL
-50	.1626E-06	.1616E-08	.1247E-13	.1642E-06	.1049E-06	.2019E-08	.2416E-13	.1069E-06
-45	.4010E-06	.4297E-08	.4137E-13	.4053E-06	.2600E-06	.5354E-08	.7949E-13	.2654E-06
-40	.9477E-06	.1095E-07	.1308E-12	.9586E-06	.6180E-06	.1360E-07	.2491E-12	.6316E-06
-35	.2152E-05	.2680E-07	.3951E-12	.2179E-05	.1411E-05	.3320E-07	.7462E-12	.1445E-05
-30	.4709E-05	.6318E-07	.1144E-11	.4772E-05	.3106E-05	.7801E-07	.2141E-11	.3184E-05
-25	.9949E-05	.1437E-06	.3179E-11	.1009E-04	.6600E-05	.1769E-06	.5900E-11	.6777E-05
-20	.2035E-04	.3162E-06	.8506E-11	.2066E-04	.1357E-04	.3881E-06	.1565E-10	.1396E-04
-15	.4034E-04	.6738E-06	.2195E-10	.4102E-04	.2707E-04	.8246E-06	.4003E-10	.2790E-04
-10	.7773E-04	.1394E-05	.5474E-10	.7912E-04	.5246E-04	.1701E-05	.9897E-10	.5416E-04
-5	.1457E-03	.2802E-05	.1321E-09	.1485E-03	.9891E-04	.3409E-05	.2369E-09	.1023E-03
0	.2663E-03	.5485E-05	.3093E-09	.2718E-03	.1818E-03	.6654E-05	.5498E-09	.1884E-03
5	.4750E-03	.1047E-04	.7032E-09	.4855E-03	.3261E-03	.1266E-04	.1239E-08	.3367E-03
10	.8282E-03	.1949E-04	.1555E-08	.8477E-03	.5717E-03	.2351E-04	.2717E-08	.5952E-03
15	.1413E-02	.3548E-04	.3347E-08	.1449E-02	.9808E-03	.4268E-04	.5801E-08	.1024E-02
20	.2363E-02	.6319E-04	.7026E-08	.2426E-02	.1649E-02	.7581E-04	.1208E-07	.1725E-02
25	.3875E-02	.1102E-03	.1440E-07	.3985E-02	.2718E-02	.1319E-03	.2455E-07	.2850E-02
30	.6239E-02	.1885E-03	.2883E-07	.6428E-02	.4400E-02	.2249E-03	.4878E-07	.4625E-02
35	.9873E-02	.3163E-03	.5649E-07	.1019E-01	.7000E-02	.3764E-03	.9480E-07	.7377E-02
40	.1537E-01	.5213E-03	.1084E-06	.1589E-01	.1095E-01	.6187E-03	.1804E-06	.1157E-01
45	.2355E-01	.8445E-03	.2037E-06	.2440E-01	.1687E-01	.9996E-03	.3366E-06	.1787E-01
50	.3556E-01	.1346E-02	.3756E-06	.3690E-01	.2560E-01	.1589E-02	.6159E-06	.2719E-01
55	.5293E-01	.2111E-02	.6799E-06	.5504E-01	.3830E-01	.2486E-02	.1107E-05	.4079E-01
60	.7774E-01	.3261E-02	.1209E-05	.8100E-01	.5652E-01	.3831E-02	.1953E-05	.6036E-01
65	.1127E-00	.4967E-02	.2114E-05	.1177E-00	.8235E-01	.5820E-02	.3390E-05	.8817E-01
70	.1614E-00	.7459E-02	.3635E-05	.1689E-00	.1185E-00	.8720E-02	.5789E-05	.1272E-00
75	.2285E-00	.1106E-01	.6155E-05	.2396E-00	.1686E-00	.1289E-01	.9732E-05	.1815E-00
80	.3199E-00	.1618E-01	.1026E-04	.3361E-00	.2371E-00	.1882E-01	.1612E-04	.2559E-00
85	.4432E-00	.2339E-01	.1687E-04	.4666E-00	.3298E-00	.2715E-01	.2631E-04	.3570E-00
90	.6077E 00	.3341E-01	.2733E-04	.6411E 00	.4543E-00	.3869E-01	.4234E-04	.4930E-00
95	.8251E 00	.4719E-01	.4369E-04	.8724E 00	.6195E 00	.5453E-01	.6725E-04	.6741E 00
100	.1110E 01	.6593E-01	.6895E-04	.1176E 01	.8370E 00	.7602E-01	.1054E-03	.9131E 00

TABLE A-I, CONTINUED. VAPOR PRESSURES, MM HG, FOR LOW TEMPERATURE RANGE.

DEG C	93.0 WT PCT				94.0 WT PCT			
	H2O	H2SO4	SO3	TOTAL	H2O	H2SO4	SO3	TOTAL
-50	.6770E-07	.2453E-08	.4547E-13	.7015E-07	.4294E-07	.2904E-08	.8485E-13	.4584E-07
-45	.1685E-06	.6494E-08	.1488E-12	.1750E-06	.1072E-06	.7678E-08	.2765E-12	.1149E-06
-40	.4020E-06	.1647E-07	.4637E-12	.4184E-06	.2565E-06	.1945E-07	.8582E-12	.2760E-06
-35	.9218E-06	.4011E-07	.1381E-11	.9619E-06	.5902E-06	.4731E-07	.2543E-11	.6375E-06
-30	.2037E-05	.9409E-07	.3937E-11	.2131E-05	.1309E-05	.1108E-06	.7218E-11	.1420E-05
-25	.4347E-05	.2130E-06	.1078E-10	.4560E-05	.2803E-05	.2505E-06	.1966E-10	.3054E-05
-20	.8980E-05	.4662E-06	.2842E-10	.9446E-05	.5813E-05	.5475E-06	.5155E-10	.6361E-05
-15	.1799E-04	.9886E-06	.7222E-10	.1898E-04	.1169E-04	.1159E-05	.1303E-09	.1285E-04
-10	.3502E-04	.2035E-05	.1774E-09	.3705E-04	.2285E-04	.2382E-05	.3182E-09	.2523E-04
-5	.6633E-04	.4070E-05	.4217E-09	.7040E-04	.4347E-04	.4758E-05	.7523E-09	.4823E-04
0	.1225E-03	.7928E-05	.9722E-09	.1304E-03	.8059E-04	.9253E-05	.1724E-08	.8985E-04
5	.2207E-03	.1505E-04	.2177E-08	.2358E-03	.1459E-03	.1754E-04	.3838E-08	.1634E-03
10	.3888E-03	.2790E-04	.4740E-08	.4167E-03	.2581E-03	.3246E-04	.8307E-08	.2905E-03
15	.6702E-03	.5054E-04	.1005E-07	.7208E-03	.4468E-03	.5869E-04	.1751E-07	.5056E-03
20	.1132E-02	.8957E-04	.2079E-07	.1222E-02	.7580E-03	.1039E-03	.3599E-07	.8619E-03
25	.1875E-02	.1555E-03	.4197E-07	.2031E-02	.1261E-02	.1800E-03	.7223E-07	.1441E-02
30	.3050E-02	.2646E-03	.8280E-07	.3315E-02	.2060E-02	.3058E-03	.1416E-06	.2366E-02
35	.4875E-02	.4419E-03	.1598E-06	.5317E-02	.3308E-02	.5099E-03	.2718E-06	.3818E-02
40	.7663E-02	.7250E-03	.3022E-06	.8388E-02	.5223E-02	.8350E-03	.5107E-06	.6058E-02
45	.1186E-01	.1169E-02	.5599E-06	.1303E-01	.8118E-02	.1344E-02	.9405E-06	.9463E-02
50	.1808E-01	.1854E-02	.1018E-05	.1993E-01	.1243E-01	.2128E-02	.1699E-05	.1456E-01
55	.2717E-01	.2895E-02	.1817E-05	.3006E-01	.1876E-01	.3318E-02	.3015E-05	.2208E-01
60	.4028E-01	.4453E-02	.3186E-05	.4473E-01	.2794E-01	.5095E-02	.5255E-05	.3304E-01
65	.5895E-01	.6751E-02	.5494E-05	.6570E-01	.4106E-01	.7712E-02	.9008E-05	.4878E-01
70	.8521E-01	.1010E-01	.9322E-05	.9531E-01	.5961E-01	.1151E-01	.1519E-04	.7114E-01
75	.1217E-00	.1490E-01	.1557E-04	.1366E-00	.8552E-01	.1696E-01	.2523E-04	.1025E-00
80	.1719E-00	.2171E-01	.2563E-04	.1937E-00	.1213E-00	.2467E-01	.4128E-04	.1460E-00
85	.2403E-00	.3125E-01	.4157E-04	.2715E-00	.1702E-00	.3546E-01	.6658E-04	.2058E-00
90	.3323E-00	.4445E-01	.6650E-04	.3768E-00	.2364E-00	.5037E-01	.1059E-03	.2869E-00
95	.4551E-00	.6253E-01	.1050E-03	.5177E 00	.3251E-00	.7074E-01	.1662E-03	.3960E-00
100	.6173E 00	.8701E-01	.1636E-03	.7045E 00	.4428E-00	.9828E-01	.2576E-03	.5414E 00

TABLE A-I, CONTINUED. VAPOR PRESSURES, MM HG, FOR LOW TEMPERATURE RANGE.

DEG C	95.0 WT PCT H2O	95.0 WT PCT H2SO4	95.0 WT PCT SO3	95.0 WT PCT TOTAL	96.0 WT PCT H2O	96.0 WT PCT H2SO4	96.0 WT PCT SO3	96.0 WT PCT TOTAL
-50	.2629E-07	.3408E-08	.1626E-12	.2970E-07	.1511E-07	.3916E-08	.3251E-12	.1903E-07
-45	.6578E-07	.9004E-08	.5284E-12	.7479E-07	.3787E-07	.1034E-07	.1054E-11	.4821E-07
-40	.1578E-06	.2279E-07	.1634E-11	.1806E-06	.9103E-07	.2616E-07	.3253E-11	.1172E-06
-35	.3641E-06	.5538E-07	.4826E-11	.4195E-06	.2105E-06	.6354E-07	.9578E-11	.2740E-06
-30	.8098E-06	.1296E-06	.1364E-10	.9395E-06	.4693E-06	.1486E-06	.2699E-10	.6179E-06
-25	.1740E-05	.2927E-06	.3701E-10	.2033E-05	.1011E-05	.3353E-06	.7297E-10	.1347E-05
-20	.3621E-05	.6390E-06	.9660E-10	.4260E-05	.2110E-05	.7315E-06	.1897E-09	.2842E-05
-15	.7308E-05	.1351E-05	.2431E-09	.8659E-05	.4273E-05	.1546E-05	.4756E-09	.5819E-05
-10	.1433E-04	.2774E-05	.5908E-09	.1711E-04	.8409E-05	.3171E-05	.1151E-08	.1158E-04
-5	.2736E-04	.5534E-05	.1390E-08	.3290E-04	.1611E-04	.6320E-05	.2696E-08	.2243E-04
0	.5093E-04	.1075E-04	.3170E-08	.6168E-04	.3009E-04	.1226E-04	.6120E-08	.4236E-04
5	.9254E-04	.2035E-04	.7019E-08	.1129E-03	.5489E-04	.2320E-04	.1349E-07	.7810E-04
10	.1644E-03	.3761E-04	.1511E-07	.2020E-03	.9787E-04	.4282E-04	.2890E-07	.1407E-03
15	.2858E-03	.6793E-04	.3169E-07	.3537E-03	.1708E-03	.7727E-04	.6030E-07	.2482E-03
20	.4868E-03	.1200E-03	.6479E-07	.6069E-03	.2922E-03	.1364E-03	.1227E-06	.4287E-03
25	.8133E-03	.2077E-03	.1293E-06	.1021E-02	.4902E-03	.2358E-03	.2435E-06	.7262E-03
30	.1334E-02	.3525E-03	.2522E-06	.1687E-02	.8075E-03	.3997E-03	.4724E-06	.1208E-02
35	.2151E-02	.5870E-03	.4812E-06	.2738E-02	.1307E-02	.6649E-03	.8967E-06	.1973E-02
40	.3411E-02	.9599E-03	.8990E-06	.4371E-02	.2082E-02	.1086E-02	.1666E-05	.3170E-02
45	.5324E-02	.1543E-02	.1647E-05	.6868E-02	.3264E-02	.1744E-02	.3036E-05	.5011E-02
50	.8186E-02	.2440E-02	.2958E-05	.1063E-01	.5041E-02	.2755E-02	.5424E-05	.7801E-02
55	.1241E-01	.3799E-02	.5219E-05	.1621E-01	.7674E-02	.4284E-02	.9517E-05	.1197E-01
60	.1856E-01	.5825E-02	.9047E-05	.2439E-01	.1153E-01	.6562E-02	.1641E-04	.1811E-01
65	.2739E-01	.8805E-02	.1542E-04	.3621E-01	.1709E-01	.9908E-02	.2781E-04	.2703E-01
70	.3994E-01	.1313E-01	.2586E-04	.5309E-01	.2503E-01	.1475E-01	.4638E-04	.3983E-01
75	.5754E-01	.1931E-01	.4271E-04	.7690E-01	.3622E-01	.2168E-01	.7617E-04	.5798E-01
80	.8197E-01	.2806E-01	.6948E-04	.1101E-00	.5182E-01	.3147E-01	.1232E-03	.8341E-01
85	.1155E-00	.4027E-01	.1114E-03	.1559E-00	.7335E-01	.4511E-01	.1966E-03	.1187E-00
90	.1611E-00	.5712E-01	.1763E-03	.2184E-00	.1027E-00	.6391E-01	.3092E-03	.1670E-00
95	.2225E-00	.8012E-01	.2752E-03	.3028E-00	.1425E-00	.8955E-01	.4801E-03	.2325E-00
100	.3043E-00	.1112E-00	.4241E-03	.4159E-00	.1958E-00	.1241E-00	.7359E-03	.3206E-00

TABLE A-I, CONTINUED. VAPOR PRESSURES, MM HG, FOR LOW TEMPERATURE RANGE.

DEG C	97.0 WT PCT				98.0 WT PCT			
	H2O	H2SO4	SO3	TOTAL	H2O	H2SO4	SO3	TOTAL
-50	.8033E-08	.4443E-08	.6939E-12	.1248E-07	.3566E-08	.4973E-08	.1750E-11	.8540E-08
-45	.2014E-07	.1173E-07	.2249E-11	.3187E-07	.8932E-08	.1313E-07	.5675E-11	.2207E-07
-40	.4846E-07	.2967E-07	.6929E-11	.7813E-07	.2149E-07	.3321E-07	.1749E-10	.5471E-07
-35	.1122E-06	.7204E-07	.2037E-10	.1843E-06	.4978E-07	.8063E-07	.5140E-10	.1305E-06
-30	.2506E-06	.1684E-06	.5728E-10	.4191E-06	.1113E-06	.1885E-06	.1444E-09	.2999E-06
-25	.5412E-06	.3799E-06	.1545E-09	.9212E-06	.2406E-06	.4250E-06	.3888E-09	.6660E-06
-20	.1132E-05	.8284E-06	.4005E-09	.1961E-05	.5041E-06	.9266E-06	.1006E-08	.1432E-05
-15	.2298E-05	.1750E-05	.1001E-08	.4049E-05	.1025E-05	.1957E-05	.2508E-08	.2984E-05
-10	.4536E-05	.3586E-05	.2414E-08	.8124E-05	.2029E-05	.4009E-05	.6033E-08	.6043E-05
-5	.8717E-05	.7144E-05	.5632E-08	.1587E-04	.3909E-05	.7983E-05	.1403E-07	.1191E-04
0	.1634E-04	.1385E-04	.1274E-07	.3020E-04	.7348E-05	.1547E-04	.3163E-07	.2285E-04
5	.2990E-04	.2619E-04	.2795E-07	.5611E-04	.1349E-04	.2923E-04	.6917E-07	.4279E-04
10	.5350E-04	.4831E-04	.5964E-07	.1019E-03	.2422E-04	.5391E-04	.1470E-06	.7828E-04
15	.9373E-04	.8710E-04	.1239E-06	.1810E-03	.4258E-04	.9714E-04	.3041E-06	.1400E-03
20	.1609E-03	.1536E-03	.2508E-06	.3148E-03	.7338E-04	.1713E-03	.6132E-06	.2453E-03
25	.2711E-03	.2654E-03	.4956E-06	.5370E-03	.1241E-03	.2957E-03	.1206E-05	.4210E-03
30	.4483E-03	.4496E-03	.9570E-06	.8989E-03	.2060E-03	.5006E-03	.2319E-05	.7089E-03
35	.7288E-03	.7472E-03	.1807E-05	.1478E-02	.3363E-03	.8314E-03	.4359E-05	.1172E-02
40	.1166E-02	.1220E-02	.3342E-05	.2388E-02	.5401E-03	.1356E-02	.8022E-05	.1904E-02
45	.1835E-02	.1957E-02	.6057E-05	.3798E-02	.8539E-03	.2175E-02	.1447E-04	.3043E-02
50	.2846E-02	.3088E-02	.1077E-04	.5945E-02	.1330E-02	.3430E-02	.2559E-04	.4786E-02
55	.4352E-02	.4798E-02	.1880E-04	.9169E-02	.2043E-02	.5326E-02	.4445E-04	.7413E-02
60	.6566E-02	.7343E-02	.3223E-04	.1394E-01	.3096E-02	.8146E-02	.7584E-04	.1132E-01
65	.9777E-02	.1108E-01	.5435E-04	.2091E-01	.4630E-02	.1228E-01	.1272E-03	.1704E-01
70	.1438E-01	.1648E-01	.9018E-04	.3095E-01	.6841E-02	.1826E-01	.2130E-03	.2531E-01
75	.2090E-01	.2420E-01	.1473E-03	.4525E-01	.9989E-02	.2680E-01	.3413E-03	.3713E-01
80	.3004E-01	.3509E-01	.2371E-03	.6537E-01	.1442E-01	.3883E-01	.5465E-03	.5379E-01
85	.4271E-01	.5026E-01	.3761E-03	.9335E-01	.2059E-01	.5557E-01	.8625E-03	.7703E-01
90	.6010E-01	.7115E-01	.5886E-03	.1318E-00	.2911E-01	.7862E-01	.1343E-02	.1091E-00
95	.8372E-01	.9960E-01	.9089E-03	.1842E-00	.4073E-01	.1100E-00	.2363E-02	.1528E-00
100	.1155E-00	.1379E-00	.1386E-02	.2548E-00	.5646E-01	.1522E-00	.3129E-02	.2118E-00

TABLE A-I, CONTINUED. VAPOR PRESSURES, MM HG, FOR LOW TEMPERATURE RANGE.

DEG C	98.5 WT PCT				99.0 WT PCT			
	H2O	H2SO4	SO3	TOTAL	H2O	H2SO4	SO3	TOTAL
-50	.2064E-08	.5227E-08	.3178E-11	.7294E-08	.9841E-09	.5506E-08	.7019E-11	.6497E-08
-45	.5166E-08	.1380E-07	.1031E-10	.1898E-07	.2455E-08	.1454E-07	.2286E-10	.1702E-07
-40	.1242E-07	.3491E-07	.3181E-10	.4736E-07	.5886E-08	.3676E-07	.7070E-10	.4272E-07
-35	.2877E-07	.8477E-07	.9347E-10	.1136E-06	.1360E-07	.8926E-07	.2082E-09	.1031E-06
-30	.6433E-07	.1981E-06	.2626E-09	.2627E-06	.3035E-07	.2086E-06	.5859E-09	.2396E-06
-25	.1391E-06	.4468E-06	.7068E-09	.5867E-06	.6556E-07	.4703E-06	.1579E-08	.5375E-06
-20	.2917E-06	.9741E-06	.1828E-08	.1268E-05	.1373E-06	.1025E-05	.4086E-08	.1167E-05
-15	.5938E-06	.2057E-05	.4552E-08	.2655E-05	.2795E-06	.2164E-05	.1018E-07	.2454E-05
-10	.1176E-05	.4214E-05	.1094E-07	.5400E-05	.5533E-06	.4432E-05	.2445E-07	.5010E-05
-5	.2268E-05	.8390E-05	.2542E-07	.1068E-04	.1068E-05	.8823E-05	.5679E-07	.9948E-05
0	.4269E-05	.1626E-04	.5721E-07	.2059E-04	.2011E-05	.1709E-04	.1277E-06	.1923E-04
5	.7848E-05	.3072E-04	.1249E-06	.3869E-04	.3700E-05	.3228E-04	.2785E-06	.3626E-04
10	.1411E-04	.5664E-04	.2651E-06	.7102E-04	.6661E-05	.5951E-04	.5901E-06	.6676E-04
15	.2485E-04	.1020E-03	.5474E-06	.1274E-03	.1175E-04	.1072E-03	.1217E-05	.1201E-03
20	.4290E-04	.1799E-03	.1102E-05	.2239E-03	.2031E-04	.1889E-03	.2443E-05	.2116E-03
25	.7267E-04	.3105E-03	.2163E-05	.3854E-03	.3446E-04	.3260E-03	.4787E-05	.3652E-03
30	.1209E-03	.5256E-03	.4149E-05	.6506E-03	.5745E-04	.5515E-03	.9161E-05	.6181E-03
35	.1977E-03	.8728E-03	.7783E-05	.1078E-02	.9417E-04	.9155E-03	.1714E-04	.1027E-02
40	.3182E-03	.1424E-02	.1429E-04	.1756E-02	.1519E-03	.1493E-02	.3139E-04	.1676E-02
45	.5041E-03	.2282E-02	.2572E-04	.2812E-02	.2412E-03	.2392E-02	.5633E-04	.2690E-02
50	.7869E-03	.3599E-02	.4540E-04	.4431E-02	.3776E-03	.3771E-02	.9913E-04	.4248E-02
55	.1211E-02	.5587E-02	.7865E-04	.6877E-02	.5827E-03	.5852E-02	.1712E-03	.6606E-02
60	.1839E-02	.8544E-02	.1339E-03	.1052E-01	.8875E-03	.8945E-02	.2905E-03	.1012E-01
65	.2757E-02	.1288E-01	.2240E-03	.1586E-01	.1334E-02	.1348E-01	.4845E-03	.1530E-01
70	.4083E-02	.1915E-01	.3689E-03	.2360E-01	.1982E-02	.2003E-01	.7951E-03	.2281E-01
75	.5975E-02	.2809E-01	.5980E-03	.3466E-01	.2910E-02	.2938E-01	.1284E-02	.3357E-01
80	.8647E-02	.4069E-01	.9551E-03	.5029E-01	.4224E-02	.4254E-01	.2044E-02	.4881E-01
85	.1238E-01	.5823E-01	.1504E-02	.7211E-01	.6066E-02	.6085E-01	.3206E-02	.7012E-01
90	.1754E-01	.8236E-01	.2335E-02	.1022E-00	.8622E-02	.8604E-01	.4961E-02	.9962E-01
95	.2460E-01	.1152E-00	.3578E-02	.1434E-00	.1214E-01	.1203E-00	.7573E-02	.1400E-00
100	.3417E-01	.1594E-00	.5413E-02	.1989E-00	.1692E-01	.1664E-00	.1141E-01	.1947E-00

TABLE A-I, CONTINUED. VAPOR PRESSURES, MM HG, FOR LOW TEMPERATURE RANGE.

DEG C	99.5 WT PCT H2O	99.5 WT PCT H2SO4	99.5 WT PCT SO3	99.5 WT PCT TOTAL	99.8 WT PCT H2O	99.8 WT PCT H2SO4	99.8 WT PCT SO3	99.8 WT PCT TOTAL
-50	.3120E-09	.5784E-08	.2326E-10	.6120E-08	.6925E-10	.5935E-08	.1075E-09	.6112E-08
-45	.7662E-09	.1528E-07	.7699E-10	.1612E-07	.1654E-09	.1569E-07	.3662E-09	.1622E-07
-40	.1812E-08	.3865E-07	.2414E-09	.4070E-07	.3822E-09	.3971E-07	.1176E-08	.4126E-07
-35	.4139E-08	.9386E-07	.7195E-09	.9872E-07	.8565E-09	.9647E-07	.3574E-08	.1009E-06
-30	.9145E-08	.2194E-06	.2045E-08	.2306E-06	.1865E-08	.2256E-06	.1031E-07	.2378E-06
-25	.1959E-07	.4947E-06	.5559E-08	.5198E-06	.3949E-08	.5088E-06	.2836E-07	.5411E-06
-20	.4073E-07	.1078E-05	.1449E-07	.1133E-05	.8148E-08	.1109E-05	.7450E-07	.1192E-05
-15	.8241E-07	.2276E-05	.3629E-07	.2394E-05	.1640E-07	.2341E-05	.1876E-06	.2545E-05
-10	.1624E-06	.4660E-05	.8759E-07	.4910E-05	.3227E-07	.4796E-05	.4538E-06	.5282E-05
-5	.3124E-06	.9275E-05	.2041E-06	.9792E-05	.6207E-07	.9545E-05	.1057E-05	.1066E-04
0	.5868E-06	.1797E-04	.4599E-06	.1901E-04	.1169E-06	.1849E-04	.2376E-05	.2098E-04
5	.1078E-05	.3392E-04	.1004E-05	.3601E-04	.2158E-06	.3491E-04	.5163E-05	.4029E-04
10	.1940E-05	.6251E-04	.2128E-05	.6658E-04	.3909E-06	.6433E-04	.1087E-04	.7559E-04
15	.3422E-05	.1126E-03	.4385E-05	.1204E-03	.6952E-06	.1158E-03	.2221E-04	.1387E-03
20	.5923E-05	.1983E-03	.8795E-05	.2130E-03	.1215E-05	.2040E-03	.4411E-04	.2493E-03
25	.1007E-04	.3421E-03	.1719E-04	.3693E-03	.2089E-05	.3519E-03	.8527E-04	.4392E-03
30	.1683E-04	.5785E-03	.3281E-04	.6282E-03	.3534E-05	.5950E-03	.1607E-03	.7592E-03
35	.2766E-04	.9601E-03	.6119E-04	.1049E-02	.5890E-05	.9871E-03	.2955E-03	.1288E-02
40	.4478E-04	.1565E-02	.1116E-03	.1721E-02	.9674E-05	.1608E-02	.5311E-03	.2149E-02
45	.7142E-04	.2506E-02	.1994E-03	.2777E-02	.1567E-04	.2576E-02	.9338E-03	.3525E-02
50	.1123E-03	.3950E-02	.3491E-03	.4411E-02	.2504E-04	.4058E-02	.1608E-02	.5691E-02
55	.1742E-03	.6126E-02	.5996E-03	.6900E-02	.3952E-04	.6293E-02	.2715E-02	.9047E-02
60	.2667E-03	.9361E-02	.1011E-02	.1064E-01	.6160E-04	.9612E-02	.4497E-02	.1417E-01
65	.4034E-03	.1410E-01	.1676E-02	.1618E-01	.9489E-04	.1447E-01	.7316E-02	.2188E-01
70	.6029E-03	.2094E-01	.2733E-02	.2428E-01	.1445E-03	.2149E-01	.1170E-01	.3334E-01
75	.8910E-03	.3070E-01	.4384E-02	.3597E-01	.2177E-03	.3150E-01	.1840E-01	.5012E-01
80	.1302E-02	.4443E-01	.6925E-02	.5266E-01	.3246E-03	.4557E-01	.2850E-01	.7440E-01
85	.1884E-02	.6353E-01	.1078E-01	.7620E-01	.4790E-03	.6514E-01	.4347E-01	.1091E-00
90	.2697E-02	.8979E-01	.1655E-01	.1090E-00	.7000E-03	.9204E-01	.6536E-01	.1581E-00
95	.3826E-02	.1255E-00	.2506E-01	.1544E-00	.1013E-02	.1286E-00	.9694E-01	.2265E-00
100	.5376E-02	.1735E-00	.3746E-01	.2163E-00	.1454E-02	.1777E-00	.1419E-00	.3210E-00

TABLE A-I, CONTINUED. VAPOR PRESSURES, MM HG, FOR LOW TEMPERATURE RANGE.

DEG C	99.9 WT PCT H2O	99.9 WT PCT H2SO4	99.9 WT PCT SO3	99.9 WT PCT TOTAL	100.0 WT PCT H2O	100.0 WT PCT H2SO4	100.0 WT PCT SO3	100.0 WT PCT TOTAL
-50	.1382E-10	.6004E-08	.5452E-09	.6563E-08	.5214E-14	.6084E-08	.1464E-05	.1470E-05
-45	.3370E-10	.1587E-07	.1818E-08	.1772E-07	.2157E-13	.1607E-07	.2876E-05	.2892E-05
-40	.7967E-10	.4016E-07	.5706E-08	.4594E-07	.8338E-13	.4066E-07	.5519E-05	.5560E-05
-35	.1829E-09	.9756E-07	.1693E-07	.1147E-06	.3024E-12	.9873E-07	.1036E-04	.1046E-04
-30	.4081E-09	.2281E-06	.4764E-07	.2761E-06	.1033E-11	.2307E-06	.1903E-04	.1926E-04
-25	.8869E-09	.5144E-06	.1276E-06	.6429E-06	.3340E-11	.5202E-06	.3428E-04	.3480E-04
-20	.1879E-08	.1121E-05	.3266E-06	.1450E-05	.1024E-10	.1133E-05	.6056E-04	.6170E-04
-15	.3887E-08	.2367E-05	.8001E-06	.3171E-05	.2992E-10	.2392E-05	.1051E-03	.1075E-03
-10	.7860E-08	.4847E-05	.1882E-05	.6737E-05	.8345E-10	.4898E-05	.1792E-03	.1841E-03
-5	.1555E-07	.9646E-05	.4263E-05	.1392E-04	.2228E-09	.9745E-05	.3005E-03	.3102E-03
0	.3013E-07	.1868E-04	.9312E-05	.2803E-04	.5713E-09	.1887E-04	.4961E-03	.5150E-03
5	.5724E-07	.3527E-04	.1967E-04	.5499E-04	.1409E-08	.3562E-04	.8067E-03	.8423E-03
10	.1067E-06	.6498E-04	.4023E-04	.1053E-03	.3352E-08	.6561E-04	.1293E-02	.1358E-02
15	.1953E-06	.1170E-03	.7985E-04	.1970E-03	.7705E-08	.1181E-03	.2043E-02	.2162E-02
20	.3514E-06	.2060E-03	.1540E-03	.3604E-03	.1714E-07	.2080E-03	.3187E-02	.3395E-02
25	.6217E-06	.3553E-03	.2893E-03	.6452E-03	.3699E-07	.3586E-03	.4908E-02	.5267E-02
30	.1083E-05	.6007E-03	.5296E-03	.1131E-02	.7751E-07	.6063E-03	.7465E-02	.8072E-02
35	.1857E-05	.9966E-03	.9464E-03	.1945E-02	.1580E-06	.1006E-02	.1122E-01	.1223E-01
40	.3138E-05	.1624E-02	.1653E-02	.3280E-02	.3138E-06	.1638E-02	.1668E-01	.1832E-01
45	.5228E-05	.2600E-02	.2825E-02	.5431E-02	.6078E-06	.2623E-02	.2452E-01	.2714E-01
50	.8594E-05	.4096E-02	.4730E-02	.8834E-02	.1150E-05	.4132E-02	.3566E-01	.3980E-01
55	.1394E-04	.6351E-02	.7765E-02	.1413E-01	.2127E-05	.6407E-02	.5135E-01	.5776E-01
60	.2234E-04	.9700E-02	.1251E-01	.2224E-01	.3851E-05	.9785E-02	.7322E-01	.8301E-01
65	.3536E-04	.1460E-01	.1981E-01	.3445E-01	.6833E-05	.1473E-01	.1034E-00	.1182E-00
70	.5533E-04	.2168E-01	.3084E-01	.5258E-01	.1189E-04	.2187E-01	.1447E-00	.1666E-00
75	.8559E-04	.3178E-01	.4723E-01	.7909E-01	.2031E-04	.3205E-01	.2008E-00	.2328E-00
80	.1310E-03	.4597E-01	.7125E-01	.1174E-00	.3408E-04	.4637E-01	.2761E-00	.3225E-00
85	.1983E-03	.6571E-01	.1059E-00	.1718E-00	.5625E-04	.6628E-01	.3766E-00	.4430E-00
90	.2973E-03	.9283E-01	.1552E-00	.2484E-00	.9133E-04	.9363E-01	.5096E 00	.6033E 00
95	.4412E-03	.1297E-00	.2245E-00	.3547E-00	.1460E-03	.1308E-00	.6842E 00	.8152E 00
100	.6488E-03	.1792E-00	.3206E-00	.5005E 00	.2301E-03	.1807E-00	.9117E 00	.1093E 01

TABLE A-IIA. WATER PARTIAL PRESSURE, MM HG.

DEG C	WEIGHT PERCENT H2SO4 10.0	20.0	25.0	30.0	35.0	40.0	45.0	50.0	55.0	60.0	65.0	70.0
0	4.363	4.003	3.721	3.362	2.929	2.441	1.937	1.447	1.000	0.6271	0.3415	0.1550
10	8.771	8.060	7.511	6.817	5.979	5.023	4.022	3.034	2.124	1.353	.7517	.3502
20	16.70	15.37	14.36	13.09	11.55	9.772	7.894	6.013	4.259	2.755	1.561	.7462
30	30.32	27.95	26.16	23.93	21.22	18.08	14.73	11.33	8.116	5.327	3.076	1.508
40	52.70	48.66	45.63	41.88	37.31	32.00	26.26	20.39	14.77	9.833	5.782	2.905
50	88.11	81.47	76.56	70.45	63.05	54.38	44.97	35.23	25.81	17.41	10.42	5.363
60	142.2	131.7	124.0	114.4	102.8	89.12	74.21	58.65	43.42	29.67	18.06	9.509
70	222.5	206.3	194.5	179.9	162.1	141.3	118.5	94.45	70.64	48.86	30.24	16.28
80	338.0	313.9	296.4	274.7	248.4	217.6	183.5	147.5	111.4	77.99	49.04	26.98
90	500.3	465.2	439.9	408.6	370.5	325.9	276.6	224.2	171.0	121.0	77.26	43.39
100	723.1	673.2	637.5	593.2	539.2	476.4	406.7	332.2	255.6	182.9	118.5	67.91
110	1023.	953.1	903.8	842.5	767.6	680.9	584.4	480.9	373.5	270.0	177.4	103.7
120	1417.	1323.	1256.	1173.	1071.	953.3	822.5	681.8	534.0	389.9	259.7	154.6
130	1929.	1802.	1713.	1602.	1466.	1310.	1136.	948.0	748.7	551.8	372.4	225.7
140	2581.	2414.	2297.	2152.	1973.	1768.	1541.	1295.	1031.	766.7	523.9	323.1
150	3400.	3184.	3034.	2846.	2613.	2350.	2057.	1740.	1396.	1047.	724.3	454.1
160	4416.	4140.	3948.	3710.	3412.	3077.	2706.	2303.	1861.	1408.	985.	627.5
170	5660.	5312.	5071.	4772.	4396.	3975.	3511.	3006.	2447.	1865.	1319.	853.5
180	7167.	6733.	6433.	6062.	5593.	5071.	4498.	3872.	3174.	2438.	1743.	1144.
190	8972.	8437.	8069.	7615.	7036.	6395.	5695.	4930.	4067.	3147.	2272.	1513.
200				9465.	8757.	7978.	7133.	6206.	5153.	4015.	2926.	1974.
210						9855.	8844.	7732.	6459.	5066.	3726.	2547.
220								9540.	8017.	6327.	4694.	3248.
230									9860.	7827.	5855.	4100.
240										9598.	7236.	5124.
250											8865.	6344.
260												7787.
270												9481.
280												
290												
300												
310												
320												
330												
340												
350												
360												
370												
380												
390												
400												

TABLE A-IIA, CONTINUED. WATER PARTIAL PRESSURE, MM HG.

DEG C	WEIGHT PERCENT H2SO4 72.0	74.0	76.0	78.0	80.0	82.0	84.0	86.0	88.0	90.0	91.0	92.0
0	0.1066	0.0705	0.0444	0.0265	0.0148	0.0077	0.0037	0.0018	0.0008	0.0004	0.0003	0.0002
10	.2443	.1640	.1053	.0641	.0368	.0198	.0101	.0050	.0025	.0012	.0008	.0006
20	.5273	.3593	.2348	.1461	.0859	.0479	.0255	.0132	.0067	.0034	.0024	.0016
30	1.079	.7459	.4958	.3148	.1898	.1091	.0603	.0324	.0171	.0088	.0062	.0044
40	2.105	1.475	.9967	.6451	.3982	.2354	.1343	.0747	.0406	.0214	.0154	.0110
50	3.929	2.792	1.916	1.263	.7969	.4837	.2840	.1624	.0907	.0489	.0356	.0256
60	7.052	5.075	3.535	2.372	1.528	.9505	.5725	.3354	.1921	.1058	.0777	.0565
70	12.21	8.895	6.286	4.287	2.818	1.793	1.105	.6611	.3871	.2175	.1614	.1185
80	20.45	15.08	10.80	7.485	5.012	3.257	2.048	1.249	.7460	.4270	.3199	.2371
90	33.23	24.79	17.99	12.65	8.626	5.715	3.661	2.268	1.380	.8038	.6077	.4543
100	52.52	39.62	29.12	20.77	14.40	9.717	6.327	3.976	2.459	1.456	1.110	.8370
110	80.94	61.70	45.89	33.19	23.37	16.04	10.60	6.746	4.234	2.545	1.957	1.488
120	121.8	93.81	70.57	51.70	36.95	25.77	17.26	11.11	7.066	4.309	3.338	2.558
130	179.4	139.5	106.1	78.68	57.03	40.36	27.37	17.79	11.46	7.081	5.527	4.268
140	259.0	203.3	156.2	117.2	86.06	61.75	42.34	27.76	18.09	11.32	8.900	6.923
150	367.0	290.6	225.5	171.0	127.2	92.44	64.03	42.33	27.87	17.65	13.97	10.94
160	511.1	408.1	319.6	244.9	184.3	135.6	94.78	63.13	41.97	26.88	21.41	16.89
170	700.3	563.8	445.5	344.7	262.2	195.1	137.6	92.27	61.93	40.07	32.11	25.49
180	945.3	766.9	611.1	477.3	366.8	275.7	196.0	132.3	89.54	58.54	47.19	37.69
190	1258.	1028.	826.0	650.7	504.8	383.2	274.5	186.5	127.2	83.96	68.05	54.67
200	1653.	1361.	1101.	874.5	684.5	524.4	378.2	258.5	177.7	118.3	96.42	77.89
210	2145.	1777.	1449.	1159.	915.1	707.0	513.3	353.0	244.4	164.1	134.4	109.1
220	2752.	2295.	1883.	1518.	1207.	940.0	686.8	475.1	331.3	224.3	184.5	150.6
230	3492.	2929.	2419.	1963.	1572.	1233.	906.7	631.1	443.0	302.2	249.7	204.8
240	4387.	3701.	3074.	2511.	2024.	1599.	1182.	827.7	584.9	401.9	333.5	274.7
250	5459.	4630.	3868.	3177.	2576.	2048.	1523.	1073.	763.2	528.0	439.9	363.9
260	6731.	5739.	4819.	3980.	3245.	2595.	1940.	1376.	984.7	685.7	573.5	476.2
270	8231.	7051.	5949.	4938.	4046.	3253.	2445.	1746.	1257.	881.1	739.5	616.4
280	9983.	8591.	7281.	6073.	4998.	4038.	3051.	2194.	1590.	1121.	943.8	789.4
290			8840.	7404.	6117.	4965.	3771.	2731.	1992.	1412.	1193.	1001.
300				8953.	7423.	6050.	4620.	3372.	2475.	1764.	1494.	1257.
310					8935.	7311.	5612.	4128.	3049.	2184.	1856.	1566.
320						8763.	6762.	5015.	3728.	2684.	2286.	1934.
330							8086.	6049.	4525.	3274.	2794.	2370.
340							9598.	7246.	5455.	3965.	3392.	2882.
350								8623.	6535.	4770.	4089.	3481.
360									7781.	5703.	4897.	4177.
370									9212.	6779.	5831.	4980.
380										8013.	6902.	5903.
390										9421.	8126.	6957.
400											9517.	8156.

TABLE A-IIA, CONTINUED. WATER PARTIAL PRESSURE, MM HG.

DEG C	WEIGHT PERCENT H2SO4 93.0	94.0	95.0	96.0	97.0	98.0	98.5	99.0	99.5	99.8	99.9	100.0
0	0.0001											
10	.0004	0.0003	0.0002									
20	.0011	.0008	.0005	0.0003	0.0002							
30	.0030	.0021	.0013	.0008	.0004	0.0002	0.0001					
40	.0077	.0052	.0034	.0021	.0012	.0005	.0003	0.0002				
50	.0181	.0124	.0082	.0050	.0028	.0013	.0008	.0004	0.0001			
60	.0403	.0279	.0186	.0115	.0066	.0031	.0018	.0009	.0003			
70	.0852	.0596	.0399	.0250	.0144	.0068	.0041	.0020	.0006	0.0001		
80	.1719	.1213	.0820	.0518	.0300	.0144	.0086	.0042	.0013	.0003	0.0001	
90	.3323	.2364	.1611	.1027	.0601	.0291	.0175	.0086	.0027	.0007	.0003	
100	.6173	.4428	.3043	.1958	.1155	.0565	.0342	.0169	.0054	.0015	.0006	0.0002
110	1.106	.7998	.5541	.3596	.2141	.1056	.0642	.0320	.0103	.0029	.0014	.0005
120	1.917	1.397	.9758	.6387	.3836	.1908	.1166	.0585	.0192	.0057	.0028	.0012
130	3.222	2.366	1.666	1.100	.6662	.3343	.2052	.1038	.0347	.0107	.0055	.0027
140	5.264	3.894	2.763	1.839	1.124	.5688	.3509	.1787	.0609	.0195	.0104	.0055
150	8.379	6.242	4.464	2.996	1.846	.9421	.5839	.2996	.1040	.0347	.0193	.0109
160	13.02	9.764	7.037	4.761	2.958	1.522	.9476	.4897	.1732	.0603	.0349	.0209
170	19.77	14.93	10.84	7.393	4.630	2.401	1.502	.7820	.2819	.1022	.0613	.0386
180	29.42	22.36	16.35	11.24	7.094	3.707	2.330	1.222	.4491	.1694	.1053	.0689
190	42.92	32.82	24.17	16.74	10.65	5.607	3.540	1.870	.7010	.2750	.1766	.1196
200	61.49	47.30	35.09	24.48	15.69	8.322	5.276	2.807	1.073	.4376	.2899	.2019
210	86.63	67.02	50.05	35.17	22.72	12.13	7.725	4.139	1.615	.6833	.4660	.3323
220	120.1	93.45	70.26	49.72	32.35	17.39	11.12	6.001	2.388	1.048	.7345	.5338
230	164.1	128.4	97.13	69.22	45.35	24.54	15.76	8.562	3.475	1.580	1.136	.8387
240	221.2	173.8	132.4	94.98	62.66	34.11	22.00	12.03	4.983	2.344	1.726	1.291
250	294.2	232.4	178.0	128.6	85.40	46.77	30.27	16.68	7.044	3.424	2.577	1.948
260	386.6	306.7	236.4	171.8	114.9	63.27	41.12	22.80	9.823	4.928	3.785	2.886
270	502.2	400.2	310.3	226.9	152.7	84.54	55.15	30.79	13.53	6.996	5.474	4.205
280	645.4	516.5	402.7	296.3	200.6	111.6	73.09	41.07	18.40	9.800	7.798	6.029
290	821.1	659.7	517.1	382.7	260.6	145.8	95.79	54.17	24.75	13.55	10.95	8.514
300	1035.	834.3	657.5	489.4	335.2	188.4	124.2	70.68	32.93	18.52	15.16	11.86
310	1292.	1046.	828.2	619.9	427.0	241.0	159.4	91.29	43.36	25.01	20.73	16.29
320	1600.	1299.	1034.	778.2	538.9	305.3	202.7	116.8	56.53	33.41	27.97	22.11
330	1965.	1600.	1280.	968.4	674.1	383.4	255.4	148.0	73.01	44.15	37.28	29.65
340	2395.	1956.	1572.	1195.	836.3	477.4	319.0	185.9	93.46	57.74	49.11	39.32
350	2898.	2373.	1916.	1464.	1029.	589.6	395.1	231.6	118.6	74.78	63.97	51.61
360	3482.	2860.	2319.	1780.	1257.	722.5	485.6	286.3	149.3	95.95	82.42	67.07
370	4158.	3423.	2788.	2150.	1525.	878.8	592.4	351.1	186.5	122.0	105.1	86.35
380	4934.	4070.	3329.	2578.	1837.	1061.	717.5	427.5	231.2	153.8	132.6	110.2
390	5822.	4812.	3951.	3073.	2199.	1273.	863.1	516.9	284.6	192.2	165.7	139.4
400	6831.	5656.	4662.	3641.	2616.	1518.	1031.	621.0	348.0	238.3	205.2	175.1

TABLE A-IIB. SULFURIC ACID PARTIAL PRESSURE, MM HG.

DEG C	WEIGHT PERCENT H2SO4 10.0	20.0	25.0	30.0	35.0	40.0	45.0	50.0	55.0	60.0	65.0	70.0
0												
10												
20												
30												
40												
50												
60												
70												
80												
90												0.0002
100												.0004
110											0.0002	.0009
120										0.0001	.0005	.0020
130										.0003	.0011	.0041
140									0.0002	.0007	.0023	.0082
150								0.0002	.0004	.0014	.0046	.0156
160							0.0001	.0003	.0009	.0028	.0088	.0285
170						0.0001	.0003	.0007	.0018	.0054	.0162	.0535
180						.0002	.0005	.0013	.0035	.0099	.0289	.0865
190					0.0002	.0004	.0011	.0025	.0065	.0177	.0497	.1435
200				0.0002	.0004	.0009	.0020	.0046	.0116	.0306	.0831	.2313
210			0.0001	.0003	.0007	.0016	.0037	.0083	.0200	.0513	.1349	.3627
220		0.0001	.0003	.0006	.0014	.0030	.0066	.0143	.0336	.0837	.2130	.5543
230		.0002	.0005	.0011	.0025	.0053	.0113	.0240	.0549	.1329	.3278	.8266
240		.0004	.0009	.0019	.0043	.0091	.0190	.0393	.0874	.2056	.4923	1.205
250	0.0001	.0008	.0016	.0033	.0073	.0151	.0309	.0626	.1356	.3106	.7224	1.718
260	.0003	.0013	.0026	.0056	.0121	.0245	.0491	.0973	.2054	.4585	1.037	2.399
270	.0004	.0022	.0044	.0092	.0194	.0388	.0761	.1476	.3043	.6623	1.458	3.287
280	.0008	.0036	.0071	.0147	.0305	.0598	.1151	.2190	.4412	.9369	2.010	4.419
290	.0013	.0058	.0113	.0229	.0466	.0901	.1702	.3179	.6267	1.299	2.718	5.838
300	.0021	.0091	.0176	.0349	.0698	.1327	.2461	.4522	.8730	1.768	3.611	7.583
310	.0033	.0140	.0267	.0521	.1023	.1913	.3487	.6307	1.193	2.363	4.715	9.695
320	.0051	.0212	.0396	.0760	.1466	.2702	.4842	.8633	1.603	3.104	6.057	12.21
330	.0078	.0312	.0578	.1088	.2060	.3741	.6596	1.161	2.115	4.012	7.660	15.15
340	.0118	.0453	.0827	.1529	.2839	.5082	.8821	1.534	2.747	5.103	9.544	18.54
350	.0173	.0644	.1163	.2109	.3840	.6778	1.159	1.993	3.512	6.394	11.72	22.40
360	.0251	.0901	.1607	.2859	.5103	.8884	1.497	2.550	4.423	7.896	14.20	26.71
370	.0358	.1240	.2186	.3810	.6666	1.145	1.903	3.213	5.490	9.616	16.98	31.48
380	.0502	.1679	.2926	.4998	.8565	1.452	2.381	3.990	6.721	11.56	20.05	36.67
390	.0694	.2240	.3860	.6455	1.083	1.813	2.934	4.884	8.118	13.71	23.39	42.23
400	.0945	.2946	.5019	.8214	1.349	2.229	3.563	5.899	9.682	16.07	26.97	48.13

TABLE A-IIB, CONTINUED. SULFURIC ACID PARTIAL PRESSURE, MM HG.

DEG C	WEIGHT PERCENT H2SO4 72.0	74.0	76.0	78.0	80.0	82.0	84.0	86.0	88.0	90.0	91.0	92.0
0												
10												
20												
30										0.0002	0.0002	0.0002
40								0.0002	0.0003	.0004	.0005	.0006
50						0.0001	0.0003	.0005	.0007	.0011	.0013	.0016
60				0.0001	0.0002	.0004	.0007	.0012	.0018	.0027	.0033	.0038
70			0.0002	.0003	.0006	.0010	.0017	.0028	.0043	.0063	.0075	.0087
80	0.0001	0.0002	.0004	.0007	.0013	.0023	.0039	.0062	.0095	.0137	.0162	.0188
90	.0003	.0005	.0010	.0017	.0030	.0051	.0084	.0132	.0199	.0285	.0334	.0387
100	.0007	.0013	.0022	.0038	.0065	.0107	.0173	.0269	.0399	.0565	.0659	.0760
110	.0016	.0027	.0047	.0079	.0132	.0214	.0340	.0523	.0766	.1075	.1248	.1432
120	.0034	.0057	.0096	.0159	.0259	.0409	.0641	.0976	.1414	.1965	.2271	.2596
130	.0069	.0114	.0187	.0304	.0485	.0753	.1163	.1754	.2517	.3464	.3985	.4538
140	.0134	.0217	.0351	.0559	.0874	.1334	.2035	.3043	.4328	.5903	.6762	.7671
150	.0251	.0399	.0633	.0990	.1519	.2283	.3442	.5108	.7206	.9745	1.112	1.256
160	.0453	.0706	.1102	.1694	.2556	.3782	.5642	.8316	1.164	1.562	1.775	1.998
170	.0788	.1209	.1857	.2808	.4168	.6081	.8981	1.315	1.829	2.434	2.755	3.092
180	.1328	.2005	.3033	.4517	.6602	.9506	1.391	2.025	2.797	3.696	4.168	4.661
190	.2172	.3229	.4815	.7066	1.0180	1.448	2.100	3.041	4.174	5.477	6.154	6.859
200	.3452	.5057	.7440	1.0770	1.5300	2.151	3.096	4.458	6.083	7.929	8.879	9.865
210	.5341	.7715	1.121	1.6010	2.2460	3.125	4.462	6.390	8.673	11.23	12.53	13.89
220	.8058	1.149	1.649	2.3260	3.2240	4.442	6.297	8.971	12.11	15.58	17.34	19.15
230	1.187	1.671	2.371	3.3070	4.5320	6.188	8.710	12.34	16.58	21.21	23.52	25.91
240	1.710	2.378	3.340	4.6060	6.2470	8.459	11.82	16.67	22.28	28.34	31.33	34.42
250	2.412	3.316	4.611	6.2930	8.4530	11.36	15.77	22.12	29.42	37.20	41.02	44.94
260	3.335	4.535	6.247	8.4450	11.2400	15.00	20.69	28.85	38.20	48.04	52.82	57.72
270	4.524	6.089	8.315	11.1400	14.7000	19.49	26.71	37.04	48.81	61.06	66.96	73.00
280	6.028	8.033	10.88	14.4500	18.9300	24.95	33.97	46.84	61.44	76.46	83.63	90.97
290	7.895	10.42	14.02	18.4700	24.0300	31.49	42.60	58.38	76.23	94.40	103.0	111.8
300	10.17	13.32	17.79	23.2600	30.0700	39.21	52.70	71.78	93.29	115.0	125.1	135.5
310	12.91	16.76	22.24	28.9000	37.1300	48.21	64.38	87.11	112.7	138.2	150.1	162.2
320	16.14	20.80	27.44	35.4300	45.2900	58.57	77.70	104.4	134.4	164.1	177.8	191.8
330	19.91	25.46	33.42	42.9000	54.5800	70.33	92.69	123.7	158.5	192.5	208.1	224.2
340	24.22	30.77	40.20	51.3300	65.0300	83.55	109.4	144.8	184.7	223.4	241.0	259.1
350	29.10	36.73	47.79	60.7300	76.6600	98.22	127.7	167.7	212.9	256.4	276.0	296.3
360	34.53	43.34	56.18	71.0900	89.4500	114.3	147.6	192.3	242.9	291.2	312.9	335.3
370	40.50	50.56	65.34	82.3500	103.4000	131.9	169.0	218.3	274.3	327.5	351.2	375.8
380	46.99	58.36	75.22	94.4700	118.3000	150.7	191.8	245.4	306.9	364.8	390.5	417.3
390	53.93	66.68	85.75	107.4000	134.2000	170.8	215.7	273.5	340.1	402.7	430.2	459.2
400	61.27	75.44	96.83	120.9000	151.0000	191.9	240.6	302.1	373.7	440.5	469.9	500.9

TABLE A-IIB, CONTINUED. SULFURIC ACID PARTIAL PRESSURE, MM HG.

DEG C	WEIGHT PERCENT H2SO4 93.0	94.0	95.0	96.0	97.0	98.0	98.5	99.0	99.5	99.8	99.9	100.0
0												
10												
20		0.0001	0.0001	0.0001	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002
30	0.0003	.0003	.0004	.0004	.0004	.0005	.0005	.0006	.0006	.0006	.0006	.0006
40	.0007	.0008	.0010	.0011	.0012	.0014	.0014	.0015	.0016	.0016	.0016	.0015
50	.0019	.0021	.0024	.0028	.0031	.0034	.0036	.0038	.0039	.0041	.0041	.0041
60	.0045	.0051	.0058	.0066	.0073	.0081	.0085	.0089	.0094	.0096	.0097	.0098
70	.0101	.0115	.0131	.0148	.0165	.0183	.0191	.0200	.0209	.0215	.0217	.0219
80	.0217	.0247	.0281	.0315	.0351	.0388	.0407	.0425	.0444	.0456	.0460	.0464
90	.0445	.0504	.0571	.0639	.0712	.0786	.0824	.0860	.0898	.0920	.0928	.0936
100	.0870	.0983	.1112	.1241	.1379	.1522	.1594	.1664	.1735	.1777	.1792	.1807
110	.1634	.1839	.2075	.2312	.2564	.2826	.2958	.3085	.3214	.3291	.3318	.3347
120	.2950	.3312	.3726	.4142	.4587	.5048	.5282	.5506	.5731	.5864	.5912	.5962
130	.5139	.5753	.6455	.7161	.7916	.8701	.9099	.9479	.9858	1.008	1.016	1.025
140	.8658	.9664	1.082	1.197	1.321	1.450	1.516	1.578	1.640	1.676	1.690	1.704
150	1.413	1.573	1.756	1.940	2.138	2.343	2.449	2.548	2.645	2.702	2.723	2.746
160	2.241	2.488	2.770	3.054	3.359	3.677	3.841	3.994	4.144	4.231	4.263	4.300
170	3.456	3.827	4.251	4.678	5.136	5.616	5.864	6.093	6.318	6.447	6.496	6.551
180	5.196	5.739	6.358	6.984	7.655	8.360	8.725	9.062	9.390	9.578	9.649	9.731
190	7.624	8.400	9.284	10.18	11.14	12.15	12.68	13.16	13.62	13.89	14.00	14.11
200	10.93	12.02	13.25	14.50	15.85	17.26	18.00	18.68	19.33	19.70	19.85	20.01
210	15.35	16.83	18.52	20.23	22.07	24.02	25.04	25.96	26.85	27.36	27.56	27.79
220	21.11	23.10	25.36	27.66	30.12	32.74	34.12	35.37	36.56	37.24	37.51	37.82
230	28.49	31.11	34.07	37.10	40.34	43.81	45.63	47.28	48.85	49.75	50.10	50.52
240	37.76	41.14	44.96	48.88	53.07	57.57	59.95	62.08	64.12	65.29	65.74	66.28
250	49.19	53.49	58.33	63.31	68.64	74.38	77.43	80.15	82.75	84.24	84.83	85.52
260	63.04	68.43	74.46	80.69	87.36	94.57	98.42	101.8	105.1	107.0	107.7	108.6
270	79.56	86.20	93.60	101.3	109.5	118.4	123.2	127.4	131.5	133.8	134.7	135.8
280	98.94	107.0	116.0	125.3	135.3	146.2	152.0	157.2	162.1	165.0	166.1	167.5
290	121.3	131.0	141.7	152.9	164.8	177.9	185.0	191.2	197.2	200.7	202.1	203.7
300	146.8	158.3	170.8	184.1	198.2	213.8	222.2	229.6	236.8	241.0	242.6	244.5
310	175.4	188.8	203.4	218.9	235.4	253.7	263.6	272.3	280.8	285.8	287.7	289.9
320	207.0	222.5	239.3	257.3	276.3	297.5	309.0	319.2	329.1	335.0	337.2	339.8
330	241.6	259.3	278.3	298.9	320.5	344.8	358.1	369.8	381.3	388.2	390.7	393.7
340	278.8	298.8	320.1	343.4	367.9	395.4	410.6	423.9	437.0	445.1	448.0	451.3
350	318.3	340.8	364.4	390.5	417.8	448.8	465.8	480.9	495.8	505.0	508.3	512.0
360	359.7	384.7	410.7	439.6	469.8	504.3	523.3	540.2	557.0	567.5	571.2	575.2
370	402.6	430.1	458.4	490.2	523.3	561.3	582.3	601.0	619.8	631.7	635.8	640.2
380	446.5	476.4	506.9	541.6	577.5	619.0	642.1	662.6	683.4	696.8	701.3	706.1
390	490.7	523.1	555.7	593.2	631.8	676.8	701.8	724.2	747.1	762.1	767.0	772.1
400	534.6	569.4	603.9	644.1	685.3	733.7	760.7	784.9	809.9	826.5	831.8	837.2

TABLE A-IIC. SULFUR TRIOXIDE PARTIAL PRESSURE, MM HG.

DEG C	WEIGHT PERCENT H2SO4 10.0	20.0	25.0	30.0	35.0	40.0	45.0	50.0	55.0	60.0	65.0	70.0
0												
10												
20												
30												
40												
50												
60												
70												
80												
90												
100												
110												
120												
130												
140												
150												
160												
170												
180												
190												
200												
210												0.0002
220												.0004
230											0.0002	.0007
240										0.0001	.0004	.0012
250										.0002	.0007	.0022
260									0.0001	.0004	.0012	.0037
270								0.0001	.0003	.0007	.0020	.0062
280								.0002	.0005	.0012	.0034	.0102
290							0.0002	.0004	.0008	.0021	.0056	.0162
300						0.0002	.0003	.0006	.0014	.0035	.0090	.0253
310					0.0001	.0003	.0005	.0011	.0023	.0056	.0141	.0385
320				0.0001	.0002	.0005	.0009	.0018	.0038	.0088	.0217	.0575
330			0.0001	.0002	.0004	.0008	.0015	.0029	.0059	.0136	.0326	.0842
340			.0002	.0003	.0007	.0013	.0024	.0045	.0092	.0205	.0479	.1209
350		0.0002	.0003	.0006	.0011	.0020	.0037	.0070	.0139	.0302	.0691	.1705
360		.0003	.0005	.0009	.0017	.0032	.0057	.0106	.0206	.0438	.0979	.2363
370	0.0001	.0004	.0008	.0014	.0026	.0048	.0085	.0156	.0299	.0622	.1361	.3223
380	.0002	.0007	.0012	.0022	.0039	.0071	.0124	.0227	.0425	.0869	.1861	.4326
390	.0003	.0011	.0019	.0033	.0058	.0104	.0178	.0322	.0595	.1191	.2503	.5719
400	.0005	.0017	.0029	.0049	.0084	.0148	.0250	.0450	.0819	.1607	.3312	.7452

TABLE A-IIC, CONTINUED. SULFUR TRIOXIDE PARTIAL PRESSURE, MM HG.

DEG C	WEIGHT PERCENT H2SO4 72.0	74.0	76.0	78.0	80.0	82.0	84.0	86.0	88.0	90.0	91.0	92.0
0												
10												
20												
30												
40												
50												
60												
70												
80												
90												
100												0.0001
110										0.0001	0.0002	.0002
120									0.0001	.0003	.0004	.0006
130								0.0001	.0003	.0006	.0008	.0012
140							0.0001	.0003	.0005	.0012	.0017	.0025
150						0.0001	.0002	.0005	.0011	.0024	.0035	.0051
160					0.0001	.0002	.0005	.0011	.0023	.0048	.0069	.0098
170				0.0001	.0002	.0005	.0010	.0022	.0045	.0092	.0130	.0183
180			0.0001	.0003	.0005	.0009	.0019	.0041	.0084	.0169	.0237	.0332
190		0.0001	.0003	.0005	.0009	.0018	.0035	.0076	.0152	.0303	.0419	.0582
200	0.0002	.0003	.0005	.0010	.0018	.0032	.0064	.0135	.0268	.0525	.0722	.0993
210	.0003	.0006	.0010	.0018	.0032	.0057	.0113	.0235	.0460	.0888	.1210	.1651
220	.0006	.0011	.0018	.0032	.0056	.0099	.0193	.0397	.0769	.1461	.1976	.2674
230	.0011	.0019	.0033	.0056	.0096	.0168	.0321	.0654	.1252	.2347	.3150	.4231
240	.0020	.0034	.0057	.0096	.0161	.0276	.0522	.1052	.1989	.3682	.4906	.6542
250	.0035	.0057	.0096	.0159	.0263	.0445	.0830	.1652	.3090	.5648	.7474	.9900
260	.0060	.0096	.0157	.0257	.0419	.0700	.1291	.2539	.4697	.8482	1.1150	1.4680
270	.0099	.0156	.0252	.0406	.0655	.1079	.1968	.3822	.6992	1.2480	1.6310	2.1330
280	.0159	.0247	.0395	.0629	.1001	.1632	.2941	.5640	1.0210	1.8020	2.3400	3.0440
290	.0251	.0383	.0606	.0953	.1501	.2423	.4315	.8166	1.4620	2.5530	3.2980	4.2650
300	.0386	.0583	.0911	.1417	.2209	.3535	.6222	1.1610	2.0560	3.5550	4.5670	5.8780
310	.0582	.0868	.1344	.2069	.3197	.5073	.8824	1.6230	2.8430	4.8670	6.2200	7.9680
320	.0860	.1269	.1946	.2968	.4550	.7166	1.2320	2.2320	3.8670	6.5550	8.3390	10.6300
330	.1248	.1820	.2769	.4188	.6376	.9975	1.6940	3.0210	5.1760	8.6940	11.0100	13.9800
340	.1776	.2567	.3876	.5817	.8804	1.3690	2.2970	4.0290	6.8250	11.3600	14.3200	18.1200
350	.2486	.3560	.5340	.7958	1.1990	1.8540	3.0730	5.2960	8.8690	14.6300	18.3800	23.1700
360	.3422	.4859	.7248	1.0730	1.6100	2.4780	4.0570	6.8660	11.3700	18.5900	23.2600	29.2300
370	.4636	.6533	.9695	1.4280	2.1350	3.2740	5.2910	8.7850	14.3700	23.3100	29.0700	36.4200
380	.6186	.8657	1.2790	1.8750	2.7970	4.2740	6.8180	11.1000	17.9400	28.8700	35.8700	44.8200
390	.8137	1.1310	1.6660	2.4330	3.6220	5.5200	8.6880	13.8500	22.1100	35.3100	43.7400	54.5200
400	1.0560	1.4590	2.1420	3.1180	4.6390	7.0540	10.9500	17.0900	26.9400	42.6800	52.7200	65.5700

TABLE A-IIC, CONTINUED. SULFUR TRIOXIDE PARTIAL PRESSURE, MM HG.

DEG C	WEIGHT PERCENT H2SO4 93.0	94.0	95.0	96.0	97.0	98.0	98.5	99.0	99.5	99.8	99.9	100.0
0												0.0005
10												.0013
20											0.0002	.0032
30										0.0002	.0005	.0075
40									0.0001	.0005	.0017	.0167
50									.0003	.0016	.0047	.0357
60							0.0001	0.0003	.0010	.0045	.0125	.0732
70						0.0002	.0004	.0008	.0027	.0117	.0308	.1447
80				0.0001	0.0002	.0005	.0010	.0020	.0069	.0285	.0712	.2761
90		0.0001	0.0002	.0003	.0006	.0013	.0023	.0050	.0165	.0654	.1552	.5096
100	0.0002	.0003	.0004	.0007	.0014	.0031	.0054	.0114	.0375	.1419	.3206	.9117
110	.0004	.0006	.0010	.0017	.0031	.0069	.0119	.0250	.0806	.2928	.6307	1.584
120	.0009	.0013	.0021	.0036	.0067	.0147	.0252	.0523	.1658	.5766	1.186	2.677
130	.0018	.0028	.0045	.0075	.0137	.0299	.0510	.1050	.3265	1.088	2.141	4.409
140	.0038	.0057	.0090	.0149	.0270	.0585	.0991	.2026	.6180	1.973	3.721	7.084
150	.0075	.0112	.0174	.0287	.0513	.1102	.1857	.3766	1.127	3.448	6.245	11.12
160	.0143	.0211	.0327	.0532	.0942	.2005	.3364	.6767	1.985	5.826	10.15	17.07
170	.0264	.0387	.0593	.0956	.1676	.3535	.5899	1.178	3.387	9.535	16.01	25.67
180	.0473	.0688	.1042	.1666	.2892	.6045	1.004	1.988	5.604	15.15	24.57	37.84
190	.0824	.1187	.1781	.2820	.4850	1.005	1.661	3.264	9.016	23.43	36.76	54.73
200	.1395	.1993	.2962	.4647	.7918	1.627	2.676	5.219	14.12	35.31	53.70	77.73
210	.2299	.3259	.4800	.7462	1.260	2.569	4.205	8.138	21.58	51.95	76.73	108.5
220	.3697	.5199	.7591	1.170	1.958	3.960	6.453	12.40	32.20	74.75	107.4	149.0
230	.5805	.8105	1.173	1.792	2.974	5.970	9.685	18.47	47.01	105.3	147.5	201.4
240	.8915	1.236	1.774	2.687	4.422	8.813	14.23	26.94	67.20	145.5	198.9	268.2
250	1.340	1.845	2.626	3.947	6.443	12.75	20.50	38.53	94.18	197.3	263.9	352.0
260	1.975	2.701	3.813	5.686	9.207	18.10	28.98	54.08	129.6	262.9	344.6	455.6
270	2.853	3.879	5.434	8.040	12.92	25.23	40.24	74.56	175.1	344.6	443.4	581.8
280	4.049	5.472	7.606	11.17	17.81	34.58	54.93	101.1	232.7	444.7	562.7	733.7
290	5.645	7.586	10.47	15.26	24.16	46.63	73.77	134.9	304.4	565.7	705.0	913.9
300	7.739	10.35	14.17	20.52	32.25	61.91	97.57	177.2	392.2	709.8	872.6	1125.
310	10.44	13.89	18.89	27.17	42.41	80.98	127.2	229.5	498.2	878.9	1068.	1369.
320	13.88	18.37	24.81	35.45	54.97	104.5	163.4	293.0	624.1	1075.	1293.	1648.
330	18.17	23.95	32.13	45.61	70.28	132.9	207.2	369.3	771.9	1300.	1549.	1963.
340	23.47	30.80	41.05	57.92	88.68	167.0	259.5	459.7	942.8	1554.	1839.	2314.
350	29.90	39.09	51.77	72.61	110.5	207.2	320.9	565.2	1138.	1839.	2163.	2701.
360	37.61	48.98	64.48	89.91	136.0	254.2	392.4	687.1	1358.	2154.	2523.	3123.
370	46.73	60.64	79.35	110.0	165.6	308.2	474.4	826.0	1604.	2499.	2920.	3578.
380	57.36	74.20	96.55	133.2	199.3	369.8	567.4	982.6	1874.	2873.	3353.	4063.
390	69.62	89.79	116.2	159.4	237.3	439.1	671.7	1157.	2168.	3276.	3822.	4574.
400	83.57	107.5	138.3	188.9	279.8	516.1	787.5	1350.	2485.	3704.	4329.	5106.

TABLE A-IID. TOTAL PRESSURE, MM HG.

DEG C	WEIGHT PERCENT H2SO4 10.0	20.0	25.0	30.0	35.0	40.0	45.0	50.0	55.0	60.0	65.0	70.0
0	4.363	4.003	3.721	3.362	2.929	2.441	1.937	1.447	1.000	0.6271	0.3415	0.1550
10	8.771	8.060	7.511	6.817	5.979	5.023	4.022	3.034	2.124	1.353	.7517	.3502
20	16.70	15.37	14.36	13.09	11.55	9.772	7.894	6.013	4.259	2.755	1.561	.7462
30	30.32	27.95	26.16	23.93	21.22	18.08	14.73	11.33	8.116	5.327	3.076	1.508
40	52.70	48.66	45.63	41.88	37.31	32.00	26.26	20.39	14.77	9.833	5.782	2.905
50	88.11	81.47	76.56	70.45	63.05	54.38	44.97	35.23	25.81	17.41	10.42	5.360
60	142.2	131.7	124.0	114.4	102.8	89.12	74.21	58.65	43.42	29.67	18.06	9.509
70	222.5	206.3	194.5	179.9	162.1	141.3	118.5	94.45	70.64	48.86	30.24	16.28
80	338.0	313.9	296.4	274.7	248.4	217.6	183.5	147.5	111.4	77.99	49.04	26.98
90	500.3	465.2	439.9	408.6	370.5	325.9	276.6	224.2	171.0	121.0	77.26	43.39
100	723.1	673.2	637.5	593.2	539.2	476.4	406.7	332.2	255.6	182.9	118.5	67.91
110	1023.	953.1	903.8	842.5	767.6	680.9	584.4	480.9	373.5	270.0	177.4	103.7
120	1417.	1323.	1256.	1173.	1071.	953.3	822.5	681.8	534.0	389.9	259.7	154.6
130	1929.	1802.	1713.	1602.	1466.	1310.	1136.	948.	748.7	551.8	372.4	225.7
140	2581.	2414.	2297.	2152.	1973.	1768.	1541.	1295.	1031.	766.7	[illegible]3.9	323.1
150	3400.	3184.	3034.	2846.	2613.	2350.	2057.	1740.	1396.	1047.	724.3	454.1
160	4416.	4140.	3948.	3710.	3412.	3077.	2706.	2303.	1861.	1408.	985.0	627.5
170	5660.	5312.	5071.	4772.	4396.	3975.	3511.	3006.	2447.	1865.	1319.	853.6
180	7167.	6733.	6433.	6062.	5593.	5071.	4498.	3872.	3174.	2438.	1743.	1144.
190	8972.	8437.	8069.	7615.	7036.	6395.	5695.	4930.	4067.	3147.	2272.	1513.
200				9465.	8757.	7978.	7133.	6206.	5153.	4015.	2926.	1975.
210						9855.	8844.	7732.	6459.	5066.	3726.	2547.
220								9540.	8017.	6327.	4694.	3249.
230									9860.	7827.	5855.	4101.
240										9598.	7237.	5125.
250											8866.	6346.
260												7790.
270												9484.
280												
290												
300												
310												
320												
330												
340												
350												
360												
370												
380												
390												
400												

TABLE A-IID, CONTINUED. TOTAL PRESSURE, MM HG.

DEG C	WEIGHT PERCENT H2SO4 72.0	74.0	76.0	78.0	80.0	82.0	84.0	86.0	88.0	90.0	91.0	92.0
0	0.1066	0.0705	0.0444	0.0265	0.0148	0.0077	0.0037	0.0018	0.0008	0.0004	0.0003	0.0002
10	.2443	.1640	.1053	.0641	.0368	.0198	.0101	.0050	.0025	.0012	.0008	.0006
20	.5273	.3593	.2348	.1461	.0859	.0479	.0255	.0132	.0068	.0034	.0024	.0017
30	1.079	.7459	.4958	.3148	.1898	.1091	.0603	.0325	.0172	.0089	.0064	.0046
40	2.105	1.475	.9967	.6452	.3982	.2355	.1344	.0748	.0408	.0218	.0159	.0116
50	3.929	2.792	1.916	1.263	.7970	.4839	.2843	.1628	.0915	.0500	.0369	.0272
60	7.052	5.075	3.536	2.372	1.528	.9509	.5732	.3365	.1939	.1085	.0810	.0604
70	12.21	8.895	6.286	4.288	2.818	1.794	1.106	.6638	.3914	.2238	.1689	.1272
80	20.45	15.08	10.80	7.485	5.014	3.259	2.052	1.255	.7555	.4408	.3361	.2559
90	33.23	24.79	17.99	12.66	8.629	5.721	3.669	2.281	1.400	.8323	.6411	.4930
100	52.53	39.62	29.12	20.78	14.41	9.727	6.344	4.003	2.499	1.512	1.176	.9131
110	80.94	61.70	45.89	33.19	23.38	16.06	10.64	6.798	4.311	2.653	2.082	1.631
120	121.8	93.81	70.58	51.71	36.98	25.81	17.32	11.20	7.207	4.506	3.566	2.819
130	179.4	139.5	106.1	78.71	57.08	40.44	27.48	17.96	11.71	7.428	5.926	4.723
140	259.0	203.3	156.2	117.2	86.15	61.89	42.54	28.07	18.52	11.91	9.578	7.693
150	367.0	290.6	225.5	171.1	127.3	92.66	64.37	42.84	28.59	18.63	15.08	12.20
160	511.1	408.2	319.7	245.1	184.5	135.9	95.35	63.96	43.14	28.45	23.19	18.90
170	700.4	563.9	445.7	345.0	262.6	195.7	138.5	93.59	63.73	42.51	34.88	28.60
180	945.4	767.1	611.4	477.7	367.4	276.7	197.4	134.4	92.34	62.26	51.38	42.38
190	1258.	1029.	826.5	651.4	505.9	384.7	276.6	189.5	131.4	89.46	74.25	61.58
200	1653.	1361.	1102.	875.6	686.0	526.5	381.3	263.0	183.8	126.3	105.4	87.85
210	2146.	1778.	1450.	1161.	917.3	710.1	517.8	359.4	253.1	175.5	147.1	123.2
220	2753.	2296.	1884.	1520.	1210.	944.4	693.1	484.2	343.5	240.0	202.1	170.0
230	3493.	2931.	2421.	1967.	1577.	1240.	915.4	643.5	459.7	323.6	273.6	231.1
240	4389.	3703.	3078.	2515.	2030.	1607.	1194.	844.5	607.4	430.6	365.4	309.8
250	5461.	4633.	3872.	3183.	2585.	2059.	1538.	1095.	792.9	565.8	481.7	409.8
260	6735.	5743.	4825.	3989.	3256.	2610.	1960.	1405.	1023.	734.6	627.4	535.4
270	8235.	7057.	5957.	4950.	4061.	3272.	2472.	1783.	1307.	943.4	808.1	691.5
280	9989.	8599.	7292.	6087.	5017.	4063.	3085.	2241.	1652.	1199.	1030.	883.4
290			8854.	7422.	6141.	4997.	3814.	2791.	2070.	1509.	1299.	1117.
300				8977.	7453.	6090.	4674.	3444.	2570.	1882.	1624.	1399.
310					8972.	7360.	5678.	4217.	3164.	2327.	2012.	1736.
320						8822.	6841.	5122.	3866.	2855.	2472.	2136.
330							8180.	6176.	4689.	3475.	3013.	2608.
340							9710.	7395.	5647.	4199.	3647.	3159.
350								8796.	6757.	5041.	4383.	3801.
360									8035.	6013.	5234.	4541.
370									9500.	7130.	6211.	5392.
380										8406.	7328.	6365.
390										9859.	8600.	7471.
400												8723.

TABLE A-IID, CONTINUED. TOTAL PRESSURE, MM HG.

DEG C	WEIGHT PERCENT H2SO4 93.0	94.0	95.0	96.0	97.0	98.0	98.5	99.0	99.5	99.8	99.9	100.0
0	0.0001											0.0005
10	.0004	0.0003	0.0002	0.0001	0.0001						0.0001	.0014
20	.0012	.0009	.0006	.0004	.0003	0.0002	0.0002	0.0002	0.0002	0.0002	.0004	.0034
30	.0033	.0024	.0017	.0012	.0009	.0007	.0007	.0006	.0006	.0008	.0011	.0081
40	.0084	.0061	.0044	.0032	.0024	.0019	.0018	.0017	.0017	.0021	.0033	.0183
50	.0199	.0146	.0106	.0078	.0059	.0048	.0044	.0042	.0044	.0057	.0088	.0398
60	.0447	.0330	.0244	.0181	.0139	.0113	.0105	.0101	.0106	.0142	.0222	.0830
70	.0953	.0711	.0531	.0398	.0310	.0253	.0236	.0228	.0243	.0333	.0526	.1666
80	.1937	.1460	.1101	.0834	.0654	.0538	.0503	.0488	.0527	.0744	.1174	.3225
90	.3768	.2869	.2184	.1670	.1318	.1091	.1022	.0996	.1090	.1581	.2484	.6033
100	.7045	.5414	.4159	.3206	.2548	.2118	.1989	.1947	.2163	.3210	.5005	1.093
110	1.270	.9843	.7626	.5924	.4736	.3951	.3719	.3656	.4124	.6248	.9638	1.919
120	2.213	1.729	1.351	1.057	.8490	.7104	.6700	.6615	.7581	1.169	1.780	3.275
130	3.738	2.944	2.316	1.823	1.471	1.234	1.166	1.157	1.347	2.107	3.163	5.436
140	6.134	4.866	3.854	3.052	2.472	2.078	1.966	1.960	2.319	3.669	5.421	8.793
150	9.800	7.826	6.238	4.965	4.035	3.396	3.218	3.224	3.876	6.185	8.987	13.88
160	15.27	12.27	9.840	7.868	6.411	5.400	5.125	5.160	6.303	10.12	14.45	21.39
170	23.26	18.80	15.15	12.17	9.934	8.371	7.956	8.053	9.986	16.08	22.57	32.26
180	34.66	28.16	22.81	18.39	15.04	12.67	12.06	12.27	15.44	24.90	34.33	47.64
190	50.62	41.34	33.64	27.20	22.27	18.76	17.88	18.29	23.34	37.60	50.93	68.96
200	72.57	59.52	48.64	39.45	32.33	27.21	25.96	26.71	34.53	55.45	73.83	97.95
210	102.2	84.18	69.05	56.15	46.05	38.72	36.97	38.24	50.05	80.00	104.8	136.6
220	141.6	117.1	96.38	78.55	64.43	54.09	51.70	53.76	71.15	113.0	145.6	187.4
230	193.2	160.3	132.4	108.1	88.67	74.32	71.08	74.31	99.33	156.6	198.7	252.8
240	259.8	216.2	179.1	146.5	120.2	100.5	96.18	101.1	136.3	213.1	266.4	335.8
250	344.7	287.7	239.0	195.8	160.5	133.9	128.2	135.4	184.0	284.9	351.3	439.4
260	451.6	377.9	314.7	258.2	211.5	175.9	168.5	178.7	244.5	374.8	456.1	567.1
270	584.6	490.3	409.3	336.3	275.1	228.2	218.6	232.8	320.1	485.4	583.6	721.9
280	748.4	629.0	526.2	432.8	353.7	292.4	280.0	299.3	413.3	619.6	736.6	907.2
290	948.1	798.3	669.3	550.9	449.6	370.3	354.6	380.3	526.4	780.0	918.0	1126.
300	1189.	1003.	842.5	694.1	565.7	464.1	444.0	477.5	662.0	969.3	1130.	1381.
310	1478.	1248.	1051.	866.1	704.8	575.6	550.2	593.1	822.3	1190.	1376.	1675.
320	1821.	1540.	1298.	1071.	870.1	707.2	675.1	729.0	1010.	1443.	1658.	2010.
330	2224.	1883.	1591.	1313.	1065.	861.2	820.8	887.2	1226.	1732.	1977.	2386.
340	2697.	2286.	1933.	1597.	1293.	1040.	989.0	1069.	1473.	2057.	2336.	2804.
350	3246.	2753.	2333.	1927.	1558.	1246.	1182.	1278.	1752.	2418.	2736.	3264.
360	3880.	3293.	2794.	2310.	1863.	1481.	1401.	1513.	2064.	2817.	3177.	3765.
370	4607.	3913.	3325.	2750.	2214.	1748.	1649.	1778.	2410.	3253.	3660.	4304.
380	5438.	4621.	3932.	3253.	2614.	2050.	1927.	2073.	2789.	3724.	4187.	4879.
390	6382.	5425.	4623.	3826.	3068.	2389.	2237.	2398.	3200.	4230.	4755.	5485.
400	7449.	6333.	5404.	4474.	3581.	2768.	2580.	2755.	3643.	4769.	5366.	6118.

TABLE A-III1A- WATER PARTIAL PRESSURE (ABRIDGED), MM HG.

WEIGHT PERCENT H_2SO_4

DEG C	10.0	20.0	30.0	40.0	50.0	60.0	70.0	75.0	80.0	85.0	90.0	92.0	94.0	96.0	97.0	98.0	98.5	99.0	99.5	100.0
-50	0.05	0.04	0.03	0.02	0.01															
-40	0.13	0.12	0.10	0.07	0.04	0.01														
-30	0.36	0.33	0.27	0.19	0.10	0.04														
-20	0.89	0.82	0.67	0.47	0.27	0.11	0.02													
-10	2.04	1.87	1.56	1.11	0.65	0.27	0.06	0.02												
0	4.36	4.00	3.36	2.44	1.45	0.63	0.15	0.06	0.01											
10	8.77	8.06	6.82	5.02	3.03	1.35	0.35	0.13	0.04											
20	16.7	15.4	13.1	9.77	6.01	2.75	0.75	0.29	0.09	0.02										
30	30.3	27.9	23.9	18.1	11.3	5.33	1.51	0.61	0.19	0.04										
40	52.7	48.7	41.9	32.0	20.4	9.83	2.91	1.22	0.40	0.10	0.02	0.01								
50	88.1	81.5	70.5	54.4	35.2	17.4	5.36	2.33	0.80	0.22	0.05	0.03	0.01							
60	142.	132.	114.	89.1	58.7	29.7	9.51	4.26	1.53	0.44	0.11	0.06	0.03	0.01						
70	222.	206.	180.	141.	94.4	48.9	16.3	7.52	2.82	0.86	0.22	0.12	0.06	0.03	0.01					
80	338.	314.	275.	218.	148,	78.0	27.0	12.8	5.01	1.61	0.43	0.24	0.12	0.05	0.03	0.01				
90	500.	465.	409.	326.	224.	121.	43.4	21.2	8.63	2.89	0.80	0.45	0.24	0.10	0.06	0.03	0.02			
100	723.	673.	593.	476.	332.	183.	67.9	34.1	14.4	5.03	1.46	0.84	0.44	0.20	0.12	0.06	0.03	0.02		
110	1020.	953.	843.	681.	481.	270.	104.	53.5	23.4	8.49	2.55	1.49	0.80	0.36	0.21	0.11	0.06	0.03	0.01	
120	1420.	1320.	1170.	953.	682.	390.	155.	81.8	37.0	13.9	4.31	2.56	1.40	0.64	0.38	0.19	0.12	0.06	0.02	
130	1930.	1800.	1600.	1310.	948.	552.	226.	122.	57.0	22.1	7.08	4.27	2.37	1.10	0.67	0.33	0.21	0.10	0.03	
140	2580.	2410.	2150.	1770.	1290.	767.	323.	179.	86.1	34.4	11.3	6.92	3.89	1.84	1.12	0.57	0.35	0.18	0.06	
150	3400.	3180.	2850.	2350.	1740.	1050.	454.	257.	127.	52.2	17.7	10.9	6.24	3.00	1.85	0.94	0.58	0.30	0.10	0.01
160	4420.	4140.	3710.	3080.	2300.	1410.	627.	363.	184.	77.6	26.9	16.9	9.76	4.76	2.96	1.52	0.95	0.49	0.17	0.02
170	5660.	5310.	4770.	3980.	3010.	1870.	854.	504.	262.	113.	40.1	25.5	14.7	7.39	4.63	2.40	1.50	0.78	0.28	0.04
180	7170.	6730.	6060.	5070.	3870.	2440.	1140.	689.	367.	162.	58.5	37.7	22.4	11.2	7.09	3.71	2.33	1.22	0.45	0.07
190	8970.	8440.	7620.	6400.	4930.	3150.	1510.	927.	505.	227.	84.0	54.7	32.8	16.7	10.7	5.61	3.54	1.97	0.70	0.12
200			9460.	7980.	6210.	4010.	1970.	1230.	685.	314.	118.	77.9	47.3	24.5	15.7	8.32	5.28	2.81	1.07	0.20
210				9850.	7730.	5070.	2550.	1610.	915.	427.	164.	109.	67.0	35.2	22.7	12.1	7.73	4.14	1.61	0.33
220					9540.	6330.	3250.	2090.	1210.	573.	224.	151.	93.5	49.7	32.4	17.4	11.1	6.00	2.39	0.53
230						7830.	4100.	2680.	1570.	759.	302.	205.	128.	69.2	45.4	24.5	15.8	8.56	3.48	0.84
240						9600.	5120.	3400.	2020.	993.	402.	275.	174.	95.0	62.7	34.1	22.0	12.0	4.98	1.29
250							6340.	4260.	2580.	1280.	528.	364.	232.	129.	85.4	46.8	30.3	16.7	7.04	1.95
260							7790.	5300.	3250.	1640.	686.	476.	307.	172.	115.	63.3	41.1	22.8	9.82	2.89
270							9480.	6530.	4050.	2070.	881.	616.	400.	227.	153.	84.5	55.1	30.8	13.5	4.21
280								7970.	5000.	2600.	1120.	789.	517.	296.	201.	112.	73.1	41.1	18.4	6.03
290								9660.	6120.	3220.	1410.	1000.	660.	383.	261.	146.	95.9	54.2	24.8	8.51
300									7420.	3960.	1760.	1260.	834.	489.	335.	188.	124.	70.7	32.9	11.9
310									8930.	4840.	2180.	1570.	1050.	620.	427.	241.	159.	91.3	43.4	16.3
320										5850.	2680.	1930.	1300.	778.	539.	305.	203.	117.	56.5	22.1
330										7030.	3270.	2370.	1600.	968.	674.	383.	255.	148.	73.0	29.6
340										8390.	3960.	2880.	1960.	1200.	836.	477.	319.	186.	93.5	39.3
350										9940.	4770.	3480.	2370.	1460.	1030.	590.	395.	232.	119.	51.6
360											5700.	4180.	2860.	1780.	1260.	722.	486.	286.	149.	67.1
370											6780.	4980.	3420.	2150.	1530.	879.	592.	351.	187.	86.3
380											8010.	5900.	4070.	2580.	1640.	1060.	717.	428.	231.	110.
390											9420.	6960.	4810.	3070.	2200.	1270.	863.	517.	285.	139.

TABLE A-III6. SULFURIC ACID PARTIAL PRESSURE (ABRIDGED), MM HG.

DEG C	10.0	20.0	30.0	40.0	50.0	60.0	70.0	75.0	80.0	85.0	90.0	92.0	94.0	96.0	97.0	98.0	98.5	99.0	99.5	100.0
									WEIGHT PERCENT H2SO4											
-50																				
-40																				
-30																				
-20																				
-10																				
0																				
10																				
20																				
30																				
40																				
50																				
60																				
70													0.01	0.01	0.02	0.02	0.02	0.02	0.02	0.02
80											0.01	0.02	0.02	0.03	0.04	0.04	0.04	0.04	0.04	0.05
90										0.01	0.03	0.04	0.05	0.06	0.07	0.08	0.08	0.09	0.09	0.09
100										0.02	0.06	0.08	0.10	0.12	0.14	0.15	0.16	0.17	0.17	0.18
110									0.01	0.04	0.11	0.14	0.18	0.23	0.26	0.28	0.30	0.31	0.32	0.33
120									0.03	0.08	0.20	0.26	0.33	0.41	0.46	0.50	0.53	0.55	0.57	0.60
130								0.01	0.05	0.14	0.35	0.45	0.58	0.72	0.79	0.87	0.91	0.95	0.99	1.02
140								0.03	0.09	0.25	0.59	0.77	0.97	1.20	1.32	1.45	1.52	1.58	1.64	1.70
150							0.02	0.05	0.15	0.42	0.97	1.26	1.57	1.94	2.14	2.34	2.45	2.55	2.65	2.75
160							0.03	0.09	0.26	0.69	1.56	2.00	2.49	3.05	3.36	3.68	3.84	3.99	4.14	4.30
170							0.05	0.15	0.42	1.09	2.43	3.09	3.83	4.68	5.14	5.62	5.86	6.09	6.32	6.55
180							0.09	0.25	0.66	1.68	3.70	4.66	5.74	6.98	7.65	8.36	8.73	9.06	9.39	9.73
190						0.02	0.14	0.39	1.02	2.53	5.48	6.86	8.40	10.2	11.1	12.2	12.7	13.2	13.6	14.1
200						0.03	0.23	0.61	1.53	3.72	7.93	9.86	12.0	14.5	15.8	17.3	18.0	18.7	19.3	20.0
210						0.05	0.36	0.93	2.25	5.34	11.2	13.9	16.8	20.2	22.1	24.0	25.0	26.0	26.9	27.8
220					0.01	0.08	0.55	1.37	3.22	7.51	15.6	19.1	23.1	27.7	30.1	32.7	34.1	35.4	36.6	37.8
230					0.02	0.13	0.83	1.99	4.53	10.4	21.2	25.9	31.1	37.1	40.3	43.8	45.6	47.3	48.9	50.5
240					0.04	0.21	1.20	2.81	6.25	14.0	28.3	34.4	41.1	48.9	53.1	57.6	59.9	62.1	64.1	66.3
250				0.02	0.06	0.31	1.72	3.90	8.45	18.6	37.2	44.9	53.5	63.3	68.6	74.4	77.4	80.2	82.8	85.5
260				0.02	0.10	0.46	2.40	5.30	11.2	24.4	48.0	57.7	68.4	80.7	87.4	94.6	98.4	102.	105.	109.
270				0.04	0.15	0.66	3.29	7.09	14.7	31.4	61.1	73.0	86.2	101.	110.	118.	123.	127.	131.	136.
280			0.01	0.06	0.22	0.94	4.42	9.31	18.9	39.8	76.5	91.0	107.	125.	135.	146.	152.	157.	162.	167.
290			0.02	0.09	0.32	1.30	5.84	12.0	24.0	49.7	94.4	112.	131.	153.	165.	178.	185.	191.	197.	204.
300			0.03	0.13	0.45	1.77	7.58	15.3	30.1	61.2	115.	136.	158.	184.	198.	214.	222.	230.	237.	245.
310		0.01	0.05	0.19	0.63	2.36	9.70	19.2	37.1	74.5	138.	162.	189.	219.	235.	254.	264.	272.	281.	290.
320		0.02	0.08	0.27	0.86	3.10	12.2	23.8	45.3	89.5	164.	192.	223.	257.	276.	297.	309.	319.	329.	340.
330		0.03	0.11	0.37	1.16	4.01	15.2	29.0	54.6	106.	193.	224.	259.	299.	321.	345.	358.	370.	381.	394.
340	0.01	0.05	0.15	0.51	1.53	5.10	18.5	35.0	65.0	125.	223.	259.	299.	343.	368.	395.	411.	424.	437.	451.
350	0.02	0.06	0.21	0.68	1.99	6.39	22.4	41.6	76.7	145.	256.	296.	341.	391.	418.	449.	466.	481.	496.	512.
360	0.03	0.09	0.29	0.89	2.55	7.90	26.7	49.0	89.5	167.	291.	335.	385.	440.	470.	504.	523.	540.	557.	575.
370	0.04	0.12	0.38	1.14	3.21	9.62	31.5	57.1	103.	190.	328.	376.	430.	479.	523.	561.	582.	601.	620.	640.
380	0.05	0.17	0.50	1.45	3.99	11.6	36.7	65.7	118.	215.	365.	417.	476.	542.	578.	619.	642.	663.	683.	706.
390	0.07	0.22	0.65	1.81	4.88	13.7	42.2	75.0	134.	240.	403.	459.	523.	593.	632.	677.	702.	724.	747.	772.

TABLE A-IIIC. SULFUR TRIOXIDE PARTIAL PRESSURE (ABRIDGED), MM HG.

DEG C	10.0	20.0	30.0	40.0	50.0	60.0	70.0	75.0	80.0	85.0	90.0	92.0	94.0	96.0	97.0	98.0	98.5	99.0	99.5	100.0
									WEIGHT PERCENT H2SO4											
-50																				
-40																				
-30																				
-20																				
-10																				
0																				
10																				
20																				
30																				
40																				0.02
50																				0.04
60																				0.07
70																				0.14
80																				0.28
90																			0.02	0.51
100																		0.01	0.04	0.91
110																	0.01	0.03	0.08	1.58
120																0.01	0.03	0.05	0.17	2.68
130															0.01	0.03	0.05	0.11	0.33	4.41
140														0.01	0.03	0.06	0.10	0.20	0.62	7.03
150													0.01	0.03	0.05	0.11	0.19	0.38	1.13	11.1
160													0.02	0.05	0.09	0.20	0.34	0.68	1.99	17.1
170												0.02	0.04	0.10	0.17	0.35	0.59	1.18	3.39	25.7
180											0.02	0.03	0.07	0.17	0.29	0.60	1.00	1.99	5.60	37.8
190											0.03	0.06	0.12	0.28	0.49	1.01	1.66	3.26	9.02	54.7
200											0.05	0.10	0.20	0.46	0.79	1.63	2.68	5.22	14.1	77.7
210										0.02	0.09	0.17	0.33	0.75	1.26	2.57	4.20	8.14	21.6	109.
220										0.03	0.15	0.27	0.52	1.17	1.96	3.96	6.45	12.4	32.2	149.
230										0.05	0.23	0.42	0.81	1.79	2.97	5.97	9.69	18.5	47.0	201.
240									0.02	0.07	0.37	0.65	1.24	2.69	4.42	8.81	14.2	26.9	67.2	268.
250									0.03	0.12	0.56	0.99	1.85	3.95	6.44	12.7	20.5	38.5	94.2	352.
260								0.01	0.04	0.18	0.85	1.47	2.70	5.69	9.21	18.1	29.0	54.1	130.	456.
270								0.02	0.07	0.27	1.25	2.13	3.88	8.04	12.9	25.2	40.2	74.6	175.	582.
280							0.01	0.03	0.10	0.40	1.80	3.04	5.47	11.2	17.8	34.6	54.9	101.	233.	734.
290							0.02	0.05	0.15	0.59	2.55	4.27	7.59	15.3	24.2	46.6	73.8	135.	304.	914.
300							0.03	0.07	0.22	0.84	3.56	5.88	10.3	20.5	32.3	61.9	97.6	177.	392.	1120.
310							0.04	0.11	0.32	1.18	4.87	7.97	13.9	27.2	42.4	81.0	127.	229.	498.	1370.
320							0.06	0.15	0.46	1.64	6.56	10.6	18.4	35.4	55.0	104.	163.	293.	624.	1650.
330						0.01	0.08	0.22	0.64	2.24	8.69	14.0	24.0	45.6	72.3	133.	207.	369.	772.	1960.
340						0.02	0.12	0.31	0.88	3.00	11.4	18.1	30.8	57.9	88.7	167.	259.	460.	943.	2310.
350						0.03	0.17	0.43	1.20	3.98	14.6	23.2	39.1	72.6	111.	207.	321.	565.	1140.	2700.
360					0.01	0.04	0.24	0.58	1.61	5.20	18.6	29.2	49.0	89.9	136.	254.	392.	687.	1360.	3120.
370					0.02	0.06	0.32	0.78	2.13	6.70	23.3	36.4	60.6	110.	166.	308.	474.	826.	1600.	3580.
380					0.02	0.09	0.43	1.03	2.80	8.54	28.9	44.8	74.2	133.	199.	370.	567.	993.	1870.	4060.
390				0.01	0.03	0.12	0.57	1.35	3.62	10.8	35.3	54.5	89.8	159.	237.	439.	672.	1160.	2170.	4570.

Table A-IV. Constants for partial-pressure equations.

WT PCT	COMP[a]	A	B	C	D
10.0	1	0.982030E 01	-0.749883E 04	0.258356E 02	0.816702E-02
	2	-0.128982E 02	-0.163377E 05	0.272789E 02	-0.221033E-01
20.0	1	0.977200E 01	-0.749838E 04	0.257519E 02	0.816702E-02
	2	-0.134025E 02	-0.161207E 05	0.302233E 02	-0.258773E-01
25.0	1	0.977451E 01	-0.751815E 04	0.257511E 02	0.816702E-02
	2	-0.139775E 02	-0.156870E 05	0.303210E 02	-0.268838E-01
30.0	1	0.105427E 02	-0.769003E 04	0.259365E 02	0.917343E-02
	2	-0.223589E 02	-0.136193E 05	0.276911E 02	-0.369479E-01
35.0	1	0.112147E 02	-0.786989E 04	0.261922E 02	0.992824E-02
	2	-0.308963E 02	-0.114447E 05	0.247785E 02	-0.470120E-01
40.0	1	0.112686E 02	-0.794653E 04	0.262859E 02	0.992824E-02
	2	-0.323148E 02	-0.106069E 05	0.238974E 02	-0.485216E-01
45.0	1	0.111961E 02	-0.799799E 04	0.262492E 02	0.992824E-02
	2	-0.310513E 02	-0.103334E 05	0.241423E 02	-0.472636E-01
50.0	1	0.997490E 01	-0.784179E 04	0.258706E 02	0.854443E-02
	2	-0.237353E 02	-0.112673E 05	0.264027E 02	-0.389637E-01
55.0	1	0.898832E 01	-0.773996E 04	0.254900E 02	0.753802E-02
	2	-0.189624E 02	-0.117582E 05	0.282963E 02	-0.341802E-01
60.0	1	0.799717E 01	-0.767477E 04	0.251806E 02	0.640581E-02
	2	-0.167992E 02	-0.117496E 05	0.295357E 02	-0.326706E-01
65.0	1	0.621220E 01	-0.748958E 04	0.246009E 02	0.439298E-02
	2	-0.126668E 02	-0.121003E 05	0.313991E 02	-0.288966E-01
70.0	1	0.366867E 01	-0.720067E 04	0.237319E 02	0.162535E-02
	2	-0.627602E 01	-0.128171E 05	0.336749E 02	-0.221033E-01
72.0	1	0.235183E 01	-0.705497E 04	0.233523E 02	0.115738E-03
	2	-0.340476E 01	-0.131338E 05	0.345232E 02	-0.188325E-01
74.0	1	0.104506E 01	-0.692787E 04	0.229998E 02	-0.139388E-02
	2	-0.934196E 00	-0.133627E 05	0.352202E 02	-0.160648E-01
76.0	1	-0.383569E-00	-0.680995E 04	0.227125E 02	-0.315510E-02
	2	0.170559E 01	-0.135858E 05	0.357492E 02	-0.127940E-01
78.0	1	-0.192599E 01	-0.670814E 04	0.225070E 02	-0.516792E-02
	2	0.390946E 01	-0.137070E 05	0.360834E 02	-0.100264E-01
80.0	1	-0.370810E 01	-0.661987E 04	0.224429E 02	-0.768395E-02
	2	0.611742E 01	-0.137794E 05	0.361787E 02	-0.700714E-02
82.0	1	-0.386130E 01	-0.691302E 04	0.230825E 02	-0.843875E-02
	2	0.651030E 01	-0.134380E 05	0.353843E 02	-0.574913E-02
84.0	1	0.410187E-00	-0.812890E 04	0.252743E 02	-0.416151E-02
	2	0.159751E 01	-0.120627E 05	0.329540E 02	-0.107812E-01
86.0	1	0.804282E 01	-0.998894E 04	0.283619E 02	0.426718E-02
	2	-0.537919E 01	-0.103316E 05	0.300090E 02	-0.183293E-01
88.0	1	0.122635E 02	-0.111674E 05	0.303436E 02	0.867023E-02
	2	-0.881814E 01	-0.936625E 04	0.283583E 02	-0.218517E-01
90.0	1	0.127306E 02	-0.115263E 05	0.307922E 02	0.892183E-02
	2	-0.949468E 01	-0.906709E 04	0.280356E 02	-0.226365E-01
91.0	1	0.118990E 02	-0.114725E 05	0.305658E 02	0.791542E-02
	2	-0.920878E 01	-0.907009E 04	0.281681E 02	-0.223549E-01
92.0	1	0.105862E 02	-0.113104E 05	0.301178E 02	0.640581E-02
	2	-0.870240E 01	-0.912802E 04	0.283916E 02	-0.218517E-01
93.0	1	0.901261E 01	-0.110819E 05	0.295050E 02	0.464459E-02
	2	-0.817590E 01	-0.920323E 04	0.286586E 02	-0.213485E-01
94.0	1	0.754884E 01	-0.108581E 05	0.288080E 02	0.313497E-02
	2	-0.765946E 01	-0.928274E 04	0.289216E 02	-0.208453E-01
95.0	1	0.631467E 01	-0.106536E 05	0.279833E 02	0.212856E-02
	2	-0.733815E 01	-0.933714E 04	0.291875E 02	-0.206440E-01
96.0	1	0.492498E 01	-0.104139E 05	0.270105E 02	0.996347E-03
	2	-0.694696E 01	-0.940360E 04	0.294321E 02	-0.202918E-01
97.0	1	0.329972E 01	-0.101233E 05	0.258560E 02	-0.387468E-03
	2	-0.668594E 01	-0.945187E 04	0.296598E 02	-0.201156E-01
98.0	1	0.104367E 01	-0.972137E 04	0.244017E 02	-0.265189E-02
	2	-0.642008E 01	-0.950100E 04	0.298651E 02	-0.198892E-01
98.5	1	0.903753E-01	-0.953695E 04	0.234732E 02	-0.340670E-02
	2	-0.632978E 01	-0.951834E 04	0.299497E 02	-0.198137E-01
99.0	1	-0.140545E 01	-0.921465E 04	0.219462E 02	-0.441311E-02
	2	-0.614434E 01	-0.954960E 04	0.300430E 02	-0.196124E-01
99.5	1	-0.489211E 01	-0.834654E 04	0.182543E 02	-0.592273E-02
	2	-0.577858E 01	-0.961414E 04	0.301802E 02	-0.191847E-01
99.8	1	-0.185063E 02	-0.564741E 04	0.114842E 02	-0.188551E-01
	2	-0.540286E 01	-0.968278E 04	0.303035E 02	-0.187318E-01
99.9	1	-0.292730E 02	-0.408354E 04	0.883038E 01	-0.316114E-01
	2	-0.538282E 01	-0.968466E 04	0.303121E 02	-0.187067E-01
100.0	1	0.212753E 02	-0.186024E 05	0.414274E 02	0.129223E-01
	2	-0.548803E 01	-0.966251E 04	0.302846E 02	-0.188325E-01

[a] 1 = H_2O, 2 = H_2SO_4.

Table A-V. K_p for the dissociation of $H_2SO_4(g)$.

T DEG C	KP	T DEG C	KP	T DEG C	KP	T DEG C	KP	T DEG C	KP
-50.00	0.1255E-11	-40.00	0.1132E-10	-30.00	0.8524E-10	-20.00	0.5474E-09	-10.00	0.3053E-08
0.	0.1502E-07	10.00	0.6606E-07	20.00	0.2627E-06	30.00	0.9544E-06	40.00	0.3194E-05
50.00	0.9925E-05	60.00	0.2882E-04	70.00	0.7868E-04	80.00	0.2030E-03	90.00	0.4971E-03
100.00	0.1161E-02	110.00	0.2594E-02	120.00	0.5565E-02	130.00	0.1150E-01	140.00	0.2294E-01
150.00	0.4429E-01	160.00	0.8297E-01	170.00	0.1511E-00	180.00	0.2680E-00	190.00	0.4638E-00
200.00	0.7842E 00	210.00	0.1297E 01	220.00	0.2103E 01	230.00	0.3344E 01	240.00	0.5222E 01
250.00	0.8016E 01	260.00	0.1211E 02	270.00	0.1801E 02	280.00	0.2641E 02	290.00	0.3820E 02
300.00	0.5454E 02	310.00	0.7692E 02	320.00	0.1072E 03	330.00	0.1478E 03	340.00	0.2016E 03
350.00	0.2722E 03	360.00	0.3641E 03	370.00	0.4826E 03	380.00	0.6340E 03	390.00	0.8260E 03

TABLE A-VI. FORTRAN PROGRAM.

```
      DIMENSION A(2,40),B(2,40),C(2,40),D(2,40),XKP(100),TT(100),W(40),
     1          PROP(5,40,5),P(4,40,100),XLNKP(100),ITT(100)
C
      READ INPUT TAPE 2,5, NPROBS
    5 FORMAT (I2)
C
  100 READ INPUT TAPE 2,10, IPROB,IN,J1,JN,JDEL,T1,KT,TDEL
   10 FORMAT (5I5,F10.2,I5,F5.0)
      WRITE OUTPUT TAPE 3,15,IPROB,NPROBS,J1,JN,JDEL,T1,TDEL,KT
   15 FORMAT (1H1,49X,7HPROBLEM,I3,3H OF,I3//10H WT PCT ID,5X,7HINITIAL,
     1I3,3X,5HFINAL,I3,3X,5HDELTA,I3,10X,11HTEMPERATURE,5X,7HINITIAL,F7.
     22,2H K,3X,5HDELTA,F7.2,3X,6HTOT NO,I3//11H INPUT DATA,5X,4HCOMP,3X
     3,2HID,3X,6HWT PCT,4X,6H(F-FO),6X,1HL,9X,2HCP,7X,5HALPHA)
      GO TO (35,30),IN
C
   20 FORMAT (2I5,6F10.0)
   25 FORMAT (17X,I2,3X,I3,3X,F6.1,2F10.1,F10.3,2F10.5)
   30 READ INPUT TAPE 2,20, I,J,(W(J)),(PROP(I,J,L),L=1,5)
      WRITE OUTPUT TAPE 3,25,I,J,(W(J)),(PROP(I,J,L),L=1,5)
      IF (I-5) 30,35,35
   35 WRITE OUTPUT TAPE 3,40
   40 FORMAT (1H1,40HCONSTANTS FOR PARTIAL PRESSURE EQUATIONS//7H WT PCT
     1,2X,4HCOMP,9X,1HA,15X,1HB,15X,1HC,15X,1HD)
C
      READ INPUT TAPE 2,45,AKP,BKP,CKP,DKP,EKP,FKP
   45 FORMAT (4F10.0,2E15.0)
      T = T1
      DO 105 K=1,KT
      TT(K) = T-273.15
      XLNKP(K) = AKP*LOGF(298.15/T)+BKP/(T**2.)+CKP/T+DKP+EKP*T+FKP*(T**
     12.)
      XKP(K) = EXPF(XLNKP(K))
  105 T = T+TDEL
C
      DO 110 J=J1,JN,JDEL
C
      A(1,J) = -3.67340+(PROP(1,J,3)-PROP(1,J,4)*298.15)/1.98726
      B(1,J) = -4143.5+(PROP(1,J,2)-PROP(1,J,3)*298.15+((298.15**2.)*(PR
     1OP(1,J,4))/2.))/1.98726
      C(1,J) = 16.87684+(PROP(1,J,3)+((PROP(1,J,1)-PROP(1,J,2))/298.15))
     1/1.98726
      D(1,J) = 0.000618943-(PROP(1,J,4)/(2.*1.98726))
      A(2,J) =  -3.95519+(PROP(2,J,3)-PROP(2,J,4)*298.15)/1.98726
      B(2,J) =-7413.26+(PROP(2,J,2)-PROP(2,J,3)*298.15+((298.15**2.)*(PR
     1OP(2,J,4))/2.))/1.98726
      C(2,J) =  13.66376+(PROP(2,J,3)+((PROP(2,J,1)-PROP(2,J,2))/298.15)
     1)/1.98726
      D(2,J) = 0.01161146-(PROP(2,J,4)/(2.*1.98726))
      WRITE OUTPUT TAPE 3,130, W(J),A(1,J),B(1,J),C(1,J),D(1,J),A(2,J),B
```

TABLE A-VI. (CONT.)

```
     1(2,J),C(2,J),D(2,J)
  130 FORMAT (F7.2,4X,2H 1,4E16.6/11X,2H 2,4E16.6)
C
      T = T1
      DO 120 K=1,KT
      XLNP1 = A(1,J)*LOGF(298.15/T)+B(1,J)/T+C(1,J)+D(1,J)*T
      XLNP2 = A(2,J)*LOGF(298.15/T)+B(2,J)/T+C(2,J)+D(2,J)*T-2.19062E-6*
     1(T**2.)
      P(1,J,K) = EXPF(XLNP1)
      P(2,J,K) = EXPF(XLNP2)
      P(3,J,K) = XKP(K)*P(2,J,K)/P(1,J,K)
      P(4,J,K) = P(1,J,K)+P(2,J,K)+P(3,J,K)
  120 T = T+TDEL
C
  110 CONTINUE
C
      WRITE OUTPUT TAPE 3,50, AKP,BKP,CKP,DKP,EKP,FKP,(TT(K),XKP(K),K=1,
     1KT)
   50 FORMAT (1H1,43HCONSTANTS FOR LN(KP) EQUATION, AKP THRU FKP// E16.6
     1/////18H VALUES OF KP=F(T)//3X,7HT DEG C,6X,2HKP,7X,7HT DEG C,6X,2
     2HKP,7X,7HT DEG C,6X,2HKP,7X,7HT DEG C,6X,2HKP,7X,7HT DEG C,6X,2HKP
     3/5(F10.2,E12.4))
C
  300 DO 360 I=1,4
      DO 360 J=J1,JN,JDEL
      DO 360 K=1,KT
      G = LOGF(P(I,J,K))/2.302585
      IF (G+4.0) 315,315,305
  305 IF (G-4.0) 310,315,315
  310 IF (G) 325,320,320
C
  315 P(I,J,K) = 0.0
      GO TO 360
C
  320 G = G+1.0
      M = XINTF(G)
      GO TO (330,335,340,345),M
  325 H = 0.0001
      GO TO 350
  330 H = 0.001
      GO TO 350
  335 H = 0.01
      GO TO 350
  340 H = 0.1
      GO TO 350
  345 H = 1.0
C
  350 R = MODF(P(I,J,K),H)
      P(I,J,K) = P(I,J,K)-R
      IF (R/H-0.5) 360,360,355
```

TABLE A-VI. (CONT.)

```
  355 P(I,J,K) = P(I,J,K)+H                                               V
  360 CONTINUE                                                            V
C                                                                         V
      DO 4000 K=1,KT
      IF (TT(K))  4001,4002,4002
 4001 TT(K)  =  TT(K) - 0.5
      GO TO 4000
 4002 TT(K)  =  TT(K) + 0.5
 4000 ITT(K) = TT(K)
C
      DO 8000 I=1,4
      MM = 2
      JX = J1
 6000 JY = JX + 11
      IF (JY - JN)  5000,6005,6010
 6010 JY = JN
 6005 MM = 1
 5000 GO TO (5005,5010,5015,5020),I
 5005 WRITE OUTPUT TAPE 3,5006
 5006 FORMAT (1H1,30X,55HTABLE A-IIA, CONTINUED.  WATER PARTIAL PRESSURE
     1, MM HG.)
      GO TO 7000
 5010 WRITE OUTPUT TAPE 3,5011
 5011 FORMAT (1H1,26X,63HTABLE A-IIB, CONTINUED.  SULFURIC ACID PARTIAL
     1PRESSURE, MM HG.)
      GO TO 7000
 5015 WRITE OUTPUT TAPE 3,5016
 5016 FORMAT (1H1,25X,65HTABLE A-IIC, CONTINUED.  SULFUR TRIOXIDE PARTIA
     1L PRESSURE, MM HG.)
      GO TO 7000
 5020 WRITE OUTPUT TAPE 3,5021
 5021 FORMAT (1H1,34X,47HTABLE A-IID, CONTINUED.  TOTAL PRESSURE, MM HG.
     1)
 7000 WRITE OUTPUT TAPE 3,7005, (W(J),J=JX,JY)
 7005 FORMAT (1H0,5HDEG C,46X,20HWEIGHT PERCENT H2SO4/5X,12F9.1)
      MMM = 2
      K1 = 1
      K2 = 0
 7010 K2 = K2 + 10
      IF (K2 - KT) 7015,7020,7025
 7025 K2 = KT
 7020 MMM = 1
 7015 WRITE OUTPUT TAPE 3,7030,(ITT(K),(P(I,J,K),J=JX,JY),K=K1,K2)
 7030 FORMAT (1H0,I4,3X,12F9.4/(1X,I4,3X,12F9.4))
      K1 = K2 + 1
      GO TO (7035,7010),MMM
 7035 JX = JY + 1
      GO TO (8000,6000),MM
 8000 CONTINUE
C
      IF (NPROBS-IPROB) 600,600,100
  600 CALL EXIT
      END
```

REFERENCES

1. C. H. Greenewalt, Ind. Eng. Chem. 17, 522 (1925).
2. B. C. Burt, J. Chem. Soc. 85, 1339 (1904).
3. W. Daudt, Z. physik. Chem. (Frankfurt) 106, 225 (1923).
4. E. Abel, J. Phys. Chem. 50, 260 (1946).
5. M. Bodenstein and M. Katayama, Z. Elektrochem. 15, 244 (1909).
6. W. F. Giauque, E. W. Hornung, J. E. Kunzler, and T. R. Rubin, J. Am. Chem. Soc. 82, 62 (1960).
7. P. A. Giguère and R. Savoie, J. Am. Chem. Soc. 85, 287 (1963).
8. National Bureau of Standards Circular 500, 1952.
9. K. K. Kelley, U. S. Bureau of Mines Bulletin 584, 1960.
10. J. E. Kunzler, Anal. Chem. 25, 93 (1953).
11. G. N. Lewis and M. Randall, Thermodynamics and the Free Energy of Chemical Substances, 1st ed. (McGraw-Hill Book Company, Inc., New York, 1923), p. 554.
12. J. E. Kunzler and W. F. Giauque, J. Am. Chem. Soc. 74, 3472 (1952).
13. T. F. Young and G. E. Walrafen, Trans. Faraday Soc. 57, 34 (1961).
14. W. W. Duecker and J. R. West, The Manufacture of Sulfuric Acid (Reinhold Publishing Corporation, New York, 1959), p. 434.
15. O. Redlich and A. T. Kister, Ind. Eng. Chem. 40, 341 (1948).