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HIGH-TEMPERATURE THERMODYNAMIC PROPERTIES
OF SODIUM

by

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NOMENCLATURE

<u>SYMBOL</u>	<u>DEFINITION</u>
a	Constant in Eq. 19 for equilateral hyperbola
b	Constant in Eq. 19 for equilateral hyperbola
B_S	Adiabatic bulk modulus, atm
B^*	Reduced adiabatic bulk modulus
C_o	Sonic velocity, m/sec
C_p	Specific heat at constant pressure, J/g-°K
C_{sat}	Specific heat along the saturated liquid curve, J/g-°K
C_v	Specific heat at constant volume, J/g-°K
H	Enthalpy, J/g
ΔH_{vap}	Enthalpy change due to vaporization, J/g
P	Pressure, atm
R	Gas constant, 82.05 atm-cm ³ /g-mole-°K
S	Entropy, J/g-°K
t	Temperature, °F or °C
T	Absolute temperature, °R or °K
V	Specific volume, cm ³ /g
α_p	Thermal expansion coefficient, °K ⁻¹
α_{sat}	Thermal expansion along the saturated liquid curve, °K ⁻¹
β_S	Adiabatic compressibility, atm ⁻¹
β_T	Isothermal compressibility, atm ⁻¹
γ_{sat}	Slope of vapor-pressure curve, dP_{sat}/dT_{sat} , atm/°K
γ_v	Thermal pressure coefficient, atm/°K
ρ	Density, g/cm ³
θ	Fractional liquid range between melting point and critical point

SUBSCRIPTS

c	Critical point	sat	Saturation condition
liq	Liquid	vap	Vapor
mp	Melting point		
T	Temperature T		

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ABSTRACT

A set of high-temperature thermodynamic properties for sodium in the two-phase and subcooled-liquid regions has been predicted for the region between the low-temperature properties recommended by Golden and Tokar¹ and the critical temperature. This set of high-temperature properties is recommended for consistent thermodynamic calculations in reactor-safety analyses involving sodium.

The saturation properties determined are: vapor pressure, liquid and vapor density, liquid and vapor enthalpy, liquid and vapor entropy, liquid compressibility (adiabatic and isothermal), liquid thermal-expansion coefficient, and liquid specific heat (constant-pressure and constant-volume).

The subcooled-liquid properties determined are: pressure, enthalpy, entropy, compressibility (adiabatic and isothermal), thermal-expansion coefficient, and specific heat (constant-pressure and constant-volume).

I. INTRODUCTION

The analysis of hypothetical LMFBR (liquid-metal-fast-breeder-reactor) accidents has been hampered by the lack of a consistent set of high-temperature sodium properties in the two-phase and subcooled-liquid regions. Although sodium property correlations for temperatures up to 2500°F are available,^{1,2} some hypothetical LMFBR-accident analyses may involve much higher temperatures. The approach of some analysts has been to use the low-temperature correlations extrapolated to much higher temperatures,³ while others have developed new high-temperature correlations which are not internally consistent.⁴

In this report, the thermodynamic properties of sodium in the two-phase and subcooled-liquid regions are discussed. The computer program SODIPROP was used to calculate the thermodynamic properties (see Appendix A). The superheated-vapor region is not discussed because it is currently of considerably less interest in hypothetical LMFBR-accident analyses. Although the supercritical region (above the critical isotherm) may also be of interest in hypothetical LMFBR-accident analyses, it is a difficult region to characterize, and this effort should be undertaken only after studies using the high-temperature sodium properties in the two-phase and subcooled-liquid regions indicate that the critical temperature will be exceeded. The transport properties (thermal conductivity and viscosity)

and other physical properties (e.g., surface tension) are not discussed in this report.

The high-temperature saturation properties developed in this report are an extension of the low-temperature properties (up to 2500°F) recommended by Golden and Tokar¹ in 1967 after a critical review of the available experimental data. Continuity with these low-temperature properties was one of the bases of the present study. Although more experimental data have become available since then, no attempt has been made to re-evaluate the recommendations by Golden and Tokar. However, several properties in the section of Golden and Tokar's report attributed to David Miller (Section VIII and Appendix E) have been found to be in substantial error (for β_T , γ_V , and C_V). Therefore, these properties were recalculated for the low-temperature region also. Several other properties in that same section (C_p and α_p) had negligible errors due to approximations which are valid in the low-temperature region, but they were recalculated to be consistent with the high-temperature properties.

II. SATURATION PROPERTIES

2.1 Critical Constants

Due to the extreme temperature and pressure conditions involved, experimental measurements of the critical point of sodium are not available. There is wide variation in the estimates for the sodium critical constants and those of Miller *et al.*⁵ have been chosen:

$$T_c = 2733^\circ\text{K};$$

$$P_c = 408.2 \text{ atm};$$

$$\rho_c = 0.1818 \text{ g/cc.}$$

Miller estimated the critical constants of several alkali metals by assuming a corresponding-status relationship with cesium, for which experimental data closer to the critical point were available. Since then, more experimental data for cesium up to and including the critical point have become available^{6,7} and it may be useful to reevaluate the cesium correlations.

2.2 Vapor Pressure

Golden and Tokar recommended the equation of Ditchburn and Gilmour⁸ for temperatures below 1600°F:

$$\log_{10} P_{\text{sat}} (\text{atm}) = 6.4818 - \frac{10020.6}{T_{\text{sat}} (^\circ\text{R})} - 0.5 \log_{10} T_{\text{sat}} (^\circ\text{R}), \quad (1)$$

and the equation of Stone *et al.*⁹ for temperatures between 1600 and 2500°F:

$$\log_{10} P_{\text{sat}} (\text{atm}) = 6.83770 - \frac{9980.94}{T_{\text{sat}} (^\circ\text{R})} - 0.61344 \log_{10} T_{\text{sat}} (^\circ\text{R}). \quad (2)$$

Between 2500°F and the estimated critical temperature of 2733°K (4919.4°F), an equation of the same form as Eq. 2 is used:

$$\log_{10} P_{\text{sat}} (\text{atm}) = 1.36041 - \frac{8178.27}{T_{\text{sat}} (^{\circ}\text{R})} + 0.789 \log_{10} T_{\text{sat}} (^{\circ}\text{R}) \quad (3)$$

The constants were determined by insuring continuity with Eq. 2 at 2500°F. Equation 3 can also be expressed more directly in the following form:

$$P_{\text{sat}} = 22.9301 T_{\text{sat}}^{0.789} \exp\left(-\frac{18831.16}{T_{\text{sat}}}\right) \quad (4)$$

Figure 1 compares Eqs. 2 and 3. If Eq. 2 is extrapolated to the estimated critical temperature of 2733°K, the predicted critical pressure is 350 instead of the assumed value of 408 atm. A straight line in Fig. 1 between 2733°K and 2500°F would have been a reasonable approximation, but this would have introduced a 3% discontinuity in the slope of the vapor-pressure curve, $(dP/dT)_{\text{sat}}$, at 2500°F.

Fig. 1.
Vapor Pressure of Sodium.

2.3 Heat of Vaporization

Miller et al.⁵ recommended the following equation for the heat of vaporization:

$$\frac{\Delta H_{\text{vap}}}{RT_c} = 4.83 \left(1 - \frac{T}{T_c}\right)^{0.377} . \quad (5)$$

When the constants in Eq. 5 were adjusted to insure continuity with the low-temperature values recommended by Golden and Tokar up to 2500°F, the resulting equation was

$$\frac{\Delta H_{\text{vap}}}{RT_c} = 5.050 \left(1 - \frac{T}{T_c}\right)^{0.4262} . \quad (6)$$

2.4 Density

Up to 2500°F, Golden and Tokar recommended the equation proposed by Stone et al.⁹ for calculating the density of the saturated liquid:

$$\begin{aligned} \rho_{\text{liq}} \text{ (lb}_m\text{/ft}^3\text{)} &= 59.566 - 7.9504 \times 10^{-3}t - 0.2872 \times 10^{-6} t^2 \\ &\quad + 0.06035 \times 10^{-9} t^3 , \end{aligned} \quad (t=^{\circ}\text{F}) \quad (7)$$

Between 1600°C and the critical point, Miller et al.⁵ recommended the following equation for the saturated liquid density:

$$\frac{\rho_{\text{liq}}}{\rho_c} = 1 + 4.097 \left(1 - \frac{T}{T_c}\right)^{0.682} . \quad (8)$$

When the constants in Eq. 8 were adjusted to insure continuity with the low-temperature values recommended by Golden and Tokar up to 2500°F, the resulting equation was

$$\frac{\rho_{\text{liq}}}{\rho_c} = 1 + 4.163 \left(1 - \frac{T}{T_c}\right)^{0.5885} . \quad (9)$$

Miller et al.⁵ also recommended an equation of the same form as Eq. 8 for the saturated-vapor density. However, this equation gave a severe discontinuity with the low-temperature values recommended by Golden and Tokar. In order to insure continuity and thermodynamic consistency, the saturated-vapor density between 2500°F and the critical point was

calculated using the Clapeyron equation

$$\left(\frac{dP}{dT}\right)_{\text{sat}} = \frac{\Delta H_{\text{vap}}}{T \left(\frac{1}{\rho_{\text{vap}}} - \frac{1}{\rho_{\text{liq}}} \right)} \quad (10)$$

The slope of the vapor-pressure curve, $(dP/dT)_{\text{sat}}$, is obtained by differentiating Eqs. 1, 2, and 3 for the vapor pressure. The heat of vaporization and the saturated-liquid density are calculated by Eqs. 6 and 9, respectively, for temperatures above 2500°F and utilizing the corresponding values in Golden and Tokar below 2500°F.

An alternative method of utilizing the correlations for ΔH_{vap} , ρ_{liq} , and ρ_{vap} recommended by Miller *et al.* is to use the Clapeyron equation to calculate $(dP/dT)_{\text{sat}}$ and to integrate backward from the critical point to obtain the vapor pressures. However, this method was found to result in severe discontinuities with the vapor pressures predicted by Stone's Eq. 2 both at 1600°C and 2500°F.

Figure 2 shows the values of the saturated-liquid and -vapor densities calculated by Eqs. 9 and 10, along with the low-temperature values recommended by Golden and Tokar.

Fig. 2.
Density of Saturated Sodium.

2.5 Enthalpy

Figure 3 shows the liquid, vapor, and average (one-half of the liquid plus vapor) enthalpies recommended by Golden and Tokar up to 2500°F. The equation for the saturated-liquid enthalpy is that proposed by Stone *et al.*:

$$\begin{aligned} H_{\text{liq}} (\text{Btu/lb}_m) = & 0.389352 T - 0.552955 \times 10^{-4} T^2 \\ & + 0.113726 \times 10^{-7} T^3 - 29.023 \quad (T = ^\circ\text{R}) \end{aligned} \quad (11)$$

Fig. 3.
Enthalpy of
Saturated Sodium.

Beyond 2500°F, the average enthalpy is linearly extrapolated to the assumed critical temperature of 2733°K. The liquid and vapor enthalpies between 2500°F and 2733°K are obtained by subtracting and adding one-half of the heat of vaporization (calculated by Eq. 6) from the average enthalpy. The following equations for the saturated-liquid and -vapor enthalpies are obtained:

$$H_{liq} \text{ (J/g)} = 3841.9 + 0.85563 [T(^{\circ}\text{K}) - 1644.3] - 0.5 \Delta H_{vap}; \quad (12)$$

$$H_{vap} \text{ (J/g)} = 3841.9 + 0.85563 [T(^{\circ}\text{K}) - 1644.3] + 0.5 \Delta H_{vap}. \quad (13)$$

2.6 Entropy

The entropy of the saturated liquid above 2500°F is obtained from the second law of thermodynamics:

$$dS_{liq} = \frac{dQ}{T} = \frac{C_{sat}}{T} dT, \quad (14)$$

where C_{sat} is the specific heat along the saturated-liquid line and is given by

$$C_{sat} = \left(\frac{dH_{liq}}{dT} \right)_{sat} - \frac{Y_{sat}}{\rho_{liq}}. \quad (15)$$

The slope of the saturated-liquid enthalpy, $(dH_{liq}/dT)_{sat}$, is obtained by differentiating Eq. 11 for temperatures up to 2500°F and Eq. 12 for temperatures between 2500°F and the critical point. Integrating Eq. 14 gives

$$S_{liq} = S_{liq}(2500^\circ\text{F}) + \int_{2500^\circ\text{F}}^T \frac{C_{sat}}{T} dT . \quad (16)$$

The entropy of the saturated vapor is then obtained by adding the entropy of vaporization to the liquid entropy:

$$S_{vap} = S_{liq} + \Delta S_{vap} = S_{liq} + \frac{\Delta H_{vap}}{T} . \quad (17)$$

Figure 4 shows the saturated liquid and vapor entropies calculated by Eqs. 16 and 17, respectively, along with the low-temperature values up to 2500°F recommended by Golden and Tokar. The entropy at the critical point is obtained by extrapolating the average (one-half of the liquid plus vapor) entropy to the critical temperature.

Fig. 4.
Entropy of Saturated Sodium.

2.7 Liquid Compressibility

The adiabatic compressibility of the saturated liquid is calculated from the sonic velocity C_o by the equation

$$\beta_S = \frac{1}{\rho C_o^2} . \quad (18)$$

The sonic velocity data of Chasanov et al.,^{10,11} and Eqs. 7 and 9 for the saturated-liquid density, have been used to calculate values for β_S up to 1500°C. To extrapolate β_S to a higher temperatures, the method proposed by Grosse¹² is used.

This method involves the use of a simple empirical relationship

$$(B' + b)(\theta + b) = a , \quad (19)$$

where B' is the reduced adiabatic bulk modulus:

$$B' = \frac{B_{S,T}}{B_{S,mp}} = \frac{\beta_{S,mp}}{\beta_{S,T}} , \quad (20)$$

θ is the fractional liquid range between the melting point and the critical point:

$$\theta = \frac{T - T_{mp}}{T_c - T_{mp}}, \quad (21)$$

and a and b are constants associated with the equation for an equilateral hyperbola.

Figure 5 shows the calculated values of B' up to 1500°C, along with a plot of Eq. 19 for the constants $a = 4.216$ and $b = 1.613$. Below 1000°C, Eq. 19 fits the experimental data points very well, but there is a slight deviation from the data between 1000 and 1500°C.

Fig. 5.
Reduced Adiabatic Bulk Modulus
of Saturated Sodium Liquid.

The values of adiabatic compressibility calculated from Eq. 19 can be used to calculate the isothermal compressibility, using an equation recommended by Rowlinson:¹³

$$\beta_T = \frac{\beta_S C_{sat} + TV \alpha_{sat} (\alpha_{sat} + \beta_S \gamma_{sat})}{C_{sat} - TV \gamma_{sat} (\alpha_{sat} + \beta_S \gamma_{sat})}, \quad (22)$$

where V is the specific volume ($1/\rho$) and α_{sat} , the thermal expansion along the saturated-liquid line:

$$\alpha_{sat} = - \frac{1}{\rho} \left(\frac{d\rho}{dT} \right)_{sat}, \quad (23)$$

is calculated from Eq. 7 for temperatures up to 2500°F and from Eq. 9 for temperatures between 2500°F and the critical point.

Figure 6 shows the values of β_S and β_T calculated by Eqs. 19 and 22, along with Miller's values tabulated in Golden and Tokar. The small differences in β_S are due to the different assumed sonic-velocity correlations;

however, the tabulated values for β_T were found to be in error. The use of Eq. 19 predicts that β_S becomes infinite at the critical point, thus implying that the sonic velocity becomes zero at the critical point. Use of the predicted values of β_S in Eq. 22 cause β_T to become infinite approximately 14°K below the critical point. Although this inconsistency near the critical point could be remedied by forcing the sonic velocity to be non-zero at the critical point, the other approximations for the properties used in Eq. 22 may also be contributing to this inconsistency. Therefore, the properties calculated by the present method are recommended for use only within ~100°K of the critical point.

Fig. 6. Compressibility of Saturated Sodium Liquid.

2.8 Thermal-expansion Coefficient of Liquid Sodium

The thermal-expansion coefficient for the saturated liquid is calculated from the equation

$$\alpha_P = \alpha_{sat} + \beta_T \gamma_{sat} \quad (24)$$

All the quantities on the right side have been determined previously.

Figure 7 shows the values of α_P calculated by Eq. 24 along with Miller's values tabulated in Golden and Tokar. Miller's values for α_P are actually α_{sat} . At low temperatures, the differences between α_{sat} and α_P are negligible, but they become significant near the critical point.

Fig. 7. Thermal-expansion Coefficient for Saturated Sodium Liquid.

2.9 Liquid Specific Heat

The two most useful heat capacities, commonly referred to as the specific heats, are those at constant pressure and at constant volume. The constant-pressure specific heat is calculated from the equation

$$C_p = C_{sat} + TV \alpha_p \gamma_{sat} , \quad (25)$$

where all quantities on the right side have been determined previously. The constant-volume specific heat is calculated from C_p by the equation

$$C_v = C_p \frac{\beta_s}{\beta_T} . \quad (26)$$

Figure 8 shows the values of C_p and C_v calculated by Eqs. 25 and 26, respectively, along with the values tabulated in Golden and Tokar. The values of C_p tabulated in Golden and Tokar are actually values of $(dH_{lig}/dT)_P^{sat}$, but the error is very small at low temperatures. However, the tabulated values for C_v were found to be in error and were even higher than the values for C_p at low temperatures.

Fig. 8. Specific Heat for Saturated Sodium Liquid.

III. SUBCOOLED-LIQUID PROPERTIES

3.1 Thermal Pressure Coefficient

The thermal pressure coefficient, which is used to calculate the pressure increase due to constant-volume heating, is calculated from the equation

$$\gamma_V = \left(\frac{\partial P}{\partial T} \right)_V = \frac{\alpha_P}{\beta_T}. \quad (27)$$

Figure 9 shows that γ_V for the saturated liquid is approximately linear almost up to the critical point. At the critical point, γ_V becomes equal to γ_{sat} , the slope of the vapor-pressure curve. The linear behavior of the γ_V curve near the critical point is not entirely reasonable for two reasons: first, the shape of the (P,V,T) surface near the critical point dictates that the slope of the γ_V curve approaches infinity; secondly, γ_V is expected to change smoothly with saturation temperature when passing through the critical point from the liquid to the vapor region.

Rowlinson¹³ has pointed out that γ_V along a set of isochores (constant-volume lines) from the saturated-liquid line into the subcooled-liquid region is essentially constant (i.e., the slope of the isochores are always small). If it assumed that γ_V is a function of density only (i.e., horizontal isochores), then Eq. 27 can be integrated along a constant-volume path in the subcooled-liquid region, giving

$$P = P_0 + \gamma_V (T - T_0), \quad (28)$$

Fig. 9. Thermal Pressure Coefficient for Saturated Sodium Liquid.

where (T, P) and (T_o, P_o) are two points having the same volume $V = V_o$. Equation 28 can be used to calculate the pressure in the subcooled-liquid region based on the value of γ_V on the saturated-liquid line,¹⁴ that is, $(T_o, P_o) = (T_{sat}, P_{sat})$.

3.2 Thermal-expansion Coefficient

Equation 28 can be used as an equation of state for the subcooled-liquid region. Since the thermal-expansion coefficient is defined by

$$\alpha_P = \frac{1}{V} \left(\frac{\partial V}{\partial T} \right)_P = - \frac{1}{\rho} \left(\frac{\partial \rho}{\partial T} \right)_P, \quad (29)$$

use of Eq. 28 to obtain $(\partial T / \partial \rho)_P$ results in

$$\frac{1}{\alpha_P} = \frac{1}{(\alpha_P)_{sat}} + \frac{\rho (P - P_{sat})}{\gamma_V^2} \frac{d\gamma_V}{d\rho}. \quad (30)$$

The two conditions, (T, P) and (T_{sat}, P_{sat}) , are at the same volume and therefore have the same value for γ_V . The derivative of γ_V with respect to density, $d\gamma_V/d\rho$ is evaluated along the saturated-liquid line.

The approach of differentiating Eq. 28 to obtain α_p was first suggested by Erdman,¹⁵ and Eq. 30, although in slightly different form, is the same as the equation which he obtained.

Figure 10 shows the values of α_p calculated by Eq. 30 at 1600, 2100, and 2600°K. At low temperatures, the effect of pressure on α_p is very small and the error in using saturated-liquid values for the subcooled-liquid region is negligible. At very high temperatures, when α_p is increasing very rapidly, the effect of pressure on α_p becomes very significant.

Fig. 10. Thermal-expansion Coefficient for Subcooled Sodium Liquid.

3.3 Compressibility

The isothermal compressibility is defined by

$$\beta_T = -\frac{1}{V} \left(\frac{\partial V}{\partial P} \right)_T = \frac{1}{\rho} \left(\frac{\partial \rho}{\partial P} \right)_T. \quad (31)$$

Use of Eq. 28 to obtain $(\partial P / \partial \rho)_T$ results in

$$\frac{1}{\beta_T} = \frac{1}{(\beta_T)_{\text{sat}}} + \rho (T - T_{\text{sat}}) \frac{d\gamma_V}{d\rho}. \quad (32)$$

If α_p has been previously calculated, β_T is obtained more simply by using Eq. 27.

The adiabatic compressibility is determined from

$$\beta_S = \beta_T - \frac{TV\alpha_P^2}{C_P} . \quad (33)$$

Equation 33 is used after first determining C_P , which will be discussed in the next section.

Figure 11 shows the values of β_T calculated by Eq. 32 at 1600, 2100, and 2600°K. As for α_P , the effect of pressure on β_T is relatively small at low temperatures, but becomes very significant at high temperatures approaching the critical point.

Fig. 11. Isothermal Compressibility for Subcooled Sodium Liquid.

3.4 Specific Heat

Saturated values for the constant-volume specific heat can be used for the subcooled liquid since it can be shown that

$$\left(\frac{\partial C_V}{\partial P} \right)_T = T \left(\frac{\partial V}{\partial P} \right)_T \left(\frac{\partial^2 P}{\partial T^2} \right)_V = T \left(\frac{\partial V}{\partial P} \right)_T \left(\frac{\partial \gamma_V}{\partial T} \right)_V = 0 . \quad (34)$$

Equation 34 follows from the fact that γ_V is assumed to be a function of density only.

The constant-pressure specific heat is calculated by the equation

$$C_P = C_V + \frac{TV\alpha_P^2}{\beta_T}, \quad (35)$$

where α_P and β_T are determined from Eqs. 30 and 32, respectively. Figure 12 shows the values of C_P calculated by Eq. 35 at 1600, 2100, and 2600°K. The behavior is similar to that of α_P and β_T : the effect of pressure is small at low temperatures and very significant at high temperatures.

Fig. 12. Constant-pressure Specific Heat for Subcooled Sodium Liquid.

3.5 Enthalpy

The effect of pressure on enthalpy in the subcooled-liquid region is given by

$$\left(\frac{\partial H}{\partial P}\right)_T = V - T \left(\frac{\partial V}{\partial T}\right)_P = V (1 - T\alpha_P). \quad (36)$$

By use of the values of α_P calculated with Eq. 30, Eq. 36 can be integrated from the saturated-liquid line along a constant-temperature path:

$$H = H_{\text{sat}} + \int_{P_{\text{sat}}}^P V (1 - T\alpha_P) dP. \quad (37)$$

Figure 13 shows the values of the subcooled-liquid enthalpy calculated from Eq. 37 at 1600, 2100 and 2600°K. At low temperatures, the enthalpy increases with increasing pressure; at high temperatures, the enthalpy decreases with increasing pressure initially, but eventually increases at very high pressures.

Fig. 13. Enthalpy of Subcooled Sodium Liquid.

3.6 Entropy

The effect of pressure on entropy in the subcooled-liquid region is given by

$$\left(\frac{\partial S}{\partial P}\right)_T = -\left(\frac{\partial V}{\partial T}\right)_P = -V \alpha_P. \quad (38)$$

By use of the values of α_P calculated from Eq. 30, Eq. 38 can be integrated from the saturated-liquid along a constant-temperature path:

$$S = S_{\text{sat}} - \int_{P_{\text{sat}}}^P V \alpha_P dP. \quad (39)$$

Figure 14 shows the values of the subcooled-liquid entropy calculated from Eq. 39 at 1600, 2100, and 2600°K. The entropy decreases with increasing pressure for all temperatures below the critical point.

Fig. 14. Entropy of Subcooled Sodium Liquid.

IV. SUMMARY

A set of thermodynamic properties for sodium in the two-phase and subcooled-liquid regions has been predicted for the high-temperature region between 2500°F and the critical temperature. This set of high-temperature properties is recommended for consistent thermodynamic calculations in reactor-safety analysis involving sodium. These properties are based on a number of high-temperature correlations and basic thermodynamic relationships summarized in the text. Until there are high-temperature sodium data to verify these correlations it is recommended that other fluids for which data are available be used as analogs. For example, Grosse¹⁶ used the behavior of the ideal liquids (such as argon) as a basis for extrapolating the adiabatic compressibility of liquid metals, including alkali metals. Since a considerable amount of data is being generated for the alkali metal cesium, the correlations recommended in this present study should be re-examined when this cesium data becomes available.

APPENDIX A

SODIPROP Computer Program

The equations in this report for the sodium thermodynamic properties in the two-phase and subcooled-liquid regions have been implemented in a digital computer program called SODIPROP. SODIPROP was used to calculate the saturated sodium properties tabulated in Appendix B and the subcooled-liquid sodium properties tabulated in Appendix C. A listing of SODIPROP is provided here to enable those with an understanding of thermodynamics to incorporate new data when they become available.

LEVEL 21.6 (MAY 72)

OS/360 FORTRAN H

CCMPILER OPTIONS - NAME= MAIN,JPT=30,LINECNT=57,SIZE=0000K,
SOURCE,EBCDIC,NOLIST,NODECK,LOAD,MAP,NOEDIT,ID,NOXREF

C

C

SODIOPROP - PROGRAM TO CALCULATE SODIUM PROPERTIES

C

ISN 0002

ISN 0003

IMPLICIT REAL*8 (A-H,O-Z)

DIMENSION TSAT(2363),PSAT(2363),RHOL(2363),RHOV(2363),HLSAT(2363),

1 HVSAT(2363),SLSAT(2363),SVSAT(2363),APSAT(2363),

2 BSSAT(2363),BTSAT(2363),CPSAT(2363),CVSAT(2363),

3 GV(2363),DGV(2363),

4 P(2363),AP(2363),BT(2363),HLIQ(2363),SLIQ(2363),

5 RHOLIQ(2363),

6 PCALC(50),RJCALC(50),HLCALC(50),SLCALC(50),APCALC(50),

7 BSCALC(50),BTCALC(50),CPCALC(50)

C

CONVERSION FACTOR TO JOULES FROM ATM-CC

ISN 0004

CTOJ = 0.1013278

J/ATM-CC

ISN 0005

TCRIT = 2733.

DEG K

ISN 0006

PCRIT = 408.2

ATM

ISN 0007

ROCRIT = 0.1818

G/CC

ISN 0008

TCROSS = (2500. + 459.7)/1.8

DEG K

ISN 0009

PSATA = 22.93013897

ISN 0010

PSATB = 18831.15833

ISN 0011

PSATC = -0.789

ISN 0012

TMIN = 371.

DEG K

ISN 0013

DT = 1.

DEG K

ISN 0014

IMAX = (TCRIT-TMIN)/DT

ISN 0015

TPRINT = 380.

DEG K

ISN 0016

DPRINT = 10.

DEG K

ISN 0017

TCALC = 400.

ISN 0018

DTCALC = 100.

ISN 0019

JMAX = (TCRIT - TCALC)/DTCALC + 1

C

CALCULATION OF SATURATED PROPERTIES

ISN 0020

TSAT(1) = TMIN

ISN 0021

ICOUNT = 0

ISN 0022

PRINT 1

ISN 0023

DO 400 I=1,IMAX

ISN 0024

IF (I.GT.1) TSAT(I)=TSAT(I-1)+DT

ISN 0026

THETA = (TSAT(I) - 371.)/2362.

ISN 0027

BSR = 4.216178/(THETA + 1.613333) - 1.613333

ISN 0028

BSSAT(I) = 1.713740-05/BSR

ATM-1

ISN 0029

TRR = 1.8*TSAT(I)

DEG R

ISN 0030

TFF = TRR - 459.7

DEG F

ISN 0031

IF (TFF.GT.2500.) GO TO 200

C

SATURATED PROPERTIES UP TO 2500 DEG F

ISN 0033

IF (TFF.GT.1600.) GO TO 150

ISN 0035

PSAT(I) = 3.03266E6*DEXP(-23373.3/TRR)/TRR**0.5

ATM

ISN 0036

DPSAT = 1.8*PSAT(I)*(23373.3/TRR-0.5)/TRR

ATM/K

ISN 0037

GO TO 151

ISN 0038

150

PSAT(I) = 6.8817602E6*DEXP(-22981.96/TRR)/TRR**0.61344

ATM

ISN 0039

DPSAT = 1.8*PSAT(I)*(22981.96/TRR-0.61344)/TRR

ATM/K

ISN 0040

151

CONTINUE

ISN 0041

RHOL(I) = (59.566-7.9504E-3*TFF-0.2872E-6*TFF**2+0.06035E-9*TFF**3

1 7/62.4283

G/CC

ISN 0042

DRHOL = (-7.9504E-3-0.5744E-6*TFF+0.18105E-9*TFF**2)*1.8/62.4283

G/CC-K

ISN 0043

ASAT = -DRHOL/RHOL(I)

K-1

ISN 0044		HL SAT(I) = 4.184*(0.389352*TRR-0.552955E-4*TRR**2+0.113726E-7*	
	1	TRR**3 -29.023)/1.8	J/G
ISN 0045		SLSAT(I) = 4.184*(.389344*DLJG(TRR)-1.10557E-4*TRR+.170408E-7*	
	1	TRR**2-1.792326)	J/G-K
ISN 0046		DHLSAT = 4.184*(0.389352-1.10591E-4*TRR+3.41178E-8*TRR*TRR)	J/G-K
ISN 0047		CSAT = DHLSAT - 0.1013278*DPSAT/RHOL(I)	J/G-K
ISN 0048		TWO = DEXP(-9.95845 + (16588.3/TRR))	ATM-1
ISN 0049		FOUR = DEXP(-24.59115 + (37589.7/TRR))	ATM-3
ISN 0050		U = TWO*PSAT(I)	
ISN 0051		W = FOUR*PSAT(I)*PSAT(I)*PSAT(I)	
ISN 0052		X1 = 0.8	
ISN 0053	170	X1P = X1	
ISN 0054		X1 = X1 - (W*X1*X1*X1*X1 + U*X1*X1 + X1 - 1.)/	
	1	(4.*W*X1*X1*X1 + 2.*U*X1 + 1.)	
ISN 0055		DIFF = DABS(X1 - X1P)/X1 - 1.D-06	
ISN 0056		IF (DIFF) 180,180,170	
ISN 0057	180	X2 = U*X1*X1	
ISN 0058		X4 = 1. - X1 - X2	
ISN 0059		ABAR = 22.991*(X1 + 2.*X2 + 4.*X4)	
ISN 0060		VSAT = (0.730229*TRR)/(ABAR*PSAT(I))	FT3/LB
ISN 0061		RHOV(I) = 1./(VSAT*62.4283)	G/CC
ISN 0062		DHF1 = 25980.7 - 2.21312*TRR + 7.06278D-04*TRR*TRR	
	1	- 1.4526 D-07*TRR*TRR*TRR	CAL/MNA1
ISN 0063		DHF2 = 2.*DHF1 - 18304.	CAL/MNA2
ISN 0064		DHF4 = 4.*DHF1 - 41478.	CAL/MNA4
ISN 0065		DH = 4.184*(X1*DHF1 + X2*DHF2 + X4*DHF4)/ABAR	J/G
ISN 0066		GO TO 250	
	C	SATURATED PROPERTIES ABOVE 2500 DEG F	
ISN 0067	200	TR = TSAT(I)/TCRIT	
ISN 0068		PSAT(I) = PSATA*DEXP(-PSATB/TRR)/TRR**PSATC	ATM
ISN 0069		DPSAT = 1.8*PSAT(I)*(PSATB/TRR - PSATC)/TRR	ATM/K
ISN 0070		RHOL(I) = ROCRIT*(1. + 4.16306*(1.-TR)**0.588504)	G/CC
ISN 0071		DRHOL = -ROCRIT*4.16306*0.588504/(TCRIT*(1.-TR)**0.411496)	G/CC-K
ISN 0072		ASAT = -DRHOL/RHOL(I)	K-1
ISN 0073		DH = 1.81061*TCRIT*(1.-TR)**0.426195	J/G
ISN 0074		RHOV(I) = 1./(1./RHOL(I) + DH/(TSAT(I)*DPSAT*CTOJ))	G/CC
ISN 0075		HL SAT(I) = 3841.89 + 0.855628*(TSAT(I) - TCROSS) - 0.5*DH	J/G
ISN 0076		DHLSAT = 0.855628 + 0.5*1.81061*0.426195/(1.-TR)**0.573805	J/G-K
ISN 0077		CSAT = DHLSAT - 0.1013278*DPSAT/RHOL(I)	J/G-K
ISN 0078		CSATAV = 0.5*(CSAT + CSAT2)	
ISN 0079		SLSAT(I) = SLSAT(I-1) + CSATAV*DLOG(TSAT(I)/TSAT(I-1))	J/G-K
ISN 0080	250	APS = ASAT + BSSAT(I)*DPSAT	K-1
ISN 0081		TVAP = CTOJ*TSAT(I)*APS/RHOL(I)	
ISN 0082		BTSAT(I) = (BSSAT(I)*CSAT + TVAP*ASAT)/(CSAT - TVAP*DPSAT)	ATM-1
ISN 0083		APSAT(I) = ASAT + BTSAT(I)*DPSAT	K-1
ISN 0084		CPSAT(I) = CSAT + CTOJ*TSAT(I)*APSAT(I)*DPSAT/RHOL(I)	J/G-K
ISN 0085		GV(I) = APSAT(I)/BTSAT(I)	ATM/K
ISN 0086		CVSAT(I) = CPSAT(I)*BSSAT(I)/BTSAT(I)	J/G-K
ISN 0087		HVSAT(I) = HL SAT(I) + DH	J/G
ISN 0088		SVSAT(I) = SLSAT(I) + DH/TSAT(I)	J/G-K
ISN 0089		IF (TSAT(I).NE.TPRINT) GO TO 350	
ISN 0091		ITSAT = TSAT(I)	
ISN 0092	1	PRINT 2, ITSAT,PSAT(I),RHOL(I),RHOV(I),HL SAT(I),HVSAT(I),SLSAT(I),	
		SVSAT(I),APSAT(I),BSSAT(I),BTSAT(I),CPSAT(I),CVSAT(I)	
ISN 0093		TPRINT = TPRINT + DPRINT	

ISN 0094	ICOUNT = ICOUNT + 1	
ISN 0095	IF (ICOUNT.LT.27) GO TO 350	
ISN 0097	PRINT 1	
ISN 0098	ICOUNT = 1	
ISN 0099	350 CSAT2 = CSAT	
ISN 0100	400 CONTINUE	
ISN 0101	ITSAT = TCRT	
ISN 0102	HCRIT = 3841.89 + 0.855628*(TCRT - TCROSS)	J/G
ISN 0103	PRINT 3, ITSAT,PCRT,ROCRIT,ROCRIT,HCRIT,HCRIT	
	C CALCULATE DERIVATIVE OF GV WITH RESPECT TO RHOL	
ISN 0104	DO 460 I=2,IMAX	
ISN 0105	DGV(I) = (GV(I) - GV(I-1))/(RHOL(I) - RHOL(I-1))	A-CC/K-G
ISN 0106	460 CONTINUE	
ISN 0107	DGV(I) = DGV(2) + 0.5*(DGV(2) - DGV(3))	
ISN 0108	IMAXM1 = IMAX - 1	
ISN 0109	DO 500 I=2,IMAXM1	
ISN 0110	DGV(I) = 0.5*(DGV(I) + DGV(I+1))	
ISN 0111	500 CONTINUE	
ISN 0112	DGV(IMAX) = 2.*DGV(IMAX) - DGV(IMAXM1)	
	C CALCULATION OF SUBCOOLED PROPERTIES	
	C SUBCOOLED RHOL, HLIQ, SLIQ, AP, AND BT	
ISN 0113	DO 1000 J=1,JMAX	
ISN 0114	N = 0	
ISN 0115	T = TCALC	
ISN 0116	DO 800 L=1,IMAX	
ISN 0117	I = IMAX + 1 - L	
ISN 0118	IF (ITSAT(I).GT.T) GO TO 800	
ISN 0120	N = N + 1	
ISN 0121	IF (ITSAT(I).LT.T) GO TO 750	
ISN 0123	P(I) = PSAT(I)	
ISN 0124	RHOLI(I) = RHOL(I)	
ISN 0125	HLIQ(I) = HLSAT(I)	
ISN 0126	SLIQ(I) = SLSAT(I)	
ISN 0127	AP(I) = APSAT(I)	
ISN 0128	BT(I) = BVSAT(I)	
ISN 0129	BSCALC(I) = BSSAT(I)	
ISN 0130	CPCALC(I) = CPSAT(I)	
ISN 0131	CVCALC = CVSAT(I)	
ISN 0132	GO TO 800	
ISN 0133	750 DP = GV(I)*(T - TSAT(I))	ATM
ISN 0134	P(N) = PSAT(I) + DP	ATM
ISN 0135	APINV = 1./APSAT(I) + RHOL(I)*DP*DGV(I)/(GV(I)*GV(I))	DEG K
ISN 0136	AP(N) = 1./APINV	K-1
ISN 0137	BT(N) = AP(N)/GV(I)	ATM-I
ISN 0138	DELP = P(N) - P(N-1)	
ISN 0139	RHDAVG = 0.5*(RHOL(I) + RHOL(I+1))	
ISN 0140	APAVG = 0.5*(AP(N) + AP(N-1))	
ISN 0141	HLIQ(N) = HLIQ(N-1) + CTOJ*(1. - T*APAVG)*DELP/RHDAVG	J/G
ISN 0142	SLIQ(N) = SLIQ(N-1) - CTOJ*APAVG*DELP/RHDAVG	J/G-K
ISN 0143	RHOLI(N) = RHOL(I)	
ISN 0144	800 CONTINUE	
ISN 0145	NPROP = N	
ISN 0146	PCALC(I) = P(I)	
ISN 0147	ROCALC(I) = RHOLI(I)	
ISN 0148	HLCALC(I) = HLIQ(I)	

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ISN 0149      SLCALC(1) = SLIQ(1)
ISN 0150      APCALC(1) = AP(1)
ISN 0151      BTCALC(1) = BT(1)
ISN 0152      N = 2
ISN 0153      PCALC(2) = 0.
ISN 0154      DPCALC = 100.
ISN 0155      850 IF (PCALC(N).GE.2000.) DPCALC=500.
ISN 0157      IF (PCALC(N).GE.5000.) DPCALC=1000.
ISN 0159      PCALC(N) = PCALC(N) + DPCALC
ISN 0160      IF (PCALC(N).LE.P(1)) GO TO 850
ISN 0162      IF (PCALC(N).GT.P(NPROP)) GO TO 875
ISN 0164      CALL CURVE (ROCALC(N),PCALC(N),RHOLIQ,P,NPROP,IERROR,1)
ISN 0165      CALL CURVE (HLCALC(N),PCALC(N),HLIQ,P,NPROP,IERROR,1)
ISN 0166      CALL CURVE (SLCALC(N),PCALC(N),SLIQ,P,NPROP,IERROR,1)
ISN 0167      CALL CURVE (APCALC(N),PCALC(N),AP,P,NPROP,IERROR,1)
ISN 0168      CALL CURVE (BTCALC(N),PCALC(N),BT,P,NPROP,IERROR,1)
ISN 0169      N = N + 1
ISN 0170      PCALC(N) = PCALC(N-1)
ISN 0171      GO TO 850
ISN 0172      875 CONTINUE
ISN 0173      NCALC = N - 1
ISN 0174      PRINT 4, TCALC
ISN 0175      PRINT 5, PCALC(1),ROCALC(1),HLCALC(1),SLCALC(1),APCALC(1),
1          BSCALC(1),BTCALC(1),CPCALC(1)
ISN 0176      C          SUBCOOLED CP AND BS
ISN 0177      DO 950 I=2,NCALC
1          CPCALC(I) = CVCALC + CTJJ*T*APCALC(I)*APCALC(I)/(ROCALC(I)*
          BTCALC(I))
ISN 0178      BSCALC(I) = BTCALC(I)*CVCALC/CPCALC(I)
ISN 0179      PRINT 5, PCALC(I),ROCALC(I),HLCALC(I),SLCALC(I),APCALC(I),
1          BSCALC(I),BTCALC(I),CPCALC(I)
ISN 0180      950 CONTINUE
ISN 0181      TCALC = TCALC + DTCALC
ISN 0182      1000 CONTINUE
ISN 0183      STOP
ISN 0184      C          FORMAT STATEMENTS
1          FORMAT (1H1,50X,'PROPERTIES OF SATURATED SODIUM' ///
1          1X,'TSAT',3X,'PSAT',5X,'RHOL',5X,'RHOV',6X,'HLIQ',5X,'HVP',5X,
2          'SLIQ',5X,'SVAP',6X,'ALPHAP',8X,'BETAS',9X,'BETAT',9X,'CP',8X,
3          'CV' /
4          1X,'( K)',2X,'( ATM)',3X,'(G/CC)',4X,'(G/CC)',4X,'( J/G)',3X,
5          '( J/G)',2X,'(J/G-K)',2X,'(J/G-K)',5X,'( K-1)',7X,'(ATM-1)',7X,
6          '(ATM-1)',5X,'( J/G-K)',2X,'( J/G-K)' // )
ISN 0185      2 FORMAT (15,F8.2,F9.5,F10.5,F10.1,F9.1,2F9.4,D13.5,2D14.5,2F10.4/)
ISN 0186      3 FORMAT (15,F8.2,F9.5,F10.5,F10.1,F9.1)
ISN 0187      4 FORMAT (1H1,38X,' SUBCOOLED SODIUM LIQUID PROPERTIES AT T =',F7.1,
1          ' DEG K' /// 10X,'P',10X,'RHOL',8X,'HLIQ',8X,'SLIQ',10X,'ALPHAP'
2          ,11X,'BETAS',12X,'BETAT',11X,'CP' / 8X,'(ATM)',7X,
3          '(G/CC)',6X,'( J/G)',5X,'( J/G-K)',8X,'( K-1)',10X,'(ATM-1)',
4          10X,'(ATM-1)',7X,'( J/G-K)' // )
ISN 0188      5 FORMAT (F13.1,F13.5,F12.1,F12.4,3D17.5,F12.4 / )
ISN 0189      END

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LEVEL 21.6 (MAY 72)		OS/360 FORTRAN H
COMPILER OPTIONS - NAME= MAIN,DPT=30,LINECNT=57,SIZE=0000K,		
SOURCE,EBCDIC,NJLIST,NODECK,LOAD,MAP,NOEDIT,ID,NOXREF		
ISN 0002	SUBROUTINE CURVE (FX,X,F,Y,N,J,ISAVE)	
ISN 0003	IMPLICIT REAL*8 (A-H,O-Z)	
ISN 0004	C	DIMENSION F(2363),Y(2363)
	C	FX - QUANTITY TO BE FOUND
	C	X - INDEPENDENT VARIABLE
	C	F - INPUT ARRAY FOR THE ORDINATE(MONOTONIC WITH Y)
	C	Y - INPUT ARRAY FOR THE ABSCISSA (MONOTONIC INCREASE)
	C	N - NUMBER OF F(I) OR Y(I) VALUES
	C	J - SUCCESS(J=1) OR FAILURE(J=2) SIGNAL
ISN 0005	C	1 FORMAT(49H TABULAR LOOKUP FAILED IN SUBROUTINE CURVE, FX = E12.6, 1 6H X = E12.6 / (10E12.4))
ISN 0006	J=1	
ISN 0007	GO TO (10,50),ISAVE	
ISN 0008	10 DO 20 I=1,N	
ISN 0009	IF(X-Y(I)) 30,15,20	
ISN 0010	15 IF(I.EQ.N) GO TO 40	
ISN 0012	20 CONTINUE	
ISN 0013	GO TO 60	
ISN 0014	30 IF(I.EQ.1) GO TO 60	
ISN 0016	40 B = (X-Y(I-1))/(Y(I)-Y(I-1))	
ISN 0017	50 FX = F(I-1) + B*(F(I)-F(I-1))	
ISN 0018	RETURN	
ISN 0019	60 PRINT 1, FX,X,(F(I),Y(I),I=1,N)	
ISN 0020	J = 10	
ISN 0021	RETURN	
ISN 0022	END	

APPENDIX B

Tabulation of Saturated Sodium Properties

<u>Property</u>	<u>Symbol</u>	<u>Units</u>
Temperature	TSAT	°K
Pressure	PSAT	atm
Liquid Density	RHOL	g/cm ³
Vapor Density	RHOV	g/cm ³
Liquid Enthalpy	HLIQ	J/g
Vapor Enthalpy	HVAP	J/g
Liquid Entropy	SLIQ	J/g-°K
Vapor Entropy	SVAP	J/g-°K
Liquid Thermal-expansion Coefficient	ALPHAP	°K ⁻¹
Liquid Adiabatic Compressibility	BETAS	atm ⁻¹
Liquid Isothermal Compressibility	BETAT	atm ⁻¹
Liquid Constant-pressure Specific Heat	CP	J/g-°K
Liquid Constant-volume Specific Heat	CV	J/g-°K

PROPERTIES OF SATURATED SODIUM

TSAT (K)	PSAT (ATM)	RHOL (G/CC)	RHOV (G/CC)	HLIQ (J/G)	HVAP (J/G)	SLIQ (J/G-K)	SVAP (J/G-K)	ALPHAP (K-1)	BETAS (ATM-1)	BETAT (ATM-1)	CP (J/G-K)	CV (J/G-K)
380	0.00	0.92536	0.00000	499.9	5032.8	2.8533	14.7029	0.251450-03	0.172440-04	0.191510-04	1.3793	1.2420
390	0.00	0.92304	0.00000	513.7	5011.5	2.8890	14.4218	0.252360-03	0.173620-04	0.193460-04	1.3746	1.2336
400	0.00	0.92071	0.00000	527.4	5020.1	2.9238	14.1555	0.253270-03	0.174820-04	0.195440-04	1.3699	1.2254
410	0.00	0.91837	0.00000	541.1	5028.6	2.9575	13.9028	0.254190-03	0.176030-04	0.197440-04	1.3653	1.2173
420	0.00	0.91604	0.00000	554.7	5037.1	2.9904	13.6627	0.255100-03	0.177250-04	0.199470-04	1.3608	1.2093
430	0.00	0.91370	0.00000	568.3	5045.4	3.0224	13.4343	0.256020-03	0.178490-04	0.201530-04	1.3564	1.2013
440	0.00	0.91136	0.00000	581.8	5053.7	3.0535	13.2169	0.256940-03	0.179730-04	0.203610-04	1.3521	1.1935
450	0.00	0.90902	0.00000	595.3	5061.9	3.0838	13.0095	0.257860-03	0.180980-04	0.205720-04	1.3479	1.1858
460	0.00	0.90667	0.00000	608.8	5069.9	3.1136	12.8116	0.258780-03	0.182240-04	0.207860-04	1.3438	1.1782
470	0.00	0.90432	0.00000	622.2	5077.9	3.1423	12.6224	0.259700-03	0.183520-04	0.210030-04	1.3398	1.1707
480	0.00	0.90197	0.00000	635.6	5085.7	3.1704	12.4415	0.260630-03	0.184800-04	0.212220-04	1.3358	1.1632
490	0.00	0.89962	0.00000	648.9	5093.4	3.1979	12.2683	0.261550-03	0.186100-04	0.214450-04	1.3320	1.1559
500	0.00	0.89727	0.00000	662.2	5101.0	3.2248	12.1023	0.262480-03	0.187410-04	0.216700-04	1.3282	1.1487
510	0.00	0.89491	0.00000	675.5	5108.4	3.2511	11.9430	0.263410-03	0.188730-04	0.218980-04	1.3246	1.1416
520	0.00	0.89255	0.00000	688.7	5115.6	3.2768	11.7901	0.264340-03	0.190060-04	0.221290-04	1.3210	1.1346
530	0.00	0.89019	0.00000	701.9	5122.8	3.3019	11.6431	0.265270-03	0.191410-04	0.223630-04	1.3175	1.1277
540	0.00	0.88783	0.00000	715.1	5129.7	3.3265	11.5018	0.266210-03	0.192770-04	0.226000-04	1.3142	1.1209
550	0.00	0.88547	0.00000	728.2	5136.6	3.3506	11.3658	0.267150-03	0.194140-04	0.228400-04	1.3109	1.1142
560	0.00	0.88310	0.00000	741.3	5143.2	3.3742	11.2348	0.268090-03	0.195520-04	0.230830-04	1.3077	1.1076
570	0.00	0.88073	0.00000	754.3	5149.7	3.3973	11.1085	0.269030-03	0.196910-04	0.233290-04	1.3046	1.1011
580	0.00	0.87836	0.00000	767.4	5156.1	3.4199	10.9867	0.269970-03	0.198320-04	0.235790-04	1.3016	1.0947
590	0.00	0.87599	0.00000	780.4	5162.3	3.4422	10.8691	0.270910-03	0.199740-04	0.238310-04	1.2986	1.0885
600	0.00	0.87361	0.00000	793.3	5168.3	3.4640	10.7555	0.271860-03	0.201180-04	0.240870-04	1.2958	1.0823
610	0.00	0.87124	0.00000	806.3	5174.2	3.4854	10.6458	0.272810-03	0.202620-04	0.243460-04	1.2931	1.0762
620	0.00	0.86886	0.00000	819.2	5179.9	3.5064	10.5397	0.273760-03	0.204090-04	0.246080-04	1.2904	1.0702
630	0.00	0.86648	0.00000	832.1	5185.4	3.5270	10.4370	0.274710-03	0.205560-04	0.248730-04	1.2879	1.0644
640	0.00	0.86410	0.00000	845.0	5190.8	3.5472	10.3377	0.275660-03	0.207050-04	0.251420-04	1.2854	1.0586

PROPERTIES OF SATURATED SODIUM

TSAT (K)	PSAT (ATM)	RHOL (G/CC)	RHOV (G/CC)	HLIQ (J/G)	HVAP (J/G)	SLIQ (J/G-K)	SVAP (J/G-K)	ALPHAP (K-1)	BETAS (ATM-1)	BETAT (ATM-1)	CP (J/G-K)	CV (J/G-K)
650	0.00	0.86172	0.00000	857.8	5196.1	3.5672	10.2415	0.276620-03	0.208550-04	0.254140-04	1.2831	1.0530
660	0.00	0.85933	0.00000	870.6	5231.2	3.5867	10.1482	0.277570-03	0.210070-04	0.256890-04	1.2808	1.0474
670	0.00	0.85695	0.00000	883.4	5206.2	3.6060	10.0578	0.278530-03	0.211610-04	0.259670-04	1.2786	1.0420
680	0.00	0.85456	0.00000	896.2	5211.0	3.6249	9.9702	0.279490-03	0.213160-04	0.262500-04	1.2765	1.0366
690	0.00	0.85217	0.00000	909.0	5215.7	3.6435	9.8852	0.280460-03	0.214720-04	0.265350-04	1.2746	1.0314
700	0.00	0.84978	0.00000	921.7	5220.3	3.6618	9.8026	0.281420-03	0.216300-04	0.268240-04	1.2727	1.0262
710	0.00	0.84739	0.00000	934.4	5224.7	3.6799	9.7225	0.282390-03	0.217890-04	0.271160-04	1.2708	1.0212
720	0.00	0.84499	0.00000	947.1	5229.0	3.6976	9.6447	0.283360-03	0.219500-04	0.274120-04	1.2691	1.0162
730	0.00	0.84260	0.00000	959.8	5233.2	3.7151	9.5691	0.284330-03	0.221130-04	0.277120-04	1.2675	1.0114
740	0.00	0.84020	0.00000	972.5	5237.3	3.7324	9.4956	0.285300-03	0.222770-04	0.280150-04	1.2660	1.0067
750	0.00	0.83780	0.00000	985.1	5241.3	3.7493	9.4242	0.286280-03	0.224430-04	0.283220-04	1.2645	1.0021
760	0.00	0.83541	0.00000	997.8	5245.1	3.7661	9.3548	0.287250-03	0.226110-04	0.286320-04	1.2632	0.9975
770	0.00	0.83300	0.00000	1010.4	5248.9	3.7826	9.2872	0.288230-03	0.227800-04	0.289460-04	1.2619	0.9931
780	0.01	0.83060	0.00000	1023.0	5252.6	3.7989	9.2215	0.289210-03	0.229510-04	0.292640-04	1.2608	0.9888
790	0.01	0.82820	0.00000	1035.6	5256.2	3.8149	9.1575	0.290200-03	0.231240-04	0.295850-04	1.2597	0.9846
800	0.01	0.82580	0.00000	1048.2	5259.8	3.8308	9.0953	0.291180-03	0.232980-04	0.299100-04	1.2587	0.9805
810	0.01	0.82339	0.00000	1060.8	5263.3	3.8464	9.0346	0.292170-03	0.234750-04	0.302390-04	1.2578	0.9765
820	0.01	0.82099	0.00000	1073.3	5266.7	3.8618	8.9756	0.293160-03	0.236530-04	0.305720-04	1.2571	0.9725
830	0.02	0.81858	0.00001	1085.9	5270.0	3.8770	8.9181	0.294150-03	0.238330-04	0.309090-04	1.2564	0.9687
840	0.02	0.81617	0.00001	1098.5	5273.3	3.8921	8.8621	0.295150-03	0.240150-04	0.312490-04	1.2557	0.9650
850	0.02	0.81376	0.00001	1111.0	5276.5	3.9069	8.8075	0.296140-03	0.241990-04	0.315940-04	1.2552	0.9614
860	0.03	0.81135	0.00001	1123.6	5279.7	3.9216	8.7543	0.297140-03	0.243850-04	0.319420-04	1.2548	0.9579
870	0.03	0.80894	0.00001	1136.1	5282.9	3.9361	8.7025	0.298140-03	0.245730-04	0.322950-04	1.2545	0.9545
880	0.04	0.80653	0.00001	1148.7	5286.0	3.9505	8.6520	0.299150-03	0.247630-04	0.326510-04	1.2542	0.9512
890	0.04	0.80411	0.00001	1161.2	5289.1	3.9646	8.6027	0.300150-03	0.249550-04	0.330120-04	1.2541	0.9480
900	0.05	0.80170	0.00002	1173.8	5292.1	3.9786	8.5546	0.301160-03	0.251490-04	0.333760-04	1.2540	0.9449

PROPERTIES OF SATURATED SODIUM

TSAT (K)	PSAT (ATM)	RHOL (G/CC)	RHOV (G/CC)	HLIQ (J/G)	HVAP (J/G)	SLIQ (J/G-K)	SVAP (J/G-K)	ALPHAP (K-1)	BETAS (ATM-1)	BETAT (ATM-1)	CP (J/G-K)	CV (J/G-K)
910	0.06	0.79929	0.00002	1186.3	5295.2	3.9925	8.5077	0.30218D-03	0.25345D-04	0.33745D-04	1.2540	0.9419
920	0.07	0.79687	0.00002	1198.8	5298.2	4.0062	8.4620	0.30319D-03	0.25543D-04	0.34118D-04	1.2542	0.9390
930	0.08	0.79445	0.00002	1211.4	5301.2	4.0198	8.4174	0.30421D-03	0.25744D-04	0.34495D-04	1.2544	0.9362
940	0.09	0.79204	0.00003	1223.9	5304.2	4.0332	8.3739	0.30523D-03	0.25947D-04	0.34876D-04	1.2547	0.9335
950	0.10	0.78962	0.00003	1236.5	5307.2	4.0464	8.3314	0.30625D-03	0.26152D-04	0.35262D-04	1.2551	0.9308
960	0.12	0.78720	0.00004	1249.0	5310.1	4.0596	8.2899	0.30727D-03	0.26359D-04	0.35651D-04	1.2556	0.9283
970	0.13	0.78478	0.00004	1261.6	5313.1	4.0726	8.2494	0.30830D-03	0.26569D-04	0.36046D-04	1.2562	0.9259
980	0.15	0.78236	0.00005	1274.2	5316.1	4.0855	8.2099	0.30933D-03	0.26781D-04	0.36444D-04	1.2568	0.9236
990	0.17	0.77994	0.00005	1286.7	5319.1	4.0983	8.1713	0.31037D-03	0.26996D-04	0.36847D-04	1.2576	0.9214
1000	0.19	0.77752	0.00006	1299.3	5322.1	4.1109	8.1336	0.31140D-03	0.27213D-04	0.37255D-04	1.2585	0.9192
1010	0.22	0.77510	0.00007	1311.9	5325.0	4.1234	8.0968	0.31244D-03	0.27432D-04	0.37667D-04	1.2594	0.9172
1020	0.25	0.77268	0.00007	1324.5	5328.0	4.1358	8.0609	0.31349D-03	0.27655D-04	0.38084D-04	1.2604	0.9153
1030	0.28	0.77026	0.00008	1337.1	5331.0	4.1481	8.0257	0.31453D-03	0.27879D-04	0.38505D-04	1.2616	0.9134
1040	0.31	0.76784	0.00009	1349.7	5334.0	4.1603	7.9914	0.31558D-03	0.28107D-04	0.38931D-04	1.2628	0.9117
1050	0.35	0.76542	0.00010	1362.4	5337.0	4.1724	7.9578	0.31664D-03	0.28337D-04	0.39362D-04	1.2641	0.9100
1060	0.39	0.76299	0.00011	1375.0	5340.1	4.1844	7.9250	0.31770D-03	0.28570D-04	0.39797D-04	1.2655	0.9085
1070	0.43	0.76057	0.00012	1387.7	5343.1	4.1963	7.8929	0.31876D-03	0.28805D-04	0.40237D-04	1.2670	0.9070
1080	0.48	0.75815	0.00014	1400.4	5346.2	4.2081	7.8616	0.31982D-03	0.29044D-04	0.40683D-04	1.2686	0.9056
1090	0.53	0.75572	0.00015	1413.1	5349.2	4.2198	7.8309	0.32089D-03	0.29285D-04	0.41133D-04	1.2702	0.9044
1100	0.59	0.75330	0.00017	1425.8	5352.3	4.2314	7.8009	0.32196D-03	0.29530D-04	0.41588D-04	1.2720	0.9032
1110	0.65	0.75088	0.00018	1438.5	5355.4	4.2429	7.7716	0.32304D-03	0.29777D-04	0.42048D-04	1.2738	0.9021
1120	0.72	0.74845	0.00020	1451.3	5358.4	4.2544	7.7429	0.32412D-03	0.30028D-04	0.42514D-04	1.2758	0.9011
1130	0.80	0.74603	0.00022	1464.1	5361.5	4.2657	7.7148	0.32521D-03	0.30281D-04	0.42984D-04	1.2778	0.9002
1140	0.88	0.74361	0.00024	1476.9	5364.6	4.2770	7.6873	0.32630D-03	0.30538D-04	0.43460D-04	1.2799	0.8994
1150	0.96	0.74118	0.00026	1489.7	5368.4	4.2882	7.6610	0.32739D-03	0.30798D-04	0.43941D-04	1.2822	0.8987
1160	1.05	0.73876	0.00028	1502.5	5371.8	4.2993	7.6349	0.32848D-03	0.31061D-04	0.44427D-04	1.2845	0.8980

PROPERTIES OF SATURATED SODIUM

TSAT (K)	PSAT (ATM)	RHOL (G/CC)	RHOV (G/CC)	HLIQ (J/G)	HVAP (J/G)	SLIQ (J/G-K)	SVAP (J/G-K)	ALPHAP (K-1)	BETAS (ATM-1)	BETAT (ATM-1)	CP (J/G-K)	CV (J/G-K)
1170	1.15	0.73633	0.00031	1515.4	5375.3	4.3103	7.6094	0.32959D-03	0.31328D-04	0.44919D-04	1.2868	0.8975
1180	1.25	0.73391	0.00033	1528.3	5378.8	4.3213	7.5844	0.33069D-03	0.31598D-04	0.45416D-04	1.2893	0.8970
1190	1.36	0.73149	0.00036	1541.2	5382.2	4.3322	7.5600	0.33181D-03	0.31872D-04	0.45919D-04	1.2919	0.8967
1200	1.48	0.72907	0.00039	1554.1	5385.7	4.3430	7.5360	0.33292D-03	0.32149D-04	0.46428D-04	1.2946	0.8964
1210	1.61	0.72664	0.00042	1567.1	5389.2	4.3538	7.5125	0.33404D-03	0.32430D-04	0.46943D-04	1.2973	0.8962
1220	1.75	0.72422	0.00045	1580.1	5392.7	4.3645	7.4895	0.33517D-03	0.32714D-04	0.47463D-04	1.3002	0.8961
1230	1.89	0.72180	0.00049	1593.1	5396.1	4.3751	7.4670	0.33631D-03	0.33003D-04	0.47990D-04	1.3031	0.8961
1240	2.05	0.71938	0.00052	1606.2	5399.6	4.3857	7.4449	0.33744D-03	0.33295D-04	0.48522D-04	1.3061	0.8962
1250	2.21	0.71695	0.00056	1619.3	5403.1	4.3962	7.4232	0.33859D-03	0.33591D-04	0.49060D-04	1.3092	0.8964
1260	2.39	0.71453	0.00060	1632.4	5406.5	4.4066	7.4020	0.33974D-03	0.33891D-04	0.49605D-04	1.3124	0.8967
1270	2.58	0.71211	0.00065	1645.5	5410.0	4.4170	7.3811	0.34089D-03	0.34195D-04	0.50156D-04	1.3157	0.8970
1280	2.77	0.70969	0.00069	1658.7	5413.4	4.4274	7.3607	0.34205D-03	0.34504D-04	0.50714D-04	1.3191	0.8975
1290	2.98	0.70727	0.00074	1672.0	5416.8	4.4377	7.3406	0.34322D-03	0.34817D-04	0.51278D-04	1.3226	0.8980
1300	3.20	0.70485	0.00079	1685.2	5420.2	4.4479	7.3209	0.34440D-03	0.35134D-04	0.51849D-04	1.3261	0.8986
1310	3.44	0.70243	0.00084	1698.5	5423.5	4.4581	7.3016	0.34558D-03	0.35455D-04	0.52426D-04	1.3298	0.8993
1320	3.68	0.70001	0.00090	1711.9	5426.9	4.4682	7.2826	0.34676D-03	0.35781D-04	0.53010D-04	1.3335	0.9001
1330	3.94	0.69760	0.00096	1725.2	5430.2	4.4783	7.2640	0.34796D-03	0.36112D-04	0.53602D-04	1.3374	0.9010
1340	4.21	0.69518	0.00102	1738.6	5433.5	4.4884	7.2457	0.34916D-03	0.36448D-04	0.54200D-04	1.3413	0.9020
1350	4.50	0.69276	0.00108	1752.1	5436.7	4.4984	7.2277	0.35037D-03	0.36788D-04	0.54806D-04	1.3453	0.9030
1360	4.80	0.69035	0.00115	1765.6	5440.0	4.5083	7.2100	0.35158D-03	0.37133D-04	0.55419D-04	1.3494	0.9042
1370	5.12	0.68793	0.00122	1779.1	5443.1	4.5182	7.1927	0.35280D-03	0.37484D-04	0.56039D-04	1.3536	0.9054
1380	5.46	0.68552	0.00129	1792.7	5446.3	4.5281	7.1756	0.35403D-03	0.37839D-04	0.56667D-04	1.3579	0.9067
1390	5.81	0.68310	0.00137	1806.3	5449.4	4.5379	7.1588	0.35527D-03	0.38200D-04	0.57303D-04	1.3623	0.9081
1400	6.17	0.68069	0.00145	1820.0	5452.5	4.5477	7.1424	0.35651D-03	0.38566D-04	0.57947D-04	1.3667	0.9096
1410	6.56	0.67828	0.00153	1833.7	5455.5	4.5575	7.1261	0.35777D-03	0.38938D-04	0.58599D-04	1.3713	0.9112
1420	6.96	0.67587	0.00162	1847.5	5458.5	4.5672	7.1102	0.35903D-03	0.39315D-04	0.59260D-04	1.3759	0.9129

PROPERTIES OF SATURATED SODIUM

TSAT (K)	PSAT (ATM)	RHOL (G/CC)	RHOV (G/CC)	HLIQ (J/G)	HVAP (J/G)	SLIQ (J/G-K)	SVAP (J/G-K)	ALPHAP (K-1)	BETAS (ATM-1)	BETAV (ATM-1)	CP (J/G-K)	CV (J/G-K)
1430	7.38	0.67346	0.00171	1861.3	5461.5	4.5769	7.0945	0.360300-03	0.396990-04	0.599280-04	1.3807	0.9146
1440	7.82	0.67105	0.00180	1875.2	5464.4	4.5866	7.0791	0.361580-03	0.400880-04	0.606050-04	1.3855	0.9165
1450	8.27	0.66864	0.00190	1889.1	5467.2	4.5962	7.0639	0.362860-03	0.404830-04	0.612910-04	1.3904	0.9184
1460	8.75	0.66624	0.00200	1903.1	5470.0	4.6058	7.0489	0.364160-03	0.408850-04	0.619860-04	1.3954	0.9204
1470	9.25	0.66383	0.00210	1917.1	5472.8	4.6153	7.0342	0.365460-03	0.412920-04	0.626900-04	1.4006	0.9225
1480	9.77	0.66143	0.00221	1931.1	5475.5	4.6249	7.0197	0.366770-03	0.417070-04	0.634040-04	1.4058	0.9247
1490	10.31	0.65902	0.00233	1945.3	5478.2	4.6344	7.0055	0.368100-03	0.421280-04	0.641260-04	1.4110	0.9270
1500	10.87	0.65662	0.00244	1959.4	5480.8	4.6439	6.9914	0.369430-03	0.425560-04	0.648590-04	1.4164	0.9294
1510	11.45	0.65422	0.00257	1973.7	5483.4	4.6533	6.9776	0.370770-03	0.429900-04	0.656010-04	1.4219	0.9318
1520	12.06	0.65182	0.00269	1988.0	5485.9	4.6627	6.9640	0.372120-03	0.434320-04	0.663540-04	1.4275	0.9344
1530	12.69	0.64942	0.00282	2002.3	5488.4	4.6721	6.9506	0.373480-03	0.438820-04	0.671170-04	1.4331	0.9370
1540	13.34	0.64703	0.00296	2016.7	5490.8	4.6815	6.9374	0.374850-03	0.443390-04	0.678900-04	1.4389	0.9397
1550	14.02	0.64463	0.00310	2031.2	5493.1	4.6909	6.9244	0.376230-03	0.448030-04	0.686750-04	1.4447	0.9425
1560	14.72	0.64224	0.00324	2045.7	5495.5	4.7002	6.9116	0.377630-03	0.452760-04	0.694700-04	1.4507	0.9454
1570	15.44	0.63985	0.00339	2060.3	5497.8	4.7095	6.8990	0.379030-03	0.457560-04	0.702770-04	1.4567	0.9484
1580	16.20	0.63745	0.00354	2074.9	5500.0	4.7188	6.8866	0.380440-03	0.462450-04	0.710950-04	1.4628	0.9515
1590	16.98	0.63506	0.00370	2089.6	5502.2	4.7281	6.8743	0.381870-03	0.467430-04	0.719250-04	1.4691	0.9547
1600	17.78	0.63268	0.00387	2104.4	5504.3	4.7373	6.8623	0.383310-03	0.472490-04	0.727670-04	1.4754	0.9580
1610	18.61	0.63029	0.00404	2119.2	5506.4	4.7466	6.8504	0.384750-03	0.477640-04	0.736220-04	1.4818	0.9614
1620	19.47	0.62790	0.00421	2134.1	5508.5	4.7558	6.8387	0.386210-03	0.482890-04	0.744900-04	1.4883	0.9648
1630	20.36	0.62552	0.00439	2149.1	5510.5	4.7650	6.8272	0.387690-03	0.488230-04	0.753700-04	1.4949	0.9684
1640	21.28	0.62314	0.00457	2164.1	5512.5	4.7742	6.8159	0.389170-03	0.493670-04	0.762640-04	1.5016	0.9720
1650	22.22	0.62076	0.00478	2179.2	5514.4	4.7833	6.8047	0.391680-03	0.499210-04	0.773520-04	1.5063	0.9722
1660	23.20	0.61837	0.00498	2194.3	5516.4	4.7924	6.7936	0.395010-03	0.504850-04	0.785960-04	1.5098	0.9698
1670	24.20	0.61597	0.00518	2209.5	5518.3	4.8014	6.7827	0.398390-03	0.510600-04	0.798720-04	1.5133	0.9674
1680	25.24	0.61356	0.00540	2224.7	5520.2	4.8104	6.7720	0.401840-03	0.516460-04	0.811810-04	1.5169	0.9650

PROPERTIES OF SATURATED SODIUM

TSAT (K)	PSAT (ATM)	RHOL (G/CC)	RHOV (G/CC)	HLIQ (J/G)	HVAP (J/G)	SLIQ (J/G-K)	SVAP (J/G-K)	ALPHAP (K-1)	BETAS (ATM-1)	BETAT (ATM-1)	CP (J/G-K)	CV (J/G-K)
1690	26.31	0.61114	0.00562	2239.9	5522.1	4.8193	6.7614	0.405360-03	0.522430-04	0.825230-04	1.5205	0.9626
1700	27.42	0.60871	0.00584	2255.2	5523.9	4.8282	6.7510	0.408950-03	0.528510-04	0.839000-04	1.5243	0.9602
1710	28.55	0.60628	0.00608	2270.5	5525.7	4.8371	6.7407	0.412610-03	0.534720-04	0.853140-04	1.5280	0.9577
1720	29.72	0.60383	0.00632	2285.9	5527.5	4.8459	6.7306	0.416340-03	0.541050-04	0.867650-04	1.5319	0.9553
1730	30.93	0.60137	0.00656	2301.3	5529.2	4.8547	6.7206	0.420150-03	0.547500-04	0.882550-04	1.5358	0.9528
1740	32.17	0.59891	0.00682	2316.7	5530.9	4.8635	6.7107	0.424040-03	0.554080-04	0.897850-04	1.5398	0.9503
1750	33.44	0.59643	0.00708	2332.2	5532.5	4.8722	6.7010	0.428010-03	0.560800-04	0.913570-04	1.5439	0.9477
1760	34.75	0.59394	0.00735	2347.7	5534.1	4.8810	6.6914	0.432060-03	0.567650-04	0.929730-04	1.5481	0.9452
1770	36.10	0.59144	0.00763	2363.2	5535.7	4.8896	6.6820	0.436200-03	0.574650-04	0.946340-04	1.5523	0.9426
1780	37.49	0.58893	0.00791	2378.8	5537.2	4.8983	6.6726	0.440430-03	0.581800-04	0.963430-04	1.5566	0.9400
1790	38.91	0.58642	0.00820	2394.5	5538.7	4.9069	6.6634	0.444750-03	0.589090-04	0.981000-04	1.5611	0.9374
1800	40.37	0.58388	0.00850	2410.2	5540.1	4.9155	6.6544	0.449160-03	0.596550-04	0.999080-04	1.5656	0.9348
1810	41.87	0.58134	0.00881	2425.9	5541.5	4.9241	6.6454	0.453670-03	0.604160-04	0.101770-03	1.5702	0.9322
1820	43.41	0.57879	0.00913	2441.7	5542.8	4.9326	6.6366	0.458280-03	0.611940-04	0.103680-03	1.5749	0.9295
1830	44.99	0.57622	0.00945	2457.5	5544.1	4.9411	6.6278	0.463000-03	0.619890-04	0.105660-03	1.5797	0.9268
1840	46.61	0.57365	0.00978	2473.3	5545.4	4.9496	6.6192	0.467830-03	0.628020-04	0.107690-03	1.5847	0.9241
1850	48.27	0.57106	0.01013	2489.3	5546.6	4.9581	6.6107	0.472760-03	0.636340-04	0.109790-03	1.5897	0.9214
1860	49.97	0.56846	0.01048	2505.2	5547.7	4.9665	6.6023	0.477820-03	0.644850-04	0.111950-03	1.5949	0.9187
1870	51.72	0.56585	0.01084	2521.2	5548.8	4.9749	6.5940	0.482990-03	0.653550-04	0.114170-03	1.6002	0.9160
1880	53.50	0.56322	0.01121	2537.3	5549.9	4.9833	6.5858	0.488290-03	0.662460-04	0.116470-03	1.6056	0.9132
1890	55.33	0.56058	0.01159	2553.4	5550.9	4.9917	6.5777	0.493710-03	0.671570-04	0.118840-03	1.6111	0.9104
1900	57.21	0.55793	0.01197	2569.5	5551.8	5.0001	6.5697	0.499270-03	0.680910-04	0.121290-03	1.6168	0.9076
1910	59.12	0.55527	0.01237	2585.8	5552.7	5.0084	6.5618	0.504970-03	0.690470-04	0.123820-03	1.6226	0.9048
1920	61.09	0.55259	0.01278	2602.0	5553.6	5.0167	6.5540	0.510810-03	0.700270-04	0.126440-03	1.6286	0.9020
1930	63.09	0.54990	0.01320	2618.3	5554.4	5.0250	6.5462	0.516800-03	0.710320-04	0.129140-03	1.6347	0.8992
1940	65.15	0.54720	0.01362	2634.7	5555.1	5.0332	6.5386	0.522950-03	0.720610-04	0.131930-03	1.6410	0.8963

PROPERTIES OF SATURATED SODIUM

TSAT (K)	PSAT (ATM)	RHOL (G/CC)	RHOV (G/CC)	HLIQ (J/G)	HVAP (J/G)	SLIQ (J/G-K)	SVAP (J/G-K)	ALPHAP (K-1)	BETAS (ATM-1)	BETAT (ATM-1)	CP (J/G-K)	CV (J/G-K)
1950	67.25	0.54448	0.01406	2651.2	5555.8	5.0415	6.5311	0.529250-03	0.731170-04	0.134820-03	1.6474	0.8934
1960	69.39	0.54174	0.01451	2667.6	5556.4	5.0497	6.5236	0.535730-03	0.742010-04	0.137810-03	1.6540	0.8906
1970	71.58	0.53900	0.01497	2684.2	5557.0	5.0579	6.5162	0.542380-03	0.753120-04	0.140910-03	1.6608	0.8877
1980	73.82	0.53623	0.01544	2700.8	5557.5	5.0661	6.5089	0.549210-03	0.764540-04	0.144120-03	1.6678	0.8847
1990	76.11	0.53346	0.01593	2717.5	5557.9	5.0743	6.5017	0.556230-03	0.776250-04	0.147450-03	1.6750	0.8818
2000	78.45	0.53066	0.01642	2734.2	5558.3	5.0825	6.4945	0.563450-03	0.788300-04	0.150890-03	1.6824	0.8789
2010	80.83	0.52785	0.01693	2751.0	5558.6	5.0906	6.4874	0.570870-03	0.800670-04	0.154470-03	1.6900	0.8760
2020	83.27	0.52503	0.01744	2767.9	5558.9	5.0988	6.4804	0.578500-03	0.813390-04	0.158190-03	1.6978	0.8730
2030	85.76	0.52219	0.01797	2784.8	5559.0	5.1069	6.4735	0.586360-03	0.826470-04	0.162040-03	1.7058	0.8700
2040	88.29	0.51933	0.01851	2801.8	5559.2	5.1150	6.4666	0.594460-03	0.839930-04	0.166050-03	1.7141	0.8671
2050	90.88	0.51646	0.01907	2818.9	5559.2	5.1231	6.4598	0.602790-03	0.853780-04	0.170210-03	1.7227	0.8641
2060	93.52	0.51356	0.01964	2836.0	5559.2	5.1312	6.4531	0.611390-03	0.868040-04	0.174550-03	1.7315	0.8611
2070	96.20	0.51065	0.02022	2853.2	5559.1	5.1393	6.4464	0.620250-03	0.882740-04	0.179060-03	1.7406	0.8581
2080	98.95	0.50773	0.02081	2870.5	5558.9	5.1473	6.4398	0.629390-03	0.897880-04	0.183750-03	1.7500	0.8551
2090	101.74	0.50478	0.02142	2887.9	5558.6	5.1554	6.4333	0.638830-03	0.913500-04	0.188650-03	1.7597	0.8521
2100	104.59	0.50181	0.02204	2905.3	5558.3	5.1635	6.4268	0.648570-03	0.929610-04	0.193750-03	1.7697	0.8491
2110	107.49	0.49883	0.02268	2922.9	5557.9	5.1715	6.4203	0.658640-03	0.946240-04	0.199070-03	1.7801	0.8461
2120	110.44	0.49582	0.02333	2940.5	5557.4	5.1795	6.4139	0.669050-03	0.963400-04	0.204630-03	1.7908	0.8431
2130	113.45	0.49280	0.02399	2958.2	5556.8	5.1876	6.4076	0.679810-03	0.981140-04	0.210440-03	1.8019	0.8401
2140	116.52	0.48975	0.02467	2976.0	5556.1	5.1956	6.4013	0.690960-03	0.999480-04	0.216510-03	1.8134	0.8371
2150	119.64	0.48669	0.02537	2993.8	5555.4	5.2036	6.3951	0.702500-03	0.101840-03	0.222860-03	1.8254	0.8341
2160	122.81	0.48360	0.02608	3011.8	5554.5	5.2117	6.3889	0.714450-03	0.103810-03	0.229520-03	1.8377	0.8312
2170	126.04	0.48049	0.02681	3029.9	5553.6	5.2197	6.3827	0.726850-03	0.105840-03	0.236490-03	1.8505	0.8282
2180	129.33	0.47735	0.02755	3048.0	5552.5	5.2277	6.3766	0.739720-03	0.107950-03	0.243800-03	1.8638	0.8252
2190	132.67	0.47420	0.02831	3066.3	5551.4	5.2358	6.3705	0.753080-03	0.110130-03	0.251470-03	1.8777	0.8223
2200	136.07	0.47101	0.02909	3084.6	5550.1	5.2438	6.3645	0.766970-03	0.112390-03	0.259540-03	1.8921	0.8194

PROPERTIES OF SATURATED SODIUM

TSAT (K)	PSAT (ATM)	RHOL (G/CC)	RHOV (G/CC)	HLIQ (J/G)	HVAP (J/G)	SLIQ (J/G-K)	SVAP (J/G-K)	ALPHAP (K-1)	BETAS (ATM-1)	BETAT (ATM-1)	CP (J/G-K)	CV (J/G-K)
2210	139.53	0.46781	0.02989	3103.1	5548.8	5.2518	6.3585	0.781410-03	0.114750-03	0.268010-03	1.9070	0.8165
2220	143.05	0.46458	0.03070	3121.7	5547.3	5.2599	6.3525	0.796430-03	0.117190-03	0.276940-03	1.9226	0.8136
2230	146.62	0.46132	0.03154	3140.4	5545.7	5.2679	6.3466	0.812090-03	0.119730-03	0.286340-03	1.9389	0.8107
2240	150.25	0.45804	0.03239	3159.2	5544.0	5.2760	6.3406	0.828410-03	0.122380-03	0.296250-03	1.9558	0.8079
2250	153.94	0.45473	0.03326	3178.1	5542.2	5.2840	6.3348	0.845440-03	0.125130-03	0.306720-03	1.9735	0.8051
2260	157.69	0.45139	0.03415	3197.1	5540.3	5.2921	6.3289	0.863220-03	0.128000-03	0.317780-03	1.9920	0.8023
2270	161.51	0.44802	0.03507	3216.3	5538.2	5.3002	6.3231	0.881820-03	0.130990-03	0.329480-03	2.0113	0.7996
2280	165.38	0.44462	0.03600	3235.6	5536.0	5.3083	6.3173	0.901280-03	0.134120-03	0.341880-03	2.0315	0.7970
2290	169.31	0.44119	0.03696	3255.1	5533.7	5.3164	6.3115	0.921660-03	0.137390-03	0.355030-03	2.0527	0.7944
2300	173.30	0.43773	0.03794	3274.7	5531.2	5.3246	6.3057	0.943040-03	0.140800-03	0.369000-03	2.0750	0.7918
2310	177.35	0.43423	0.03894	3294.4	5528.6	5.3327	6.2999	0.965500-03	0.144380-03	0.383850-03	2.0984	0.7893
2320	181.46	0.43070	0.03996	3314.3	5525.8	5.3409	6.2941	0.989110-03	0.148140-03	0.399670-03	2.1229	0.7869
2330	185.64	0.42714	0.04102	3334.3	5522.9	5.3491	6.2884	0.101400-02	0.152080-03	0.416530-03	2.1488	0.7845
2340	189.88	0.42354	0.04209	3354.6	5519.8	5.3573	6.2826	0.104020-02	0.156220-03	0.434550-03	2.1761	0.7823
2350	194.17	0.41990	0.04320	3374.9	5516.5	5.3656	6.2769	0.106780-02	0.160570-03	0.453840-03	2.2049	0.7801
2360	198.54	0.41622	0.04433	3395.5	5513.1	5.3738	6.2711	0.109710-02	0.165160-03	0.474500-03	2.2353	0.7781
2370	202.96	0.41250	0.04548	3416.3	5509.4	5.3822	6.2654	0.112800-02	0.170010-03	0.496690-03	2.2675	0.7761
2380	207.45	0.40874	0.04667	3437.2	5505.6	5.3905	6.2596	0.116090-02	0.175120-03	0.520560-03	2.3018	0.7743
2390	212.00	0.40493	0.04789	3458.3	5501.6	5.3989	6.2538	0.119580-02	0.180540-03	0.546290-03	2.3381	0.7727
2400	216.61	0.40108	0.04914	3479.7	5497.3	5.4073	6.2480	0.123300-02	0.186280-03	0.574090-03	2.3767	0.7712
2410	221.29	0.39718	0.05043	3501.3	5492.8	5.4158	6.2422	0.127260-02	0.192370-03	0.604200-03	2.4180	0.7699
2420	226.03	0.39323	0.05174	3523.1	5488.1	5.4243	6.2363	0.131500-02	0.198860-03	0.636870-03	2.4620	0.7687
2430	230.84	0.38923	0.05310	3545.2	5483.2	5.4329	6.2305	0.136050-02	0.205770-03	0.672420-03	2.5092	0.7678
2440	235.71	0.38517	0.05449	3567.5	5478.0	5.4416	6.2246	0.140930-02	0.213160-03	0.711210-03	2.5598	0.7672
2450	240.65	0.38106	0.05592	3590.1	5472.5	5.4503	6.2186	0.146190-02	0.221070-03	0.753660-03	2.6142	0.7668
2460	245.65	0.37688	0.05739	3612.9	5466.8	5.4590	6.2126	0.151870-02	0.229550-03	0.800270-03	2.6730	0.7667

PROPERTIES OF SATURATED SODIUM

TSAT (K)	PSAT (ATM)	RHOL (G/CC)	RHOV (G/CC)	HLIQ (J/G)	HVAP (J/G)	SLIQ (J/G-K)	SVAP (J/G-K)	ALPHAP (K-1)	BETAS (ATM-1)	BETAT (ATM-1)	CP (J/G-K)	CV (J/G-K)
2470	250.72	0.37265	0.05890	3636.1	5460.7	5.4679	6.2066	0.15803D-02	0.23868D-03	0.85160D-03	2.7366	0.7670
2480	255.85	0.36834	0.06046	3659.6	5454.3	5.4768	6.2005	0.16473D-02	0.24854D-03	0.90835D-03	2.8057	0.7677
2490	261.05	0.36397	0.06207	3683.5	5447.6	5.4858	6.1943	0.17203D-02	0.25920D-03	0.97134D-03	2.8809	0.7688
2500	266.32	0.35952	0.06373	3707.7	5440.5	5.4950	6.1881	0.18004D-02	0.27078D-03	0.10415D-02	2.9632	0.7704
2510	271.65	0.35499	0.06544	3732.3	5433.0	5.5042	6.1817	0.18884D-02	0.28340D-03	0.11202D-02	3.0535	0.7725
2520	277.05	0.35037	0.06721	3757.3	5425.1	5.5135	6.1753	0.19858D-02	0.29721D-03	0.12086D-02	3.1531	0.7754
2530	282.51	0.34567	0.06904	3782.8	5416.7	5.5230	6.1688	0.20940D-02	0.31237D-03	0.13088D-02	3.2635	0.7789
2540	288.04	0.34087	0.07094	3808.7	5407.9	5.5326	6.1621	0.22148D-02	0.32910D-03	0.14228D-02	3.3865	0.7833
2550	293.64	0.33597	0.07290	3835.2	5398.5	5.5423	6.1554	0.23508D-02	0.34767D-03	0.15535D-02	3.5245	0.7888
2560	299.31	0.33095	0.07494	3862.3	5388.5	5.5522	6.1484	0.25048D-02	0.36838D-03	0.17045D-02	3.6802	0.7954
2570	305.04	0.32582	0.07707	3890.0	5378.0	5.5623	6.1413	0.26806D-02	0.39163D-03	0.18805D-02	3.8574	0.8034
2580	310.85	0.32055	0.07928	3918.3	5366.7	5.5726	6.1340	0.28831D-02	0.41792D-03	0.20874D-02	4.0508	0.8130
2590	316.72	0.31514	0.08160	3947.4	5354.7	5.5832	6.1265	0.31190D-02	0.44789D-03	0.23335D-02	4.2965	0.8247
2600	322.65	0.30957	0.08402	3977.4	5341.9	5.5940	6.1188	0.33969D-02	0.48236D-03	0.26298D-02	4.5729	0.8388
2610	328.66	0.30382	0.08656	4008.3	5328.1	5.6051	6.1107	0.37291D-02	0.52244D-03	0.29920D-02	4.9015	0.8559
2620	334.74	0.29788	0.08925	4040.3	5313.2	5.6165	6.1024	0.41326D-02	0.56961D-03	0.34423D-02	5.2985	0.8768
2630	340.88	0.29172	0.09208	4073.5	5297.1	5.6284	6.0936	0.46328D-02	0.62594D-03	0.40138D-02	5.7874	0.9025
2640	347.09	0.28531	0.09510	4108.1	5279.6	5.6407	6.0844	0.52682D-02	0.69439D-03	0.47577D-02	6.4039	0.9346
2650	353.37	0.27861	0.09833	4144.4	5260.4	5.6535	6.0747	0.61002D-02	0.77932D-03	0.57571D-02	7.2050	0.9753
2660	359.73	0.27156	0.10182	4182.7	5239.3	5.6671	6.0643	0.72338D-02	0.88753D-03	0.71550D-02	8.2865	1.0279
2670	366.15	0.26411	0.10561	4223.4	5215.7	5.6814	6.0531	0.88623D-02	0.10301D-02	0.92191D-02	9.8248	1.0978
2680	372.64	0.25615	0.10981	4267.2	5189.0	5.6969	6.0408	0.11384D-01	0.12264D-02	0.12508D-01	12.1788	1.1942
2690	379.20	0.24754	0.11453	4315.0	5158.3	5.7137	6.0272	0.15764D-01	0.15141D-02	0.18393D-01	16.2115	1.3345
2700	385.83	0.23806	0.12002	4368.5	5121.8	5.7325	6.0115	0.25059D-01	0.19761D-02	0.31278D-01	24.6290	1.5560
2733	408.20	0.18180	0.18180	4773.4	4773.4							

APPENDIX C

Tabulation of Subcooled-liquid Sodium Properties

<u>Property</u>	<u>Symbol</u>	<u>Units</u>
Temperature	T	°K
Pressure	P	atm
Density	RHOL	g/cm ³
Enthalpy	HLIQ	J/g
Entropy	SLIQ	J/g-°K
Thermal-expansion Coefficient	ALPHAP	°K ⁻¹
Adiabatic Compressibility	BETAS	atm ⁻¹
Isothermal Compressibility	BETAT	atm ⁻¹
Constant-pressure Specific Heat	CP	J/g-°K

SJ3COOLED SODIUM LIQUID PROPERTIES AT T = 400.0 DEG K

P (ATM)	RHOL (G/CC)	HLIQ (J/G)	SLIQ (J/G-K)	ALPHAP (K-1)	BETAS (ATM-1)	BETAT (ATM-1)	CP (J/G-K)
0.0	0.92071	527.4	2.9238	0.25327D-03	0.17482D-04	0.19544D-04	1.3699
100.0	0.92250	537.3	2.9210	0.25131D-03	0.17268D-04	0.19295D-04	1.3692
200.0	0.92427	547.2	2.9183	0.24940D-03	0.17060D-04	0.19053D-04	1.3686
300.0	0.92602	557.0	2.9155	0.24753D-03	0.16857D-04	0.18818D-04	1.3679

SJBCOOLED SODIUM LIQUID PROPERTIES AT T = 500.0 DEG K

P (ATM)	RHOL (G/CC)	HLIQ (J/G)	SLIQ (J/G-K)	ALPHAP (K-1)	BETAS (ATM-1)	BETAT (ATM-1)	CP (J/G-K)
0.0	0.89727	662.2	3.2248	0.26248D-03	0.18741D-04	0.21670D-04	1.3282
100.0	0.89920	672.0	3.2219	0.26024D-03	0.18489D-04	0.21364D-04	1.3273
200.0	0.90111	681.8	3.2189	0.25807D-03	0.18244D-04	0.21067D-04	1.3265
300.0	0.90300	691.6	3.2161	0.25596D-03	0.18007D-04	0.20780D-04	1.3256
400.0	0.90486	701.4	3.2132	0.25390D-03	0.17777D-04	0.20501D-04	1.3248
500.0	0.90671	711.2	3.2104	0.25189D-03	0.17553D-04	0.20231D-04	1.3240
600.0	0.90853	720.9	3.2076	0.24994D-03	0.17336D-04	0.19969D-04	1.3232
700.0	0.91034	730.7	3.2048	0.24804D-03	0.17125D-04	0.19714D-04	1.3224
800.0	0.91212	740.4	3.2020	0.24618D-03	0.16919D-04	0.19466D-04	1.3216
900.0	0.91389	750.2	3.1993	0.24437D-03	0.16719D-04	0.19226D-04	1.3209
1000.0	0.91564	759.9	3.1966	0.24261D-03	0.16525D-04	0.18992D-04	1.3202
1100.0	0.91737	769.6	3.1940	0.24089D-03	0.16336D-04	0.18765D-04	1.3195
1200.0	0.91908	779.3	3.1913	0.23921D-03	0.16152D-04	0.18543D-04	1.3188
1300.0	0.92077	789.0	3.1887	0.23757D-03	0.15972D-04	0.18328D-04	1.3181
1400.0	0.92245	798.7	3.1861	0.23596D-03	0.15797D-04	0.18119D-04	1.3175
1500.0	0.92412	808.4	3.1835	0.23440D-03	0.15627D-04	0.17914D-04	1.3169
1600.0	0.92577	818.1	3.1809	0.23287D-03	0.15461D-04	0.17716D-04	1.3162
1700.0	0.92740	827.8	3.1784	0.23137D-03	0.15299D-04	0.17522D-04	1.3156

SUBCOOLED SODIUM LIQUID PROPERTIES AT T = 600.0 DEG K

P (ATM)	RHO L (G/CC)	H LIQ (J/G)	S LIQ (J/G-K)	ALPHA P (K-1)	BETA S (ATM-1)	BETA T (ATM-1)	CP (J/G-K)
0.0	0.87361	793.3	3.4640	0.271860-03	0.201180-04	0.240870-04	1.2958
100.0	0.87570	803.1	3.4608	0.269320-03	0.198220-04	0.237120-04	1.2947
200.0	0.87777	812.8	3.4577	0.266860-03	0.195360-04	0.233490-04	1.2935
300.0	0.87980	822.4	3.4547	0.264470-03	0.192590-04	0.229990-04	1.2925
400.0	0.88181	832.1	3.4516	0.262150-03	0.189910-04	0.226600-04	1.2914
500.0	0.88380	841.8	3.4486	0.259900-03	0.187300-04	0.223310-04	1.2904
600.0	0.88576	851.5	3.4457	0.257700-03	0.184780-04	0.220130-04	1.2894
700.0	0.8877	861.2	3.4427	0.255560-03	0.182330-04	0.217050-04	1.2884
800.0	0.88962	870.8	3.4398	0.253490-03	0.179950-04	0.214060-04	1.2874
900.0	0.89151	880.5	3.4370	0.251460-03	0.177640-04	0.211160-04	1.2865
1000.0	0.89338	890.1	3.4341	0.249490-03	0.175400-04	0.208350-04	1.2856
1100.0	0.89523	899.8	3.4313	0.247570-03	0.173220-04	0.205620-04	1.2847
1200.0	0.89706	909.4	3.4285	0.245700-03	0.171100-04	0.202970-04	1.2839
1300.0	0.89887	919.0	3.4258	0.243870-03	0.169040-04	0.200390-04	1.2830
1400.0	0.90067	928.6	3.4230	0.242090-03	0.167030-04	0.197890-04	1.2822
1500.0	0.90244	938.2	3.4203	0.240360-03	0.165080-04	0.195450-04	1.2814
1600.0	0.90419	947.9	3.4176	0.238660-03	0.163180-04	0.193090-04	1.2806
1700.0	0.90593	957.5	3.4150	0.237000-03	0.161330-04	0.190780-04	1.2799
1800.0	0.90765	967.0	3.4123	0.235390-03	0.159530-04	0.188540-04	1.2791
1900.0	0.90935	976.6	3.4097	0.233810-03	0.157770-04	0.186360-04	1.2784
2000.0	0.91104	986.2	3.4071	0.232270-03	0.156050-04	0.184230-04	1.2777
2500.0	0.91924	1034.0	3.3945	0.225050-03	0.148100-04	0.174380-04	1.2744
3000.0	0.92708	1081.5	3.3823	0.218570-03	0.141030-04	0.165670-04	1.2714

SUBCOOLED SODIUM LIQUID PROPERTIES AT T = 700.0 DEG K

P (ATM)	RHOL (G/CC)	HLIQ (J/G)	SLIQ (J/G-K)	ALPHAP (K-1)	BETAS (ATM-1)	BETAT (ATM-1)	CP (J/G-K)
0.0	0.84978	921.7	3.6618	0.28142D-03	0.21630D-04	0.26824D-04	1.2727
100.0	0.85204	931.3	3.6585	0.27856D-03	0.21285D-04	0.26366D-04	1.2712
200.0	0.85427	940.8	3.6552	0.27579D-03	0.20951D-04	0.25924D-04	1.2698
300.0	0.85647	950.4	3.6520	0.27310D-03	0.20629D-04	0.25498D-04	1.2685
400.0	0.85864	960.0	3.6488	0.27049D-03	0.20317D-04	0.25087D-04	1.2671
500.0	0.86078	969.5	3.6456	0.26796D-03	0.20015D-04	0.24689D-04	1.2659
600.0	0.86289	979.1	3.6424	0.26550D-03	0.19723D-04	0.24305D-04	1.2646
700.0	0.86498	988.7	3.6393	0.26311D-03	0.19440D-04	0.23933D-04	1.2634
800.0	0.86703	998.2	3.6363	0.26079D-03	0.19166D-04	0.23574D-04	1.2622
900.0	0.86906	1007.8	3.6332	0.25854D-03	0.18900D-04	0.23226D-04	1.2611
1000.0	0.87107	1017.3	3.6303	0.25634D-03	0.18642D-04	0.22888D-04	1.2600
1100.0	0.87305	1026.9	3.6273	0.25421D-03	0.18391D-04	0.22562D-04	1.2589
1200.0	0.87501	1036.4	3.6243	0.25213D-03	0.18148D-04	0.22245D-04	1.2579
1300.0	0.87694	1045.9	3.6214	0.25011D-03	0.17912D-04	0.21938D-04	1.2568
1400.0	0.87886	1055.5	3.6186	0.24814D-03	0.17683D-04	0.21640D-04	1.2559
1500.0	0.88075	1065.0	3.6157	0.24622D-03	0.17460D-04	0.21350D-04	1.2549
1600.0	0.88262	1074.5	3.6129	0.24434D-03	0.17243D-04	0.21069D-04	1.2539
1700.0	0.88447	1084.0	3.6101	0.24252D-03	0.17032D-04	0.20797D-04	1.2530
1800.0	0.88630	1093.5	3.6073	0.24074D-03	0.16827D-04	0.20531D-04	1.2521
1900.0	0.88811	1103.0	3.6046	0.23900D-03	0.16627D-04	0.20274D-04	1.2512
2000.0	0.88990	1112.5	3.6019	0.23731D-03	0.16433D-04	0.20023D-04	1.2504
2500.0	0.89859	1159.9	3.5887	0.22940D-03	0.15533D-04	0.18866D-04	1.2464
3000.0	0.90687	1207.2	3.5760	0.22234D-03	0.14738D-04	0.17849D-04	1.2428
3500.0	0.91479	1254.3	3.5638	0.21600D-03	0.14032D-04	0.16950D-04	1.2396
4000.0	0.92238	1301.2	3.5521	0.21027D-03	0.13400D-04	0.16149D-04	1.2368

SUBCOOLED SODIUM LIQUID PROPERTIES AT T = 800.0 DEG K

P (ATM)	RHOL (G/CC)	HLIQ (J/G)	SLIQ (J/G-K)	ALPHAP (K-1)	BETAS (ATM-1)	BETAT (ATM-1)	CP (J/G-K)
0.0	0.82580	1048.2	3.8308	0.291180-03	0.232980-04	0.299100-04	1.2587
100.0	0.82825	1057.6	3.8272	0.287970-03	0.228970-04	0.293530-04	1.2570
200.0	0.83066	1067.0	3.8237	0.284850-03	0.225090-04	0.288180-04	1.2552
300.0	0.83303	1076.4	3.8203	0.281840-03	0.221360-04	0.283020-04	1.2536
400.0	0.83537	1085.9	3.8169	0.278930-03	0.217750-04	0.278050-04	1.2523
500.0	0.83768	1095.3	3.8135	0.276100-03	0.214260-04	0.273260-04	1.2504
600.0	0.83995	1104.7	3.8102	0.273360-03	0.210890-04	0.268630-04	1.2489
700.0	0.84219	1114.1	3.8069	0.270700-03	0.207630-04	0.264170-04	1.2475
800.0	0.84440	1123.6	3.8037	0.268120-03	0.204480-04	0.259860-04	1.2460
900.0	0.84658	1133.0	3.8005	0.265620-03	0.201420-04	0.255700-04	1.2447
1000.0	0.84873	1142.4	3.7973	0.263190-03	0.198470-04	0.251680-04	1.2433
1100.0	0.85086	1151.8	3.7942	0.260830-03	0.195600-04	0.247780-04	1.2420
1200.0	0.85295	1161.3	3.7911	0.258530-03	0.192820-04	0.244020-04	1.2408
1300.0	0.85502	1170.7	3.7880	0.256300-03	0.190130-04	0.240370-04	1.2396
1400.0	0.85706	1180.1	3.7850	0.254120-03	0.187510-04	0.236840-04	1.2384
1500.0	0.85908	1189.5	3.7820	0.252010-03	0.184970-04	0.233410-04	1.2372
1600.0	0.86107	1198.9	3.7791	0.249950-03	0.182510-04	0.230090-04	1.2361
1700.0	0.86304	1208.3	3.7761	0.247940-03	0.180120-04	0.226870-04	1.2350
1800.0	0.86499	1217.8	3.7732	0.245990-03	0.177790-04	0.223750-04	1.2339
1900.0	0.86691	1227.2	3.7704	0.244080-03	0.175530-04	0.220710-04	1.2329
2000.0	0.86881	1236.6	3.7675	0.242230-03	0.173330-04	0.217770-04	1.2319
2500.0	0.87802	1283.5	3.7537	0.233600-03	0.163180-04	0.204230-04	1.2271
3000.0	0.88677	1330.4	3.7406	0.225930-03	0.154260-04	0.192410-04	1.2233
3500.0	0.89510	1377.1	3.7279	0.219070-03	0.146370-04	0.182020-04	1.2192
4000.0	0.90307	1423.8	3.7157	0.212900-03	0.139340-04	0.172800-04	1.2159
4500.0	0.91072	1470.2	3.7040	0.207310-03	0.133050-04	0.164590-04	1.2129
5000.0	0.91807	1516.6	3.6927	0.202240-03	0.127380-04	0.157220-04	1.2102

SJBCOOLED SODIUM LIQUID PROPERTIES AT T = 900.0 DEG K

P (ATM)	RHOL (G/CC)	HLIQ (J/G)	SLIQ (J/G-K)	ALPHAP (K-1)	BETAS (ATM-1)	BETAT (ATM-1)	CP (J/G-K)
0.0	0.80170	1173.8	3.9786	0.301160-03	0.251490-04	0.333760-04	1.2540
100.0	0.80435	1183.0	3.9749	0.297560-03	0.246830-04	0.327020-04	1.2519
200.0	0.80696	1192.2	3.9711	0.294090-03	0.242340-04	0.320550-04	1.2498
300.0	0.80953	1201.4	3.9675	0.290730-03	0.238020-04	0.314330-04	1.2478
400.0	0.81205	1210.7	3.9639	0.287480-03	0.233860-04	0.308350-04	1.2459
500.0	0.81453	1219.9	3.9603	0.284340-03	0.229840-04	0.302600-04	1.2440
600.0	0.81698	1229.2	3.9568	0.281290-03	0.225970-04	0.297070-04	1.2422
700.0	0.81939	1238.5	3.9533	0.278350-03	0.222220-04	0.291740-04	1.2405
800.0	0.82176	1247.7	3.9499	0.275500-03	0.218610-04	0.286600-04	1.2388
900.0	0.82410	1257.0	3.9465	0.272730-03	0.215110-04	0.281650-04	1.2371
1000.0	0.82640	1266.3	3.9432	0.270050-03	0.211730-04	0.276860-04	1.2356
1100.0	0.82868	1275.6	3.9399	0.267440-03	0.208460-04	0.272250-04	1.2340
1200.0	0.83092	1284.9	3.9367	0.264910-03	0.205300-04	0.267790-04	1.2325
1300.0	0.83313	1294.1	3.9334	0.262460-03	0.202230-04	0.263480-04	1.2311
1400.0	0.83531	1303.4	3.9303	0.260070-03	0.199260-04	0.259310-04	1.2297
1500.0	0.83746	1312.7	3.9271	0.257750-03	0.196370-04	0.255270-04	1.2283
1600.0	0.83958	1322.0	3.9240	0.255500-03	0.193580-04	0.251370-04	1.2270
1700.0	0.84168	1331.3	3.9210	0.253300-03	0.190870-04	0.247590-04	1.2257
1800.0	0.84375	1340.6	3.9179	0.251170-03	0.188240-04	0.243920-04	1.2244
1900.0	0.84580	1349.9	3.9149	0.249090-03	0.185680-04	0.240370-04	1.2232
2000.0	0.84782	1359.2	3.9120	0.247060-03	0.183200-04	0.236930-04	1.2220
2500.0	0.85757	1405.7	3.8976	0.237680-03	0.171780-04	0.221160-04	1.2165
3000.0	0.86681	1452.1	3.8838	0.229370-03	0.161800-04	0.207480-04	1.2117
3500.0	0.87558	1498.4	3.8707	0.221980-03	0.153000-04	0.195510-04	1.2074
4000.0	0.88394	1544.7	3.8581	0.215340-03	0.145200-04	0.184950-04	1.2036
4500.0	0.89194	1590.8	3.8460	0.209370-03	0.138240-04	0.175590-04	1.2001
5000.0	0.89961	1636.9	3.8343	0.203950-03	0.132000-04	0.167220-04	1.1970
6000.0	0.91411	1728.6	3.8121	0.194520-03	0.121270-04	0.152940-04	1.1917

SUBCOOLED SODIUM LIQUID PROPERTIES AT T = 1000.0 DEG K

P (ATM)	RHOL (G/CC)	HLIQ (J/G)	SLIQ (J/G-K)	ALPHA (K-1)	BETAS (ATM-1)	BETAT (ATM-1)	CP (J/G-K)
0.2	0.77752	1299.3	4.1109	0.311400-03	0.272130-04	0.372550-04	1.2585
100.0	0.78039	1308.3	4.1069	0.307390-03	0.266740-04	0.364420-04	1.2559
200.0	0.78321	1317.3	4.1029	0.303510-03	0.261550-04	0.356630-04	1.2534
300.0	0.78597	1326.3	4.0990	0.299780-03	0.256560-04	0.349170-04	1.2510
400.0	0.78870	1335.3	4.0952	0.296170-03	0.251760-04	0.342010-04	1.2487
500.0	0.79137	1344.4	4.0914	0.292690-03	0.247150-04	0.335140-04	1.2465
600.0	0.79400	1353.4	4.0877	0.289330-03	0.242700-04	0.328540-04	1.2444
700.0	0.79659	1362.5	4.0840	0.286070-03	0.238410-04	0.322200-04	1.2423
800.0	0.79913	1371.6	4.0804	0.282930-03	0.234270-04	0.316110-04	1.2403
900.0	0.80164	1380.7	4.0769	0.279880-03	0.230280-04	0.310240-04	1.2384
1000.0	0.80411	1389.8	4.0733	0.276930-03	0.226430-04	0.304580-04	1.2365
1100.0	0.80654	1398.9	4.0699	0.274080-03	0.222700-04	0.299130-04	1.2347
1200.0	0.80893	1408.1	4.0665	0.271310-03	0.219100-04	0.293880-04	1.2330
1300.0	0.81129	1417.2	4.0631	0.268620-03	0.215620-04	0.288810-04	1.2313
1400.0	0.81362	1426.3	4.0597	0.266010-03	0.212250-04	0.283910-04	1.2296
1500.0	0.81591	1435.5	4.0565	0.263480-03	0.208980-04	0.279180-04	1.2280
1600.0	0.81818	1444.6	4.0532	0.261010-03	0.205820-04	0.274610-04	1.2265
1700.0	0.82041	1453.8	4.0500	0.258620-03	0.202760-04	0.270190-04	1.2250
1800.0	0.82261	1462.9	4.0468	0.256300-03	0.199790-04	0.265920-04	1.2235
1900.0	0.82478	1472.1	4.0437	0.254040-03	0.196900-04	0.261780-04	1.2221
2000.0	0.82693	1481.3	4.0406	0.251840-03	0.194110-04	0.257770-04	1.2207
2500.0	0.83726	1527.1	4.0255	0.241670-03	0.181290-04	0.239490-04	1.2144
3000.0	0.84701	1573.0	4.0113	0.232710-03	0.170130-04	0.223720-04	1.2088
3500.0	0.85624	1618.9	3.9977	0.224760-03	0.160350-04	0.210000-04	1.2039
4000.0	0.86501	1664.8	3.9847	0.217660-03	0.151700-04	0.197960-04	1.1996
4500.0	0.87338	1710.5	3.9722	0.211270-03	0.144010-04	0.187330-04	1.1957
5000.0	0.88138	1756.3	3.9601	0.205510-03	0.137140-04	0.177870-04	1.1922
6000.0	0.89645	1847.4	3.9373	0.195510-03	0.125380-04	0.161800-04	1.1863

SUBCOOLED SODIUM LIQUID PROPERTIES AT T = 1100.0 DEG K

P (ATM)	RHOL (G/CC)	HLIQ (J/G)	SLIQ (J/G-K)	ALPHAP (K-1)	BETAS. (ATM-1)	BETAT (ATM-1)	CP (J/G-K)
0.6	0.75330	1425.8	4.2314	0.321960-03	0.295300-04	0.415880-04	1.2720
100.0	0.75638	1434.4	4.2271	0.317500-03	0.289070-04	0.406130-04	1.2689
200.0	0.75943	1443.2	4.2229	0.313180-03	0.283060-04	0.396770-04	1.2660
300.0	0.76241	1451.9	4.2188	0.309040-03	0.277300-04	0.387840-04	1.2632
400.0	0.76534	1460.7	4.2147	0.305040-03	0.271780-04	0.379290-04	1.2605
500.0	0.76822	1469.5	4.2107	0.301190-03	0.266470-04	0.371110-04	1.2579
600.0	0.77104	1478.4	4.2068	0.297480-03	0.261370-04	0.363270-04	1.2553
700.0	0.77382	1487.2	4.2029	0.293900-03	0.256460-04	0.355760-04	1.2529
800.0	0.77655	1496.1	4.1991	0.290450-03	0.251730-04	0.348550-04	1.2506
900.0	0.77923	1505.0	4.1953	0.287110-03	0.247170-04	0.341630-04	1.2483
1000.0	0.78187	1513.9	4.1916	0.283880-03	0.242780-04	0.334970-04	1.2461
1100.0	0.78447	1522.8	4.1879	0.280750-03	0.238540-04	0.328570-04	1.2440
1200.0	0.78703	1531.7	4.1843	0.277720-03	0.234450-04	0.322400-04	1.2420
1300.0	0.78955	1540.7	4.1808	0.274790-03	0.230500-04	0.316470-04	1.2400
1400.0	0.79203	1549.6	4.1773	0.271950-03	0.226690-04	0.310750-04	1.2381
1500.0	0.79447	1558.6	4.1738	0.269190-03	0.222990-04	0.305230-04	1.2363
1600.0	0.79688	1567.6	4.1704	0.266520-03	0.219420-04	0.299910-04	1.2345
1700.0	0.79925	1576.6	4.1671	0.263930-03	0.215960-04	0.294770-04	1.2327
1800.0	0.80159	1585.6	4.1637	0.261400-03	0.212620-04	0.289800-04	1.2310
1900.0	0.80390	1594.6	4.1604	0.258960-03	0.209370-04	0.285000-04	1.2294
2000.0	0.80617	1603.6	4.1572	0.256570-03	0.206230-04	0.280360-04	1.2278
2500.0	0.81711	1648.8	4.1415	0.245600-03	0.191850-04	0.259270-04	1.2205
3000.0	0.82739	1694.1	4.1267	0.235970-03	0.179410-04	0.241190-04	1.2142
3500.0	0.83709	1739.5	4.1126	0.227460-03	0.168530-04	0.225530-04	1.2086
4000.0	0.84629	1784.9	4.0991	0.219870-03	0.158960-04	0.211860-04	1.2037
4500.0	0.85504	1830.2	4.0863	0.213080-03	0.150480-04	0.199820-04	1.1994
5000.0	0.86339	1875.6	4.0739	0.206960-03	0.142910-04	0.189170-04	1.1955
6000.0	0.87906	1966.1	4.0504	0.196380-03	0.130030-04	0.171160-04	1.1889

SJB COOLED SODIUM LIQUID PROPERTIES AT T = 1200.0 DEG K

P (ATM)	RHOL (G/CC)	HLIQ (J/G)	SLIQ (J/G-K)	ALPHAP (K-1)	BETAS (ATM-1)	BETAT (ATM-1)	CP (J/G-C)
1.5	0.72907	1554.1	4.3430	0.332920-03	0.321490-04	0.464280-04	1.2945
100.0	0.73237	1562.4	4.3385	0.327980-03	0.314300-04	0.452640-04	1.2910
200.0	0.73565	1570.8	4.3340	0.323170-03	0.307330-04	0.441400-04	1.2875
300.0	0.73886	1579.2	4.3296	0.318560-03	0.300660-04	0.430710-04	1.2842
400.0	0.74201	1587.7	4.3253	0.314140-03	0.294280-04	0.420520-04	1.2810
500.0	0.74510	1596.2	4.3210	0.309890-03	0.288170-04	0.410800-04	1.2779
600.0	0.74813	1604.8	4.3168	0.305800-03	0.282300-04	0.401520-04	1.2750
700.0	0.75111	1613.4	4.3127	0.301870-03	0.276670-04	0.392630-04	1.2721
800.0	0.75403	1622.0	4.3087	0.298080-03	0.271260-04	0.384130-04	1.2694
900.0	0.75690	1630.7	4.3047	0.294420-03	0.266060-04	0.375990-04	1.2668
1000.0	0.75973	1639.3	4.3008	0.290890-03	0.261060-04	0.368180-04	1.2642
1100.0	0.76250	1648.0	4.2970	0.287480-03	0.256240-04	0.360690-04	1.2618
1200.0	0.76523	1656.7	4.2932	0.284190-03	0.251590-04	0.353490-04	1.2595
1300.0	0.76791	1665.5	4.2894	0.281000-03	0.247110-04	0.346560-04	1.2572
1400.0	0.77055	1674.2	4.2858	0.277910-03	0.242790-04	0.339910-04	1.2550
1500.0	0.77315	1683.0	4.2821	0.274930-03	0.238620-04	0.333500-04	1.2529
1600.0	0.77571	1691.8	4.2785	0.272030-03	0.234580-04	0.327320-04	1.2508
1700.0	0.77823	1700.6	4.2750	0.269220-03	0.230690-04	0.321370-04	1.2488
1800.0	0.78071	1709.4	4.2715	0.266500-03	0.226910-04	0.315630-04	1.2469
1900.0	0.78316	1718.3	4.2681	0.263860-03	0.223270-04	0.310090-04	1.2450
2000.0	0.78557	1727.1	4.2647	0.261290-03	0.219730-04	0.304740-04	1.2432
2500.0	0.79713	1771.5	4.2484	0.249500-03	0.203630-04	0.280520-04	1.2349
3000.0	0.80796	1816.1	4.2329	0.239190-03	0.189750-04	0.259880-04	1.2277
3500.0	0.81816	1860.9	4.2183	0.230100-03	0.177680-04	0.242100-04	1.2214
4000.0	0.82780	1905.8	4.2044	0.222030-03	0.167090-04	0.226640-04	1.2159
4500.0	0.83694	1950.7	4.1911	0.214810-03	0.157730-04	0.213090-04	1.2110
5000.0	0.84565	1995.6	4.1784	0.208330-03	0.149420-04	0.201140-04	1.2067
6000.0	0.86193	2085.4	4.1544	0.197170-03	0.135300-04	0.181030-04	1.1994

SJBCOOLED SODIUM LIQUID PROPERTIES AT T = 1300.0 DEG K

P (ATM)	RHOL (G/CC)	HLIQ (J/G)	SLIQ (J/G-K)	ALPHAP (K-1)	BETAS (ATM-1)	BETAT (ATM-1)	CP (J/G-K)
3.2	0.70485	1685.2	4.4479	0.34440D-03	0.35134D-04	0.51849D-04	1.3261
100.0	0.70835	1692.9	4.4432	0.33894D-03	0.34305D-04	0.50465D-04	1.3219
200.0	0.71188	1701.0	4.4384	0.33356D-03	0.33490D-04	0.49113D-04	1.3178
300.0	0.71534	1709.1	4.4337	0.32843D-03	0.32714D-04	0.47831D-04	1.3139
400.0	0.71873	1717.2	4.4291	0.32352D-03	0.31973D-04	0.46615D-04	1.3101
500.0	0.72205	1725.4	4.4245	0.31882D-03	0.31266D-04	0.45459D-04	1.3065
600.0	0.72529	1733.6	4.4201	0.31431D-03	0.30589D-04	0.44359D-04	1.3031
700.0	0.72848	1741.9	4.4158	0.30999D-03	0.29942D-04	0.43310D-04	1.2998
800.0	0.73161	1750.2	4.4115	0.30583D-03	0.29322D-04	0.42309D-04	1.2967
900.0	0.73467	1758.6	4.4073	0.30184D-03	0.28726D-04	0.41354D-04	1.2936
1000.0	0.73768	1767.0	4.4032	0.29799D-03	0.28155D-04	0.40439D-04	1.2907
1100.0	0.74064	1775.4	4.3991	0.29427D-03	0.27606D-04	0.39564D-04	1.2879
1200.0	0.74354	1783.9	4.3951	0.29070D-03	0.27078D-04	0.38727D-04	1.2852
1300.0	0.74640	1792.4	4.3912	0.28724D-03	0.26569D-04	0.37922D-04	1.2826
1400.0	0.74921	1800.9	4.3873	0.28390D-03	0.26079D-04	0.37150D-04	1.2801
1500.0	0.75197	1809.5	4.3835	0.28067D-03	0.25607D-04	0.36408D-04	1.2777
1600.0	0.75468	1818.0	4.3797	0.27755D-03	0.25151D-04	0.35694D-04	1.2753
1700.0	0.75735	1826.6	4.3760	0.27452D-03	0.24712D-04	0.35008D-04	1.2730
1800.0	0.75998	1835.2	4.3724	0.27159D-03	0.24287D-04	0.34347D-04	1.2708
1900.0	0.76257	1843.9	4.3688	0.26875D-03	0.23876D-04	0.33710D-04	1.2687
2000.0	0.76513	1852.5	4.3652	0.26599D-03	0.23479D-04	0.33096D-04	1.2667
2500.0	0.77734	1896.0	4.3482	0.25336D-03	0.21677D-04	0.30328D-04	1.2573
3000.0	0.78874	1939.9	4.3322	0.24236D-03	0.20130D-04	0.27983D-04	1.2492
3500.0	0.79944	1984.0	4.3170	0.23270D-03	0.18790D-04	0.25973D-04	1.2421
4000.0	0.80953	2028.3	4.3026	0.22414D-03	0.17619D-04	0.24233D-04	1.2360
4500.0	0.81908	2072.7	4.2889	0.21651D-03	0.16588D-04	0.22714D-04	1.2305
5000.0	0.82816	2117.2	4.2758	0.20966D-03	0.15673D-04	0.21378D-04	1.2257
6000.0	0.84507	2206.2	4.2512	0.19791D-03	0.14127D-04	0.19141D-04	1.2176

SUBCOOLED SODIUM LIQUID PROPERTIES AT T = 1400.0 DEG K

P (ATM)	RHOL (G/CC)	HLTO (J/G)	SLIQ (J/G-K)	ALPHAP (K-1)	BETAS (ATM-1)	BETAT (ATM-1)	CP (J/G-K)
6.2	0.68069	1820.0	4.5477	0.356510-03	0.385660-04	0.579470-04	1.3667
100.0	0.68435	1827.1	4.5428	0.350530-03	0.376130-04	0.563150-04	1.3619
200.0	0.68816	1834.6	4.5377	0.344480-03	0.366510-04	0.546770-04	1.3570
300.0	0.69188	1842.3	4.5327	0.338730-03	0.357390-04	0.531340-04	1.3524
400.0	0.69551	1850.0	4.5278	0.333260-03	0.348720-04	0.516770-04	1.3480
500.0	0.69907	1857.8	4.5229	0.328050-03	0.340480-04	0.502990-04	1.3438
600.0	0.70255	1865.7	4.5182	0.323070-03	0.332630-04	0.489940-04	1.3398
700.0	0.70595	1873.6	4.5136	0.318310-03	0.325140-04	0.477540-04	1.3360
800.0	0.70929	1881.6	4.5091	0.313750-03	0.317990-04	0.465760-04	1.3323
900.0	0.71256	1889.7	4.5047	0.309370-03	0.311150-04	0.454540-04	1.3288
1000.0	0.71577	1897.7	4.5003	0.305170-03	0.304590-04	0.443850-04	1.3255
1100.0	0.71892	1905.9	4.4960	0.301140-03	0.298310-04	0.433640-04	1.3223
1200.0	0.72200	1914.0	4.4918	0.297250-03	0.292290-04	0.423890-04	1.3192
1300.0	0.72504	1922.3	4.4877	0.293510-03	0.286500-04	0.414560-04	1.3162
1400.0	0.72802	1930.5	4.4836	0.289900-03	0.280940-04	0.405630-04	1.3133
1500.0	0.73094	1938.8	4.4796	0.286420-03	0.275580-04	0.397060-04	1.3106
1600.0	0.73382	1947.1	4.4757	0.283050-03	0.270430-04	0.388840-04	1.3079
1700.0	0.73665	1955.5	4.4718	0.279800-03	0.265460-04	0.380950-04	1.3054
1800.0	0.73943	1963.9	4.4680	0.276650-03	0.260670-04	0.373370-04	1.3029
1900.0	0.74217	1972.3	4.4642	0.273590-03	0.256040-04	0.366060-04	1.3005
2000.0	0.74487	1980.7	4.4605	0.270660-03	0.251590-04	0.359060-04	1.2982
2500.0	0.75775	2023.2	4.4427	0.257180-03	0.231390-04	0.327550-04	1.2876
3000.0	0.76973	2066.2	4.4260	0.245490-03	0.214160-04	0.301030-04	1.2786
3500.0	0.78096	2109.6	4.4103	0.235260-03	0.199290-04	0.278410-04	1.2707
4000.0	0.79151	2153.2	4.3955	0.226220-03	0.186340-04	0.258910-04	1.2638
4500.0	0.80147	2197.0	4.3814	0.218170-03	0.174580-04	0.241960-04	1.2578
5000.0	0.81092	2241.0	4.3679	0.210970-03	0.164930-04	0.227090-04	1.2525
6000.0	0.82848	2329.2	4.3426	0.198620-03	0.147990-04	0.202320-04	1.2435

SJB-COOLED SODIUM LIQUID PROPERTIES AT T = 1500.0 DEG K

P (ATM)	RHOL (G/CC)	HLIQ (J/G)	SLIQ (J/G-K)	ALPHAP (K-1)	BETAS (ATM-1)	BETAT (ATM-1)	CP (J/G-K)
10.9	0.65662	1959.4	4.6439	0.369430-03	0.425560-04	0.648590-04	1.4164
100.0	0.66037	1965.6	4.6388	0.362930-03	0.414660-04	0.629520-04	1.4109
200.0	0.66448	1972.7	4.6333	0.356050-03	0.403130-04	0.609500-04	1.4051
300.0	0.66848	1979.8	4.6280	0.349560-03	0.392270-04	0.590770-04	1.3996
400.0	0.67238	1987.1	4.6227	0.343430-03	0.382020-04	0.573210-04	1.3945
500.0	0.67619	1994.4	4.6176	0.337620-03	0.372320-04	0.556700-04	1.3896
600.0	0.67991	2001.9	4.6126	0.332100-03	0.363120-04	0.541140-04	1.3850
700.0	0.68355	2009.4	4.6077	0.326840-03	0.354380-04	0.526440-04	1.3806
800.0	0.68710	2017.0	4.6029	0.321820-03	0.346080-04	0.512530-04	1.3764
900.0	0.69059	2024.6	4.5982	0.317030-03	0.338160-04	0.499350-04	1.3724
1000.0	0.69400	2032.4	4.5936	0.312450-03	0.330600-04	0.486830-04	1.3685
1100.0	0.69735	2040.2	4.5891	0.308060-03	0.323380-04	0.474930-04	1.3649
1200.0	0.70063	2048.0	4.5847	0.303840-03	0.316470-04	0.463590-04	1.3614
1300.0	0.70384	2055.9	4.5803	0.299790-03	0.309860-04	0.452770-04	1.3580
1400.0	0.70700	2063.8	4.5760	0.295900-03	0.303510-04	0.442450-04	1.3548
1500.0	0.71010	2071.8	4.5718	0.292150-03	0.297430-04	0.432580-04	1.3517
1600.0	0.71315	2079.9	4.5677	0.288530-03	0.291580-04	0.423130-04	1.3487
1700.0	0.71614	2088.0	4.5636	0.285040-03	0.285950-04	0.414080-04	1.3458
1800.0	0.71908	2096.1	4.5596	0.281670-03	0.280540-04	0.405400-04	1.3430
1900.0	0.72197	2104.2	4.5557	0.278410-03	0.275320-04	0.397070-04	1.3403
2000.0	0.72481	2112.4	4.5518	0.275260-03	0.270290-04	0.389070-04	1.3377
2500.0	0.73837	2153.8	4.5333	0.260930-03	0.247640-04	0.353340-04	1.3260
3000.0	0.75095	2195.9	4.5159	0.248570-03	0.228440-04	0.323470-04	1.3160
3500.0	0.76270	2238.4	4.4997	0.237770-03	0.211940-04	0.298130-04	1.3073
4000.0	0.77372	2281.3	4.4843	0.228260-03	0.197630-04	0.276380-04	1.2997
4500.0	0.78411	2324.5	4.4697	0.219810-03	0.185110-04	0.257540-04	1.2930
5000.0	0.79394	2367.9	4.4559	0.212250-03	0.174060-04	0.241070-04	1.2871
6000.0	0.81216	2455.2	4.4299	0.199330-03	0.155520-04	0.213730-04	1.2773

SUBCOOLED SODIUM LIQUID PROPERTIES AT T = 1600.0 DEG K

P (ATM)	RHOL (G/CC)	HLIQ (J/G)	SLIQ (J/G-K)	ALPHAP (-1)	BETAS (ATM-1)	BETAT (ATM-1)	CP (J/G-K)
17.8	0.63268	2104.4	4.7373	0.38331D-03	0.47249D-04	0.72767D-04	1.4754
100.0	0.63641	2109.6	4.7323	0.37636D-03	0.46014D-04	0.70573D-04	1.4693
200.0	0.64084	2116.0	4.7264	0.36844D-03	0.44606D-04	0.68091D-04	1.4624
300.0	0.64514	2122.5	4.7207	0.36105D-03	0.43292D-04	0.65792D-04	1.4559
400.0	0.64933	2129.2	4.7151	0.35411D-03	0.42060D-04	0.63655D-04	1.4498
500.0	0.65341	2136.1	4.7096	0.34758D-03	0.40903D-04	0.61660D-04	1.4441
600.0	0.65739	2143.0	4.7043	0.34142D-03	0.39813D-04	0.59793D-04	1.4388
700.0	0.66128	2150.0	4.6991	0.33559D-03	0.38783D-04	0.58041D-04	1.4337
800.0	0.66507	2157.2	4.6940	0.33006D-03	0.37808D-04	0.56393D-04	1.4289
900.0	0.66878	2164.4	4.6891	0.32480D-03	0.36884D-04	0.54839D-04	1.4243
1000.0	0.67241	2171.7	4.6842	0.31979D-03	0.36005D-04	0.53370D-04	1.4200
1100.0	0.67596	2179.1	4.6794	0.31501D-03	0.35170D-04	0.51979D-04	1.4159
1200.0	0.67944	2186.6	4.6747	0.31043D-03	0.34373D-04	0.50659D-04	1.4119
1300.0	0.68284	2194.1	4.6702	0.30605D-03	0.33612D-04	0.49406D-04	1.4081
1400.0	0.68618	2201.7	4.6657	0.30185D-03	0.32885D-04	0.48213D-04	1.4045
1500.0	0.68946	2209.4	4.6612	0.29781D-03	0.32190D-04	0.47076D-04	1.4010
1600.0	0.69268	2217.1	4.6569	0.29393D-03	0.31523D-04	0.45991D-04	1.3977
1700.0	0.69583	2224.9	4.6526	0.29020D-03	0.30883D-04	0.44955D-04	1.3945
1800.0	0.69893	2232.7	4.6484	0.28660D-03	0.30269D-04	0.43963D-04	1.3914
1900.0	0.70198	2240.6	4.6443	0.28313D-03	0.29679D-04	0.43014D-04	1.3884
2000.0	0.70497	2248.5	4.6403	0.27977D-03	0.29112D-04	0.42104D-04	1.3855
2500.0	0.71922	2288.7	4.6209	0.26458D-03	0.26567D-04	0.38063D-04	1.3726
3000.0	0.73241	2329.7	4.6029	0.25155D-03	0.24424D-04	0.34711D-04	1.3615
3500.0	0.74469	2371.3	4.5861	0.24022D-03	0.22594D-04	0.31886D-04	1.3520
4000.0	0.75619	2413.4	4.5702	0.23025D-03	0.21012D-04	0.29470D-04	1.3437
4500.0	0.76700	2455.9	4.5552	0.22141D-03	0.19632D-04	0.27335D-04	1.3364
5000.0	0.77722	2498.7	4.5409	0.21352D-03	0.18418D-04	0.25569D-04	1.3299
6000.0	0.79610	2584.9	4.5143	0.20004D-03	0.16387D-04	0.22565D-04	1.3191

SJBCOOLED SODIUM LIQUID PROPERTIES AT T = 1700.0 DEG K

P (ATM)	RHOL (G/CC)	HLIQ (J/G)	SLIQ (J/G-K)	ALPHAP (K-1)	BETAS (ATM-1)	BETAT (ATM-1)	CP (J/G-K)
27.4	0.60871	2255.2	4.8282	0.408950-03	0.528510-04	0.839000-04	1.5243
100.0	0.61236	2259.0	4.8233	0.398860-03	0.513150-04	0.808840-04	1.5135
200.0	0.61722	2264.5	4.8169	0.386120-03	0.493640-04	0.771060-04	1.4998
300.0	0.62189	2270.2	4.8107	0.374290-03	0.475590-04	0.736540-04	1.4870
400.0	0.62639	2276.3	4.8047	0.365370-03	0.459960-04	0.708260-04	1.4785
500.0	0.63077	2282.5	4.7988	0.357980-03	0.446140-04	0.683900-04	1.4719
600.0	0.63502	2288.9	4.7931	0.351050-03	0.433220-04	0.661300-04	1.4657
700.0	0.63917	2295.4	4.7876	0.344550-03	0.421110-04	0.640260-04	1.4599
800.0	0.64321	2302.0	4.7822	0.338420-03	0.409710-04	0.620600-04	1.4544
900.0	0.64715	2308.7	4.7770	0.332630-03	0.398970-04	0.602180-04	1.4492
1000.0	0.65101	2315.6	4.7718	0.327140-03	0.388820-04	0.584880-04	1.4443
1100.0	0.65477	2322.5	4.7668	0.321920-03	0.379200-04	0.568570-04	1.4397
1200.0	0.65845	2329.6	4.7618	0.316950-03	0.370080-04	0.553190-04	1.4353
1300.0	0.66206	2336.7	4.7570	0.312220-03	0.361400-04	0.538630-04	1.4310
1400.0	0.66559	2344.0	4.7523	0.307690-03	0.353140-04	0.524840-04	1.4270
1500.0	0.66904	2351.3	4.7476	0.303350-03	0.345260-04	0.511740-04	1.4232
1600.0	0.67243	2358.6	4.7431	0.299200-03	0.337730-04	0.499290-04	1.4195
1700.0	0.67576	2366.1	4.7386	0.295210-03	0.330540-04	0.487430-04	1.4159
1800.0	0.67902	2373.6	4.7342	0.291370-03	0.323640-04	0.476110-04	1.4125
1900.0	0.68223	2381.1	4.7299	0.287680-03	0.317030-04	0.465310-04	1.4093
2000.0	0.68537	2388.7	4.7257	0.284120-03	0.310690-04	0.454980-04	1.4061
2500.0	0.70032	2427.6	4.7055	0.268070-03	0.282420-04	0.409420-04	1.3919
3000.0	0.71411	2467.4	4.6868	0.254390-03	0.258800-04	0.371930-04	1.3799
3500.0	0.72693	2508.0	4.6694	0.242540-03	0.238740-04	0.340530-04	1.3695
4000.0	0.73890	2549.3	4.6530	0.232150-03	0.221480-04	0.313830-04	1.3605
4500.0	0.75015	2591.0	4.6375	0.222950-03	0.206480-04	0.290870-04	1.3526
5000.0	0.76075	2633.1	4.6228	0.214750-03	0.193320-04	0.270920-04	1.3456
6000.0	0.78031	2718.2	4.5955	0.200740-03	0.171360-04	0.238050-04	1.3339

SUBCOOLED SODIUM LIQUID PROPERTIES AT T = 1800.0 DEG K

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P (ATM)	RHOL (G/CC)	HLIQ (J/G)	SLIQ (J/G-K)	ALPHAP (K-1)	BETAS (ATM-1)	BETAT (ATM-1)	CP (J/G-K)
40.4	0.58388	2410.2	4.9155	0.449160-03	0.596550-04	0.999080-04	1.5656
100.0	0.58731	2412.2	4.9109	0.438100-03	0.579790-04	0.963490-04	1.5534
200.0	0.59283	2416.1	4.9036	0.421280-03	0.554090-04	0.909820-04	1.5349
300.0	0.59811	2420.5	4.8965	0.406270-03	0.530970-04	0.862460-04	1.5184
400.0	0.60316	2425.2	4.8898	0.392780-03	0.510030-04	0.820310-04	1.5035
500.0	0.60801	2430.3	4.8833	0.380550-03	0.490930-04	0.782500-04	1.4900
600.0	0.61268	2435.7	4.8771	0.369410-03	0.473440-04	0.748360-04	1.4776
700.0	0.61718	2441.4	4.8711	0.359190-03	0.457340-04	0.717360-04	1.4663
800.0	0.62154	2447.3	4.8653	0.349780-03	0.442460-04	0.689060-04	1.4558
900.0	0.62574	2453.5	4.8597	0.340430-03	0.427680-04	0.661260-04	1.4456
1000.0	0.62982	2459.8	4.8543	0.334400-03	0.416000-04	0.640870-04	1.4401
1100.0	0.63381	2466.3	4.8489	0.328710-03	0.405000-04	0.621680-04	1.4349
1200.0	0.63771	2472.9	4.8437	0.323310-03	0.394620-04	0.603680-04	1.4300
1300.0	0.64151	2479.6	4.8387	0.318190-03	0.384800-04	0.586740-04	1.4254
1400.0	0.64524	2486.4	4.8337	0.313310-03	0.375490-04	0.570770-04	1.4210
1500.0	0.64888	2493.3	4.8288	0.308660-03	0.366640-04	0.555660-04	1.4167
1600.0	0.65245	2500.3	4.8240	0.304220-03	0.358230-04	0.541360-04	1.4127
1700.0	0.65594	2507.3	4.8194	0.299970-03	0.350200-04	0.527790-04	1.4088
1800.0	0.65937	2514.5	4.8148	0.295890-03	0.342540-04	0.514890-04	1.4051
1900.0	0.66274	2521.7	4.8103	0.291970-03	0.335220-04	0.502610-04	1.4016
2000.0	0.66604	2529.0	4.8058	0.288210-03	0.328220-04	0.490910-04	1.3982
2500.0	0.68168	2566.3	4.7848	0.271330-03	0.297190-04	0.439640-04	1.3829
3000.0	0.69608	2604.9	4.7654	0.257040-03	0.271500-04	0.397870-04	1.3699
3500.0	0.70943	2644.5	4.7473	0.244710-03	0.249810-04	0.363110-04	1.3588
4000.0	0.72188	2684.8	4.7304	0.233920-03	0.231230-04	0.333710-04	1.3491
4500.0	0.73356	2725.7	4.7145	0.224390-03	0.215130-04	0.308520-04	1.3406
5000.0	0.74454	2767.1	4.6994	0.215910-03	0.201060-04	0.286730-04	1.3331
6000.0	0.76477	2851.0	4.6714	0.201420-03	0.177620-04	0.250900-04	1.3204

SUBCOOLED SODIUM LIQUID PROPERTIES AT T = 1900.0 DEG K

P (ATM)	RHOL (G/CC)	HLIQ (J/G)	SLIQ (J/G-K)	ALPHA (K-1)	BETAS (ATM-1)	BETAT (ATM-1)	CP (J/G-K)
57.2	0.55793	2569.5	5.0001	0.499270-03	0.680910-04	0.121290-03	1.6168
100.0	0.56079	2570.0	4.9962	0.488250-03	0.664370-04	0.117440-03	1.6045
200.0	0.56718	2571.7	4.9877	0.465120-03	0.629290-04	0.109450-03	1.5786
300.0	0.57322	2574.1	4.9796	0.445030-03	0.598420-04	0.102590-03	1.5560
400.0	0.57896	2577.2	4.9719	0.427370-03	0.570980-04	0.966360-04	1.5361
500.0	0.58442	2580.7	4.9646	0.411670-03	0.546380-04	0.914060-04	1.5184
600.0	0.58965	2584.7	4.9576	0.397600-03	0.524170-04	0.867710-04	1.5025
700.0	0.59466	2589.1	4.9509	0.384900-03	0.503980-04	0.826290-04	1.4881
800.0	0.59948	2593.8	4.9445	0.373340-03	0.485540-04	0.789020-04	1.4750
900.0	0.60413	2598.9	4.9383	0.362770-03	0.468600-04	0.755280-04	1.4629
1000.0	0.60861	2604.2	4.9323	0.353060-03	0.452970-04	0.724570-04	1.4518
1100.0	0.61295	2609.9	4.9265	0.344080-03	0.438500-04	0.696460-04	1.4416
1200.0	0.61716	2615.7	4.9209	0.335760-03	0.425050-04	0.670640-04	1.4320
1300.0	0.62123	2621.7	4.9155	0.328020-03	0.412510-04	0.646810-04	1.4231
1400.0	0.62517	2628.0	4.9103	0.318570-03	0.398680-04	0.620080-04	1.4117
1500.0	0.62900	2634.5	4.9052	0.313600-03	0.388720-04	0.602640-04	1.4071
1600.0	0.63275	2641.1	4.9002	0.308860-03	0.379290-04	0.586200-04	1.4028
1700.0	0.63642	2647.7	4.8953	0.304340-03	0.370340-04	0.570680-04	1.3986
1800.0	0.64001	2654.5	4.8905	0.300030-03	0.361820-04	0.555980-04	1.3947
1900.0	0.64354	2661.3	4.8858	0.295890-03	0.353710-04	0.542030-04	1.3909
2000.0	0.64699	2668.3	4.8812	0.291930-03	0.345970-04	0.528780-04	1.3872
2500.0	0.66333	2704.0	4.8593	0.274260-03	0.311970-04	0.471220-04	1.3709
3000.0	0.67833	2741.3	4.8392	0.259410-03	0.284100-04	0.424820-04	1.3572
3500.0	0.69221	2779.7	4.8205	0.246650-03	0.260730-04	0.386500-04	1.3454
4000.0	0.70514	2819.0	4.8030	0.235520-03	0.240830-04	0.354260-04	1.3352
4500.0	0.71723	2859.0	4.7866	0.225710-03	0.223640-04	0.326760-04	1.3261
5000.0	0.72860	2899.7	4.7711	0.216960-03	0.208650-04	0.303010-04	1.3181
6000.0	0.74950	2982.2	4.7424	0.202060-03	0.183780-04	0.264160-04	1.3047

COMPUTED SODIUM LIQUID PROPERTIES AT T = 2000.0 DEG K

P (ATM)	RHO (G/CC)	HLIQ (J/G)	SLIQ (J/G-K)	ALPHA (K-1)	BETAS (ATM-1)	BETAT (ATM-1)	CP (J/G-C)
78.4	0.53066	2734.2	5.0825	0.563450-03	0.788300-04	0.150890-03	1.6824
100.0	0.53237	2733.7	5.0802	0.555310-03	0.776290-04	0.147760-03	1.6732
200.0	0.53995	2732.3	5.0700	0.521730-03	0.726050-04	0.135080-03	1.6352
300.0	0.54699	2732.0	5.0606	0.493650-03	0.683190-04	0.124830-03	1.6033
400.0	0.55360	2732.7	5.0517	0.469720-03	0.646060-04	0.115850-03	1.5761
500.0	0.55984	2734.2	5.0433	0.449000-03	0.613490-04	0.108360-03	1.5524
600.0	0.56575	2736.4	5.0354	0.430830-03	0.586440-04	0.101880-03	1.5315
700.0	0.57138	2739.1	5.0279	0.414720-03	0.558840-04	0.962030-04	1.5130
800.0	0.57675	2742.4	5.0207	0.400310-03	0.535600-04	0.911890-04	1.4964
900.0	0.58191	2746.1	5.0138	0.387320-03	0.514530-04	0.867210-04	1.4813
1000.0	0.58685	2750.2	5.0072	0.375520-03	0.495310-04	0.827110-04	1.4677
1100.0	0.59162	2754.7	5.0008	0.364750-03	0.477690-04	0.790880-04	1.4551
1200.0	0.59622	2759.5	4.9947	0.354860-03	0.461460-04	0.757960-04	1.4436
1300.0	0.60066	2764.5	4.9888	0.345730-03	0.446460-04	0.727890-04	1.4329
1400.0	0.60497	2769.9	4.9830	0.337280-03	0.432530-04	0.700310-04	1.4230
1500.0	0.60914	2775.4	4.9775	0.329410-03	0.419560-04	0.674910-04	1.4138
1600.0	0.61319	2781.2	4.9721	0.322070-03	0.407440-04	0.651420-04	1.4052
1700.0	0.61713	2787.2	4.9668	0.315200-03	0.396090-04	0.629620-04	1.3971
1800.0	0.62096	2793.3	4.9617	0.308750-03	0.385430-04	0.609330-04	1.3895
1900.0	0.62467	2799.8	4.9568	0.299270-03	0.374500-04	0.583490-04	1.3769
2000.0	0.62827	2806.3	4.9520	0.295120-03	0.363900-04	0.568510-04	1.3731
2500.0	0.64531	2840.4	4.9292	0.276740-03	0.326670-04	0.504030-04	1.3561
3000.0	0.66090	2876.3	4.9084	0.261410-03	0.296500-04	0.452660-04	1.3418
3500.0	0.67529	2913.5	4.8891	0.248290-03	0.271420-04	0.410580-04	1.3295
4000.0	0.68867	2951.7	4.8711	0.236880-03	0.250170-04	0.375380-04	1.3188
4500.0	0.70118	2990.8	4.8542	0.226830-03	0.231900-04	0.345480-04	1.3093
5000.0	0.71293	3030.6	4.8382	0.217880-03	0.216020-04	0.319750-04	1.3009
6000.0	0.73448	3111.8	4.8088	0.202620-03	0.189730-04	0.277770-04	1.2867

SUBCOOLED SODIUM LIQUID PROPERTIES AT T = 2100.0 DEG K

P (ATM)	RHDL (G/CC)	HLIQ (J/G)	SLIQ (J/G-K)	ALPHAP (K-1)	BETAS (ATM-1)	BETAT (ATM-1)	CP (J/G-K)
104.6	0.50181	2905.3	5.1635	0.64857D-03	0.92961D-04	0.19375D-03	1.7697
200.0	0.51064	2899.5	5.1516	0.59851D-03	0.85649D-04	0.17279D-03	1.7130
300.0	0.51908	2895.3	5.1402	0.55689D-03	0.79375D-04	0.15570D-03	1.6656
400.0	0.52685	2892.7	5.1298	0.52297D-03	0.74136D-04	0.14204D-03	1.6268
500.0	0.53408	2891.4	5.1200	0.49455D-03	0.69677D-04	0.13082D-03	1.5943
600.0	0.54085	2891.2	5.1110	0.47053D-03	0.65823D-04	0.12143D-03	1.5665
700.0	0.54724	2891.8	5.1024	0.44967D-03	0.62449D-04	0.11343D-03	1.5423
800.0	0.55328	2893.2	5.0943	0.43139D-03	0.59464D-04	0.10652D-03	1.5210
900.0	0.55904	2895.2	5.0866	0.41519D-03	0.56799D-04	0.10048D-03	1.5021
1000.0	0.56453	2897.8	5.0792	0.40070D-03	0.54401D-04	0.95152D-04	1.4852
1100.0	0.56979	2900.9	5.0722	0.38765D-03	0.52230D-04	0.90411D-04	1.4698
1200.0	0.57484	2904.4	5.0654	0.37581D-03	0.50252D-04	0.86162D-04	1.4559
1300.0	0.57970	2908.3	5.0589	0.36499D-03	0.48441D-04	0.82327D-04	1.4431
1400.0	0.58439	2912.6	5.0527	0.35507D-03	0.46775D-04	0.78846D-04	1.4313
1500.0	0.58892	2917.1	5.0466	0.34591D-03	0.45235D-04	0.75671D-04	1.4205
1600.0	0.59330	2922.0	5.0407	0.33743D-03	0.43807D-04	0.72762D-04	1.4104
1700.0	0.59756	2927.1	5.0351	0.32955D-03	0.42479D-04	0.70084D-04	1.4009
1800.0	0.60168	2932.4	5.0296	0.32219D-03	0.41238D-04	0.67609D-04	1.3921
1900.0	0.60569	2938.0	5.0242	0.31530D-03	0.40077D-04	0.65316D-04	1.3838
2000.0	0.60960	2943.7	5.0190	0.30884D-03	0.38988D-04	0.63182D-04	1.3761
2500.0	0.62763	2975.2	4.9950	0.27862D-03	0.34124D-04	0.53788D-04	1.3384
3000.0	0.64379	3009.6	4.9734	0.26292D-03	0.30865D-04	0.48123D-04	1.3239
3500.0	0.65869	3045.5	4.9535	0.24954D-03	0.28180D-04	0.43521D-04	1.3114
4000.0	0.67251	3082.7	4.9350	0.23793D-03	0.25920D-04	0.39695D-04	1.3004
4500.0	0.68543	3120.8	4.9176	0.22771D-03	0.23986D-04	0.36456D-04	1.2906
5000.0	0.69754	3159.8	4.9013	0.21861D-03	0.22310D-04	0.33682D-04	1.2819
6000.0	0.71973	3239.5	4.8712	0.20307D-03	0.19545D-04	0.29167D-04	1.2671
7000.0	0.73969	3321.1	4.8439	0.19029D-03	0.17361D-04	0.25661D-04	1.2551

SJ8COOLED SODIUM LIQUID PROPERTIES AT T = 2200.0 DEG K

P (ATM)	RHO_L (G/CC)	HLIQ (J/G)	SLIQ (J/G-K)	ALPHAP (K-1)	BETAS (ATM-1)	BETAT (ATM-1)	CP (J/G-K)
136.1	0.47101	3084.6	5.2438	0.766970-03	0.112390-03	0.259540-03	1.8921
200.0	0.47847	3076.1	5.2337	0.710790-03	0.104470-03	0.233180-03	1.8288
300.0	0.48897	3065.9	5.2196	0.643460-03	0.945640-04	0.202270-03	1.7526
400.0	0.49836	3058.6	5.2069	0.592360-03	0.867390-04	0.179370-03	1.6944
500.0	0.50691	3053.4	5.1954	0.551880-03	0.803590-04	0.161630-03	1.6481
600.0	0.51479	3049.9	5.1848	0.518790-03	0.750280-04	0.147420-03	1.6099
700.0	0.52212	3047.8	5.1749	0.491070-03	0.704890-04	0.135740-03	1.5779
800.0	0.52899	3046.7	5.1657	0.467420-03	0.665640-04	0.125950-03	1.5504
900.0	0.53547	3046.6	5.1570	0.446930-03	0.631290-04	0.117610-03	1.5264
1000.0	0.54160	3047.3	5.1488	0.428940-03	0.600910-04	0.110400-03	1.5053
1100.0	0.54744	3048.7	5.1409	0.412990-03	0.573790-04	0.104100-03	1.4865
1200.0	0.55301	3050.7	5.1335	0.398710-03	0.549400-04	0.985430-04	1.4697
1300.0	0.55835	3053.2	5.1263	0.385830-03	0.527320-04	0.935990-04	1.4544
1400.0	0.56347	3056.2	5.1194	0.374140-03	0.507210-04	0.891670-04	1.4404
1500.0	0.56840	3059.5	5.1128	0.363450-03	0.488800-04	0.851680-04	1.4277
1600.0	0.57316	3063.3	5.1065	0.353640-03	0.471870-04	0.815400-04	1.4157
1700.0	0.57775	3067.4	5.1003	0.344580-03	0.456230-04	0.782310-04	1.4053
1800.0	0.58220	3071.8	5.0944	0.336190-03	0.441740-04	0.752000-04	1.3949
1900.0	0.58651	3076.4	5.0886	0.328390-03	0.428260-04	0.724100-04	1.3854
2000.0	0.59070	3081.4	5.0830	0.321100-03	0.415670-04	0.698340-04	1.3765
2500.0	0.61000	3109.1	5.0573	0.290750-03	0.363410-04	0.594060-04	1.3394
3000.0	0.62705	3141.0	5.0346	0.263810-03	0.320560-04	0.510270-04	1.3043
3500.0	0.64243	3175.7	5.0141	0.250300-03	0.291890-04	0.460180-04	1.2918
4000.0	0.65668	3211.8	4.9950	0.238580-03	0.267920-04	0.418790-04	1.2808
4500.0	0.66997	3248.9	4.9772	0.228270-03	0.247520-04	0.383930-04	1.2709
5000.0	0.68244	3287.0	4.9604	0.219080-03	0.229900-04	0.354120-04	1.2621
6000.0	0.70525	3365.2	4.9296	0.203380-03	0.200940-04	0.305790-04	1.2469
7000.0	0.72574	3445.5	4.9018	0.190420-03	0.178130-04	0.268350-04	1.2344

SUBCOOLED SODIUM LIQUID PROPERTIES AT T = 2300.0 DEG K

P (ATM)	RHOL (G/CC)	HLIQ (J/G)	SLIQ (J/G-K)	ALPHAP (K-1)	BETAS (ATM-1)	BETAT (ATM-1)	CP (J/G-C)
173.3	0.43773	3274.7	5.3246	0.943040-03	0.140800-03	0.359000-03	2.0750
200.0	0.44191	3267.8	5.3189	0.897510-03	0.134770-03	0.344800-03	2.0246
300.0	0.45578	3247.3	5.3002	0.771690-03	0.117100-03	0.278680-03	1.8844
400.0	0.46760	3232.5	5.2842	0.687420-03	0.104400-03	0.235990-03	1.7698
500.0	0.47800	3221.7	5.2702	0.625980-03	0.947040-04	0.205760-03	1.7203
600.0	0.48736	3213.6	5.2575	0.578640-03	0.369880-04	0.183070-03	1.6664
700.0	0.49591	3207.7	5.2460	0.540720-03	0.806610-04	0.169330-03	1.6229
800.0	0.50380	3203.5	5.2354	0.509470-03	0.753540-04	0.151020-03	1.5869
900.0	0.51116	3200.7	5.2255	0.483140-03	0.708220-04	0.139210-03	1.5563
1000.0	0.51806	3199.1	5.2162	0.460550-03	0.668970-04	0.129260-03	1.5300
1100.0	0.52457	3198.3	5.2074	0.440900-03	0.634540-04	0.120770-03	1.5069
1200.0	0.53074	3198.5	5.1991	0.423600-03	0.604060-04	0.113410-03	1.4865
1300.0	0.53662	3199.3	5.1912	0.408200-03	0.576820-04	0.106970-03	1.4683
1400.0	0.54223	3200.7	5.1837	0.394390-03	0.552310-04	0.101280-03	1.4519
1500.0	0.54761	3202.7	5.1765	0.381910-03	0.530110-04	0.962070-04	1.4370
1600.0	0.55278	3205.2	5.1696	0.370550-03	0.509880-04	0.916390-04	1.4234
1700.0	0.55775	3208.1	5.1629	0.360160-03	0.491350-04	0.875520-04	1.4109
1800.0	0.56255	3211.5	5.1565	0.350600-03	0.474310-04	0.838230-04	1.3993
1900.0	0.56719	3215.1	5.1503	0.341770-03	0.458570-04	0.804200-04	1.3886
2000.0	0.57168	3219.1	5.1443	0.333570-03	0.443970-04	0.773010-04	1.3785
2500.0	0.59225	3242.9	5.1168	0.299930-03	0.384270-04	0.648990-04	1.3373
3000.0	0.61037	3271.5	5.0926	0.274720-03	0.339970-04	0.560660-04	1.3058
3500.0	0.62654	3303.9	5.0711	0.250450-03	0.301920-04	0.485250-04	1.2726
4000.0	0.64119	3338.9	5.0515	0.238750-03	0.276540-04	0.440730-04	1.2619
4500.0	0.65485	3375.1	5.0333	0.228440-03	0.255060-04	0.403370-04	1.2522
5000.0	0.66764	3412.2	5.0161	0.219250-03	0.236580-04	0.371520-04	1.2434
6000.0	0.69105	3488.9	4.9846	0.203490-03	0.206330-04	0.320040-04	1.2281
7000.0	0.71205	3568.0	4.9562	0.190430-03	0.182580-04	0.280240-04	1.2153

SJ3COOLED SODIUM LIQUID PROPERTIES AT $T = 2400.0$ DEG K

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P (ATM)	RHOL (G/CC)	MLTQ (J/G)	SLIS (J/G-K)	ALPHAP (K-1)	BETAS (ATM-1)	BETAY (ATM-1)	CP (J/G-K)
216.6	0.40108	3479.7	5.4073	0.123300-02	0.186280-03	0.574090-03	2.3767
300.0	0.41783	3445.9	5.3047	0.989370-03	0.155000-03	0.424640-03	2.1128
400.0	0.43370	3418.2	5.3632	0.827900-03	0.131430-03	0.329950-03	1.9360
500.0	0.44687	3393.5	5.3454	0.726210-03	0.115340-03	0.272720-03	1.8235
600.0	0.45829	3383.9	5.3300	0.654750-03	0.103440-03	0.233900-03	1.7438
700.0	0.46844	3372.9	5.3163	0.601040-03	0.941940-04	0.205600-03	1.6833
800.0	0.47763	3364.5	5.3039	0.558750-03	0.867450-04	0.183960-03	1.6354
900.0	0.48607	3358.2	5.2925	0.524430-03	0.805850-04	0.166790-03	1.5962
1000.0	0.49388	3353.6	5.2820	0.495780-03	0.753860-04	0.152810-03	1.5632
1100.0	0.50119	3350.4	5.2721	0.471420-03	0.709240-04	0.141170-03	1.5350
1200.0	0.50806	3348.2	5.2629	0.450370-03	0.670440-04	0.131320-03	1.5105
1300.0	0.51455	3347.1	5.2541	0.431940-03	0.636320-04	0.122850-03	1.4889
1400.0	0.52072	3346.7	5.2458	0.415630-03	0.606020-04	0.115500-03	1.4697
1500.0	0.52659	3347.1	5.2379	0.401060-03	0.578910-04	0.109030-03	1.4525
1600.0	0.53221	3348.2	5.2304	0.387940-03	0.554460-04	0.103310-03	1.4369
1700.0	0.53759	3349.7	5.2232	0.376040-03	0.532290-04	0.981930-04	1.4226
1800.0	0.54277	3351.8	5.2162	0.365190-03	0.512070-04	0.935970-04	1.4096
1900.0	0.54776	3354.3	5.2095	0.355230-03	0.493530-04	0.894390-04	1.3976
2000.0	0.55258	3357.3	5.2031	0.346050-03	0.476460-04	0.856580-04	1.3864
2500.0	0.57449	3376.7	5.1737	0.308920-03	0.407820-04	0.709090-04	1.3409
3000.0	0.59362	3402.1	5.1492	0.281620-03	0.358010-04	0.606650-04	1.3068
3500.0	0.61069	3431.6	5.1254	0.260410-03	0.319900-04	0.530910-04	1.2798
4000.0	0.62607	3464.3	5.1049	0.238340-03	0.285740-04	0.462510-04	1.2483
4500.0	0.64006	3499.5	5.0862	0.228150-03	0.263100-04	0.422720-04	1.2390
5000.0	0.65317	3535.9	5.0687	0.219040-03	0.243710-04	0.388860-04	1.2305
6000.0	0.67713	3611.0	5.0366	0.203360-03	0.212110-04	0.334310-04	1.2155
7000.0	0.69862	3688.8	5.0076	0.190300-03	0.187380-04	0.292210-04	1.2026
8000.0	0.71809	3748.4	4.9812	0.179260-03	0.167490-04	0.258810-04	1.1917

SJ8COOLED SODIUM LIQUID PROPERTIES AT T = 2500.0 DEG K

P (ATM)	RHOL (G/CC)	HLIQ (J/G)	SLIQ (J/G-K)	ALPHAP (K-1)	BETAS (ATM-1)	BETAT (ATM-1)	CP (J/G-K)
266.3	0.35952	3707.7	5.4950	0.180040-02	0.270780-03	0.104150-02	2.9632
300.0	0.37076	3678.9	5.4797	0.148770-02	0.236510-03	0.809790-03	2.6377
400.0	0.39502	3623.3	5.4469	0.106380-02	0.179450-03	0.510530-03	2.1917
500.0	0.41278	3588.3	5.4229	0.870560-03	0.148540-03	0.382800-03	1.9854
600.0	0.42721	3563.6	5.4034	0.755590-03	0.128350-03	0.309880-03	1.8599
700.0	0.43954	3545.3	5.3867	0.675300-03	0.113360-03	0.262080-03	1.7732
800.0	0.45040	3531.4	5.3720	0.616770-03	0.102820-03	0.228040-03	1.7086
900.0	0.46017	3520.7	5.3588	0.571300-03	0.940620-04	0.202430-03	1.6579
1000.0	0.46910	3512.3	5.3468	0.534680-03	0.869090-04	0.182400-03	1.6168
1100.0	0.47733	3506.0	5.3356	0.504370-03	0.809320-04	0.166240-03	1.5824
1200.0	0.48500	3501.2	5.3253	0.478740-03	0.758470-04	0.152920-03	1.5532
1300.0	0.49219	3497.7	5.3156	0.456710-03	0.714570-04	0.141720-03	1.5279
1400.0	0.49897	3495.3	5.3065	0.437500-03	0.676200-04	0.132160-03	1.5057
1500.0	0.50540	3493.8	5.2978	0.420560-03	0.642330-04	0.123890-03	1.4859
1600.0	0.51151	3493.2	5.2896	0.405470-03	0.612160-04	0.116670-03	1.4682
1700.0	0.51734	3493.2	5.2817	0.391910-03	0.585080-04	0.110300-03	1.4523
1800.0	0.52293	3493.9	5.2742	0.379650-03	0.560620-04	0.104630-03	1.4377
1900.0	0.52829	3495.2	5.2670	0.368480-03	0.538390-04	0.995470-04	1.4244
2000.0	0.53345	3496.9	5.2601	0.358260-03	0.518080-04	0.949680-04	1.4121
2500.0	0.55677	3511.6	5.2288	0.317510-03	0.437860-04	0.774480-04	1.3626
3000.0	0.57695	3533.5	5.2018	0.288130-03	0.381050-04	0.655920-04	1.3261
3500.0	0.59484	3560.2	5.1779	0.265590-03	0.338330-04	0.569840-04	1.2975
4000.0	0.61098	3590.4	5.1564	0.247550-03	0.304830-04	0.504210-04	1.2743
4500.0	0.62565	3623.4	5.1368	0.227320-03	0.273560-04	0.441750-04	1.2440
5000.0	0.63903	3658.9	5.1190	0.218400-03	0.253050-04	0.406010-04	1.2361
6000.0	0.66351	3732.6	5.0862	0.202950-03	0.219760-04	0.348490-04	1.2216
7000.0	0.68546	3809.1	5.0567	0.189990-03	0.193820-04	0.304160-04	1.2090
8000.0	0.70534	3887.7	5.0299	0.178960-03	0.172990-04	0.269010-04	1.1983

SUBCOOLED SODIUM LIQUID PROPERTIES AT T = 2600.0 DEG K

P (ATM)	RHOL (G/CC)	HLIQ (J/G)	SLIQ (J/G-K)	ALPHAP (K-1)	BETAS (ATM-1)	BETAT (ATM-1)	CP (J/G-K)
322.7	0.30957	3977.4	5.5940	0.33969D-02	0.48236D-03	0.26298D-02	4.5729
400.0	0.34757	3866.7	5.5423	0.15788D-02	0.29517D-03	0.97623D-03	2.7741
500.0	0.37444	3800.0	5.5059	0.10992D-02	0.21513D-03	0.58676D-03	2.2877
600.0	0.39362	3758.9	5.4799	0.89053D-03	0.17425D-03	0.43043D-03	2.0719
700.0	0.40901	3730.0	5.4591	0.76770D-03	0.14841D-03	0.34380D-03	1.9430
800.0	0.42206	3708.5	5.4414	0.68469D-03	0.13026D-03	0.28804D-03	1.8547
900.0	0.43350	3691.9	5.4260	0.62387D-03	0.11666D-03	0.24886D-03	1.7892
1000.0	0.44375	3679.0	5.4121	0.57690D-03	0.10601D-03	0.21969D-03	1.7382
1100.0	0.45307	3668.9	5.3995	0.53921D-03	0.97402D-04	0.19704D-03	1.6968
1200.0	0.46165	3660.9	5.3879	0.50813D-03	0.90272D-04	0.17891D-03	1.6623
1300.0	0.46963	3654.7	5.3772	0.48193D-03	0.84251D-04	0.16403D-03	1.6330
1400.0	0.47709	3649.9	5.3671	0.45944D-03	0.79087D-04	0.15159D-03	1.6077
1500.0	0.48411	3646.3	5.3576	0.43988D-03	0.74600D-04	0.14101D-03	1.5855
1600.0	0.49076	3643.8	5.3487	0.42265D-03	0.70660D-04	0.13191D-03	1.5658
1700.0	0.49707	3642.2	5.3402	0.40733D-03	0.67166D-04	0.12397D-03	1.5481
1800.0	0.50309	3641.4	5.3320	0.39358D-03	0.64045D-04	0.11699D-03	1.5322
1900.0	0.50885	3641.2	5.3243	0.38116D-03	0.61235D-04	0.11080D-03	1.5176
2000.0	0.51438	3641.7	5.3169	0.36986D-03	0.58691D-04	0.10527D-03	1.5044
2500.0	0.53916	3651.3	5.2836	0.32549D-03	0.48844D-04	0.84515D-04	1.4513
3000.0	0.56039	3669.4	5.2551	0.29409D-03	0.42058D-04	0.70839D-04	1.4127
3500.0	0.57911	3693.1	5.2300	0.27029D-03	0.37052D-04	0.61087D-04	1.3828
4000.0	0.59593	3720.9	5.2076	0.25141D-03	0.33183D-04	0.53751D-04	1.3586
4500.0	0.61125	3751.7	5.1871	0.23592D-03	0.30089D-04	0.48013D-04	1.3384
5000.0	0.62526	3785.1	5.1685	0.21725D-03	0.27083D-04	0.42273D-04	1.3092
6000.0	0.65021	3857.4	5.1352	0.20220D-03	0.23460D-04	0.36244D-04	1.2958
7000.0	0.67258	3932.7	5.1052	0.18946D-03	0.20648D-04	0.31601D-04	1.2837
8000.0	0.69285	4010.1	5.0779	0.17853D-03	0.18397D-04	0.27918D-04	1.2728
9000.0	0.71137	4089.3	5.0528	0.16907D-03	0.16555D-04	0.24935D-04	1.2633

SJBCJLED SODIUM LIQUID PROPERTIES AT T = 2700.0 DEG K

P (ATM)	RHOL (G/CC)	HLIQ (J/G)	SLIQ (J/G-K)	ALPHAP (K-1)	BETAS (ATM-1)	BETAT (ATM-1)	CP (J/G-K)
385.8	0.23806	4368.5	5.7325	0.250590-01	0.197610-02	0.312780-01	24.6290
400.0	0.27135	4247.4	5.6856	0.476630-02	0.114650-02	0.472120-02	6.4073
500.0	0.32924	4066.2	5.6062	0.152420-02	0.479740-03	0.104780-02	3.3985
600.0	0.35684	3994.6	5.5688	0.108360-02	0.333200-03	0.636210-03	2.9711
700.0	0.37669	3949.6	5.5419	0.883000-03	0.261460-03	0.465760-03	2.7718
800.0	0.39262	3917.7	5.5203	0.763100-03	0.217620-03	0.370710-03	2.6506
900.0	0.40613	3893.7	5.5021	0.681470-03	0.187630-03	0.309510-03	2.5668
1000.0	0.41795	3875.1	5.4861	0.621430-03	0.165630-03	0.266580-03	2.5043
1100.0	0.42852	3860.5	5.4718	0.574930-03	0.148720-03	0.234670-03	2.4553
1200.0	0.43613	3848.8	5.4588	0.537570-03	0.135250-03	0.209950-03	2.4155
1300.0	0.44697	3839.4	5.4468	0.506720-03	0.124240-03	0.190210-03	2.3823
1400.0	0.45518	3832.0	5.4357	0.480690-03	0.115050-03	0.174050-03	2.3540
1500.0	0.46285	3826.1	5.4254	0.458350-03	0.107250-03	0.160560-03	2.3294
1600.0	0.47006	3821.5	5.4156	0.438900-03	0.100540-03	0.149120-03	2.3079
1700.0	0.47688	3818.0	5.4064	0.421770-03	0.946880-04	0.139280-03	2.2887
1800.0	0.48336	3815.5	5.3977	0.406520-03	0.895430-04	0.130720-03	2.2716
1900.0	0.48953	3813.9	5.3894	0.392850-03	0.849780-04	0.123210-03	2.2561
2000.0	0.49543	3813.0	5.3814	0.380490-03	0.808950-04	0.116550-03	2.2419
2500.0	0.52170	3817.1	5.3461	0.332630-03	0.655500-04	0.920920-04	2.1861
3000.0	0.54400	3831.2	5.3161	0.299350-03	0.553850-04	0.763850-04	2.1460
3500.0	0.56355	3852.0	5.2899	0.274410-03	0.481000-04	0.653830-04	2.1151
4000.0	0.58103	3877.3	5.2665	0.254780-03	0.425900-04	0.572130-04	2.0903
4500.0	0.59691	3906.1	5.2453	0.238770-03	0.382590-04	0.508850-04	2.0695
5000.0	0.61149	3937.4	5.2259	0.225360-03	0.347530-04	0.458280-04	2.0518
6000.0	0.63723	4007.1	5.1916	0.201070-03	0.290000-04	0.376030-04	2.0176
7000.0	0.65998	4081.1	5.1512	0.188660-03	0.254120-04	0.327660-04	2.0063
8000.0	0.68061	4157.5	5.1335	0.177920-03	0.225510-04	0.289270-04	1.9959
9000.0	0.69946	4235.7	5.1080	0.168560-03	0.202190-04	0.258130-04	1.9865

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