# AEC-NASA TECH BRIEF



## Thermophysical Properties of Sodium

A critical assessment and tabulation of the physical and thermodynamic properties of real sodium have been presented (*1*). Consideration is given to the liquid density, vapor pressure, thermodynamic and pressure-volume-temperature (PVT) properties, transport properties, electrical resistivity, and surface tension, as well as the thermal-expansion coefficient, compressibility, and sonic velocity of the liquid.

A FORTRAN subroutine was written for computation of the enthalpy and entropy of sodium in a given state, and also the composition, mean molecular weight, specific volume, and compressibility factor of the corresponding vapor. Tabular results for the saturated liquid and vapor are presented for the range from 500° to 2,500°F. Also given are derived H-S and T-S diagrams. The transport properties (the viscosity and thermal conductivity of the saturated liquid and vapor) also are presented in tabular form for the range from 210° to 2,500°F.

Several recent studies of sodium's related properties have been prompted by interest in sodium as a heat-transfer fluid and as a working fluid for power cycles. The large amount of information accumulated since 1960 had warranted an updated compilation.

The updating was stimulated by recently published PVT and related measurements for saturated and superheated sodium vapor. From a thermodynamic analysis of the data it was concluded that the vapor contains not only the monomer and dimer, but also species of higher molecular weight, probably the tetramer. With these results the thermodynamic properties of saturated and superheated sodium were computed for the range from 1,600° to 2,500°F, essentially the range of the reference measurements. There is, however, great interest in such values at temperatures well below 1,600°F, at which precise PVT measurements have not been made. Thus the compilation of sodium properties was undertaken with updating wherever possible through 1966.

The critical parameters (temperature, pressure, and specific volume) are not included in the compilation because considerable uncertainty exists regarding reported values, and no experimental basis is available for a "best choice."

### Reference:

1. G. H. Golden and J. V. Tokar, *ANL-7323* (Argonne National Laboratory, August 1967); available from the Clearinghouse for Federal Scientific and Technical Information, Springfield, Virginia 22151, at $3.00 (microfiche, $0.65).

### Notes:

1. Chemical processors, heating plants, and highway-development organizations, in addition to physical chemists, may be interested in this information.
2. Inquiries may be directed to:

   Office of Industrial Cooperation
   Argonne National Laboratory
   9700 South Cass Avenue
   Argonne, Illinois 60439
   Reference: B69-10240

   Source: G. H. Golden and J. V. Tokar
   Reactor Engineering Division
   (ARG-10363)

### Patent status:

Inquiries concerning rights for commercial use of this innovation may be made to:

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U.S. Atomic Energy Commission
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