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Computer Program for Calculating Thermodynamic and Transport Properties of Fluids

A computer code, GASP, has been developed to provide thermodynamic and transport properties of the following fluids: argon, carbon dioxide, carbon monoxide, fluorine, helium, methane, neon, nitrogen, oxygen, and parahydrogen. The equation of state and transport coefficients are updated and other fluids added as new material becomes available.

GASP accepts any two of pressure, temperature or density as input conditions. In addition, pressure and either entropy or enthalpy are also allowable input variables. The properties available in any combination as output include temperature, density, pressure, entropy, enthalpy, specific heats (C_p, C_v), expansion coefficient (C_p/C_v), sonic velocity, $(\partial P/\partial \rho)_T$,$(\partial P/\partial T)_\rho$, viscosity, thermal conductivity and surface tension. A special technique is provided to estimate the thermal conductivity near the thermodynamic critical point.

Properties are calculated at pressures from 0.1 to 400 atmospheres (to 100 atmospheres for helium and 1000 atmospheres for hydrogen). The temperatures range from near the triple point to 300 K (81°F) for neon, to 500 K (441°F) for carbon monoxide, oxygen and fluorine, to 600 K (621°F) for methane and nitrogen, to 1000 K (1341°F) for argon and carbon dioxide, and to 2000 K (3141°F) for parahydrogen, and from 6 to 500 K(-449 to 441°F) for helium (restricted use below 6 K (-449°F)).

The GASP package was developed to be used with heat transfer and fluid flow calculations, and as such has broad application. It appears to be particularly useful in the many applications of cryogenic fluids. Some of the problems associated with the liquefaction, storage and gassification of liquefied natural gas and liquefied petroleum gas can also be studied using GASP.

GASP was written for the engineer user who requires both accuracy and speed in calculating thermodynamic and transport properties.

Notes:

1. This program is written in FORTRAN IV for use on the UNIVAC 1106 computer.
2. It is also available for use on the IBM 7094/7044 DCS machine (reference LEW-11629) and can be easily converted to a CDC machine with a FORTRAN IV/V compiler.
3. The code is somewhat modular and can be used as a single package or disassembled for core storage limited problems.
4. Inquiries concerning the program should be addressed to:

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   Information Services
   112 Barrow Hall
   University of Georgia
   Athens, Georgia 30602
   Reference: LEW-12520 (UNIVAC 1106)
   LEW-11629 (IBM 7094/7044 DCS)

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