NASA TECH BRIEF

Computer Programs for Thermodynamic and Transport Properties of Hydrogen

The problem:

The computations that generate thermodynamic and transport properties data through accurate formulas are very slow since the formulas are complicated and require iterative solution.

The solution:

Computer program subroutines which provide the thermodynamic and transport properties of hydrogen in tabular form.

How it's done:

The thermodynamic and transport properties were first determined by experimental data and theory. In the program, these properties are presented in tables. The tabular intervals are varied to hold the accuracy of the interpolated values to an approximately constant level.

The range of the program is from 1 to 5,000 psia for temperatures from the triple point to 5,000°R or for enthalpies from −130 BTU/lb to 20,000 BTU/lb.

The programs provide 18 combinations of input and output variables. Input variables are the pairs pressure/temperature or pressure/enthalpy. Output variables are enthalpy or temperature, density, entropy, thermal conductivity, viscosity, velocity of sound, heat capacity at constant pressure, heat capacity at constant volume, and the heat capacity ratio.

Since these programs assume parahydrogen at low temperatures and conversion to the normal mixture through dissociation, it would not be proper to use these programs on a process which begins in the cryogenic range, goes to high temperature, and then is returned to the cryogenic range.

Notes:

1. This program is written in Fortran IV for use on the IBM 7044 or CDC 3600 computers.
2. This program will be useful to scientists and engineers involved in cryogenics research.
3. Inquiries concerning this program may be made to:

    COSMIC
    Computer Center
    University of Georgia
    Athens, Georgia 30601
    Reference: B68-10150

Patent status:

No patent action is contemplated by AEC or NASA.

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Category 06