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Standard Specification for Ethane Thermophysical Property Tables[1]

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1. Scope

1.1 The thermophysical property tables for ethane are for use in the calculation of the pressure-volume-temperature (PVT), thermodynamic, and transport properties of ethane for process design and operations. Tables are provided for gaseous and liquid ethane at temperatures between 92 and 600 K at pressures to 20 MPa. Two tables provide properties at the conditions of liquid-vapor equilibrium (saturation properties). A third table provides properties at selected *T*, *p* points for the equilibrium phase at those conditions. The tables were developed by the National Institute of Standards and Technology from a Standard Reference Database product REFPROP, version 9.0.

1.2 The values stated in SI units are to be regarded as standard. No other units of measurement are included in this standard.

2. Applicability

2.1 These tables apply directly only to pure gaseous ethane. However, it is expected that they may find substantial use in mathematical models and tables for the thermophysical properties of mixtures containing ethane.

3. Tables

3.1 These tables were produced by equations from a computer package, "NIST Standard Reference Database 23; Reference Fluid Thermodynamic and Transport Properties Database (REFPROP): Version 9.0." A wide selection of units (SI units, engineering units, chemical units) and additional properties are available with this program.[2]

3.2 These thermophysical property tables are:

3.2.1 *Thermophysical Properties of Ethane Liquid at Vapor-Liquid Equilibrium,* in SI units. See Table 1.

3.2.2 *Thermophysical Properties of Ethane Vapor at Vapor-Liquid Equilibrium,* in SI units. See Table 2.

3.2.3 *Thermophysical Properties of Ethane Along Isobars,* in SI units. See Table 3.

3.3 The symbols are:

T, temperature (K)
ρ, molar density ($mol \cdot l^{-1}$)
H, molar enthalpy ($J \cdot mol^{-1}$)
S, molar entropy ($J \cdot K^{-1} \cdot mol^{-1}$)
C_v, constant volume molar heat capacity ($J \cdot K^{-1} \cdot mol^{-1}$)
C_p, constant pressure molar heat capacity ($J \cdot K^{-1} \cdot mol^{-1}$)
c, speed of sound ($m \cdot s^{-1}$)
η, viscosity (μPa·s)
λ, thermal conductivity ($mW \cdot m^{-1} \cdot K^{-1}$)

3.4 The tabulated thermophysical properties are:

ρ, molar density ($mol \cdot l^{-1}$)
H, molar enthalpy ($J \cdot mol^{-1}$)
S, molar entropy ($J \cdot K^{-1} \cdot mol^{-1}$)
C_v, constant volume molar heat capacity ($J \cdot K^{-1} \cdot mol^{-1}$)
C_p, constant pressure molar heat capacity ($J \cdot K^{-1} \cdot mol^{-1}$)
c, speed of sound ($m \cdot s^{-1}$)
η, viscosity (μPa·s)
λ, thermal conductivity ($mW \cdot m^{-1} \cdot K^{-1}$)

4. Additional Information

4.1 Reference state properties are required to calculate certain of the thermodynamic properties (enthalpy, entropy, etc.) from an equation of state formulation. The reference state properties used to generate the tables in this specification are: enthalpy, *H*, and entropy, *S*, at the Normal Boiling Point; 184.57K and 0.10133MPa (H = 14716 J/mol and S = 79.731 J/(mol K)). The molar mass of ethane is 30.069 g/mol.

5. Keywords

5.1 ethane gas tables; natural gas; thermodynamic properties of ethane; transport properties of ethane

[1] This specification is under the jurisdiction of ASTM Committee D03 on Gaseous Fuels and is the direct responsibility of Subcommittee D03.08 on Thermophysical Properties.

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[2] Available from Standard Reference Data, National Institute of Standards and Technology (NIST), 100 Bureau Drive, Stop 3460, Gaithersburg, MD 20899.

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