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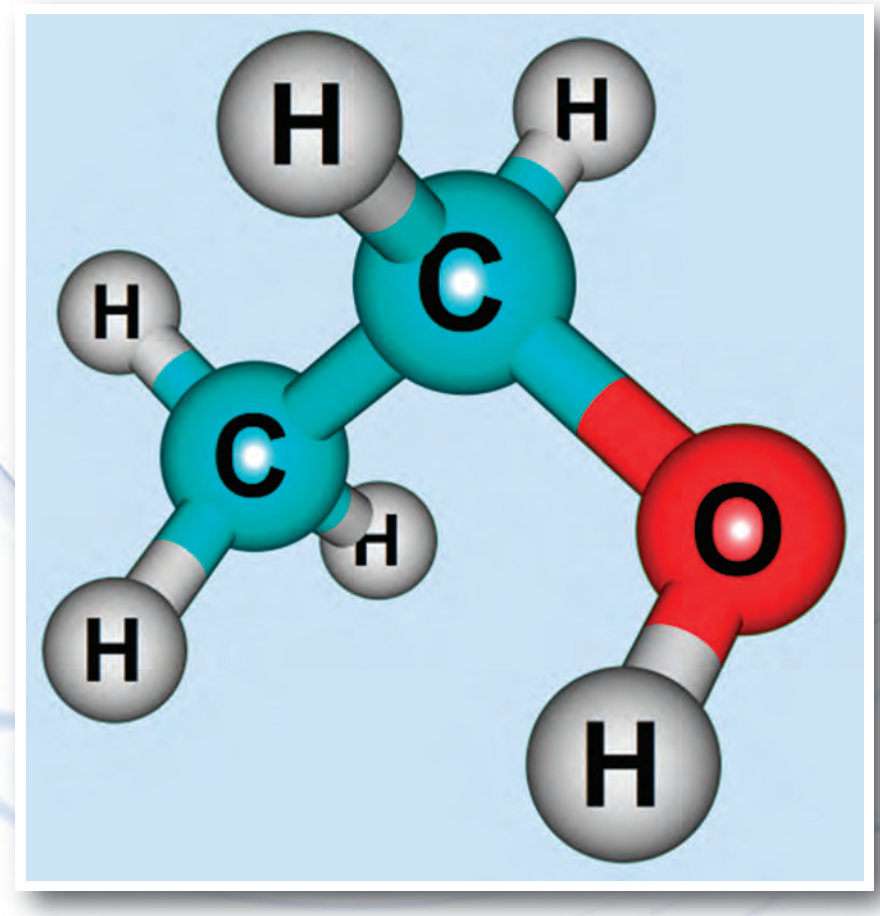

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Reference Correlation for the Viscosity of Ethane

Eckhard Vogel[a)]
Institut für Chemie, Universität Rostock, D-18059 Rostock, Germany

Roland Span
Lehrstuhl für Thermodynamik, Ruhr-Universität Bochum, D-44780 Bochum, Germany

Sebastian Herrmann
Fachgebiet Technische Thermodynamik, Hochschule Zittau/Görlitz, D-02763 Zittau, Germany

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A new representation of the viscosity for the fluid phase of ethane includes a zero-density correlation and a contribution for the critical enhancement, initially both developed separately, but based on experimental data. The higher-density contributions are correlated as a function of the reduced density $\delta = \rho/\rho_c$ and of the reciprocal reduced temperature $\tau = T_c/T$ (ρ_c—critical density and T_c—critical temperature). The final formulation contains 14 coefficients obtained using a state-of-the-art linear optimization algorithm. The evaluation and choice of the selected primary data sets is reviewed, in particular with respect to the assessment used in earlier viscosity correlations. The new viscosity surface correlation makes use of the reference equation of state for the thermodynamic properties of ethane by Bücker and Wagner [J. Phys. Chem. Ref. Data **35**, 205 (2006)] and is valid in the fluid region from the melting line to temperatures of 675 K and pressures of 100 MPa. The viscosity in the limit of zero density is described with an expanded uncertainty of 0.5% (coverage factor $k = 2$) for temperatures $290 < T/\mathrm{K} < 625$, increasing to 1.0% at temperatures down to 212 K. The uncertainty of the correlated values is 1.5% in the range $290 < T/\mathrm{K} < 430$ at pressures up to 30 MPa on the basis of recent measurements judged to be very reliable as well as 4.0% and 6.0% in further regions. The uncertainty in the near-critical region ($1.001 < 1/\tau < 1.010$ and $0.8 < \delta < 1.2$) increases with decreasing temperature up to 3.0% considering the available reliable data. Tables of the viscosity calculated from the correlation are listed in an appendix for the single-phase region, for the vapor–liquid phase boundary, and for the near-critical region. [http://dx.doi.org/10.1063/1.4930838]

Key words: correlation; critical enhancement; ethane; viscosity.

CONTENTS

[a)]Electronic mail: eckhard.vogel@uni-rostock.de.