

Reference Correlation of the Viscosity of Toluene from the Triple Point to 680 K and up to 500 MPa

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Toluene was the first reference liquid to be proposed (after water), as it is widely used as a basic compound for chemical synthesis and as an organic solvent. Furthermore, its unusually wide temperature range in the liquid phase (178 to 384 K) and its resistance to decomposition, makes it an ideal reference liquid for viscosity calibration purposes and apparatus validation. Thus in 2001, under the auspices of the International Association, a correlation for the viscosity of toluene as a function of temperature and density was proposed by Assael et al.[1]. The temperature range covered was from 213 to 373 K, and the pressure range from atmospheric up to 250 MPa. The standard deviation of the proposed correlation was 2.7% (within a 95% confidence limit). Following the publication of new low-temperature experimental data on the viscosity of liquid toluene along the saturation line, in 2006 a new correlation for the viscosity of toluene along the saturation line was published by Santos et al. [2]. Recommended values were proposed with uncertainties of 0.5% (at the 95% confidence level), for temperatures between 260 K to 370 K, and 2% for 210 K to 260 K and 370 K to 400 K. Furthermore, the value of $554.2 \pm 3.3 \mu\text{Pa s}$, was proposed for the viscosity of toluene at 298.15 K. In 2012 an equation of state for toluene was published by Lemmon and Span,[3] thus making possible the development of a wide range viscosity correlation for toluene. Hence, in this work, based on critically-assessed literature data, a new wide-ranging correlation for the viscosity of toluene, valid over gas, liquid, and supercritical states, is proposed.

References

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