Measurement and Correlation of the (p, v, T) Behavior of Liquid Propylene Glycol in the Temperature Range from (273 to 393) K at Pressures up to 100 MPa

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The (p, v, T) behavior of propylene glycol (propane-1,2-diol) was investigated in the homogeneous liquid phase over the temperature range from (273 to 393) K at pressures from (5 to 100) MPa. For the measurements, a commercially available high-pressure vibrating tube densimeter was utilized. To properly calibrate the instrument over the density range of interest, high-purity water was used. Prior to the measurements, the propylene glycol sample with a purity of 99.50 vol-% (product #: W294004, provided by Sigma Aldrich) was degassed by several freeze-thaw-pump cycles. The main impurity was water, and we assume that it did not significantly affect the results as the density of water is similar to that of propylene glycol. Based on this assumption, the sample was not further purified. Overall, the relative combined expanded uncertainty in density was estimated to be less than 0.15% for most cases (level of confidence 95%). From the experimental results, a simple correlation equation for the density of propylene glycol has been established. We compare the experimental data from this work with our new correlation equation and the data reported by other experimentalists. The main purpose of this work was to provide a comprehensive data set of liquid-phase densities of propylene glycol for the future development of a fundamental equation of state for this pure substance. This fundamental equation is of interest for polymer production, food processing and for low temperature heat exchange applications. The simple correlation equation presented here is easy to implement and can be used when only liquid-phase densities are of interest.