Viscosity of Methane, Nitrogen, and Their Mixtures at Temperatures Between (95 and 225) K at Pressures up to 10 MPa

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Natural gas is an important energy source today and in the future, playing a role in the transition of the global energy consumption structure from fossil fuels to renewable energies, in particular liquefied natural gas (LNG). The optimization of the design and operation of natural gas processes requires accurate knowledge of the phase behavior and transport properties of the various phases and compositions. However, there is a lack of research on the viscosity of mixtures of LNG and its main components below 200 K. Viscosity measurements of methane, nitrogen, and their mixture in gaseous, liquid, and supercritical states are reported for temperatures between (95 and 225) K and pressures between (0 and 10) MPa by using two vibrating-wire viscometers with tungsten wires of different radii. The standard uncertainty of the viscosity measurements was estimated to be 2.2% over all temperature and pressure ranges. The results were compared with the work of other authors and the corresponding-states model. The measured data can be used to develop and improve viscosity models for natural gas throughout the entire fluid range.