

Modeling the Thermal Conductivity of Hydrocarbons Via the Use of Density Scaling

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Casalini and Roland [*Phys. Rev. E* **69**, 062501 (2004); *J. Non-Cryst. Solids* **353**, 3936 (2007)] have effectively proved that both the dielectric relaxation times and the viscosity of liquids can be graphically represented into a single master curve as a function of the thermodynamic potential ($T\rho^{-\gamma}$), where T is the temperature, ρ is the molar density, and γ is a state-independent scaling exponent. In this work, we applied the aforementioned thermodynamic scaling to the thermal conductivity of saturated hydrocarbons from methane to n -decane. Unlike previous studies on density scaling of transport properties, a more suitable normalization of the thermal conductivity was used in this work in order to obtain improved correlations of thermal conductivity over much wider temperature and pressure ranges encompassing the zero-density limit, the high-density region, the gas-liquid saturation line and the vicinity of the critical point. A calculation procedure is also described here to optimize the value of the scaling exponent γ that ensures the best superpositioning of all experimental isotherms considered.