Accurate Density and Viscosity Modeling of Ionic Liquids Using Density Scaling Coupled with a Cubic EoS

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The so-called *thermodynamic scaling or power-law density scaling* has proven to be a promising modeling approach for the shear viscosity of various types of molecular liquids including highly polar, associating, and ionic fluids. However, experimental densities of the fluid of interest must be available in order to ensure the best superposition of the viscosity data with a power-law scaling potential involving temperature and density; moreover, measured density and viscosity at the same temperature and pressure may not available either. Consequently, the purpose of this work is to present the application of a density scaling approach coupled with a cubic equation of state CEoS (Soave or Peng-Robinson) for modeling the dynamic viscosity of pure ionic liquids (ILs). The use of a CEoS served here to provide density data of the high accuracy required for the density scaling approach; the repulsion and attractive parameters (including the α function) of the CEoS were refitted for such a purpose. The resulting modeling approach was successfully validated during the representation of experimental dynamic viscosities of three families of imidazolium-based ILs([$C_X$mim][BF_4], [$C_X$mim][PF_6] and [$C_X$mim][Tf_2N]) in a temperature range varying from 0 to 80 °C and at pressures from 1 up to 3 000 bar.