Liquid-Liquid Coexistence Curves Obtained from Refractive-Index Data

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Measurements of the refractive index \( n \) as a function of the temperature \( T \) provide an effective method for investigating the shape of coexistence curves in liquid-liquid phase transitions. To gain useful information from such measurements, experimental \( T-n \) data need to be converted into \( T-x \) and \( T-\rho_x \) data (where \( x \) and \( \rho_x \) stand for the mole fraction and partial density, respectively). For this purpose the Lorentz-Lorenz (LL) equation is commonly employed. The question arises how reliable are such LL-based procedures. Here we address this question by analyzing literature data of \( T-x \) and \( T-\rho_x \) for the coexistence curves of liquid mixtures in the framework of the concept of complete scaling to account for asymmetric criticality [1,2]. In particular, we develop specific fitting procedures which enable us to obtain reliable values for the two coefficients in the expressions for the scaling fields that are responsible for liquid-liquid asymmetry. We shall provide evidence that these asymmetry coefficients are related to the molecular volumes of the two liquid components [3].