Liquid-Liquid Equilibria from a More General Point of View: Mixtures of Alkanes or Ionic Liquids with *n*-Alkyl Alcohols

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In order to gain a more general insight into liquid-liquid phase behavior, we have performed a systematic study of the liquid-liquid phase behavior of mixtures of classical molecular liquids (*n*-alkanes) and ionic liquids (protic and non-protic ones) with *n*-alkyl alcohols; in sum 85 different binary systems were considered. The main objective was to identify systematic trends of the phase behavior. By a gradual variation of chain lengths of one component of the investigated systems, small changes of the molecular interactions are achieved resulting in characteristic shifts of the phase behavior. The critical solution temperature, the critical composition, and the parameters characterizing the shape of the phase body are determined by a numerical analysis of the phase diagrams presuming Ising criticality and a nonlinear diameter. Notably, this method enables also accurate predictions of the critical solution point on the basis of data at noncritical composition. The systems studied so far show limited miscibility with upper critical solution temperatures (UCSTs), they show variations from an asymmetric shape to an almost symmetrical one. The UCST decreases with decreasing length of the alkyl-chains of either in case of the alkane-alcohol mixtures the alkane or in case of the IL-alcohol mixtures the alcohols. Both classes of systems show the same universal critical behavior. The variations of the parameters are mainly determined by the size of the alkyl-chains. A simple determination of the free enthalpies on the basis of a Flory-Huggins like approach allows for a description and partially a prediction of UCSTs of the different systems.