

Estimating Critical Solution Temperatures Above the Decomposition Temperature: Ternary Mixtures of the Protic Ionic Liquid Ethyl-Ammonium Nitrate and Mixtures of *n*-Alkyl Alcohols

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Binary mixtures of the protic ionic liquid ethyl-ammonium nitrate (EAN) with *n*-alkyl alcohols exhibit a phase behavior with a liquid-liquid upper critical solution point. For the EAN-alcohol mixtures with 1-heptanol and 1-octanol the critical temperatures are located at $T = 259.4$ K and $T = 310.8$ K, respectively. The critical temperatures are strongly increasing when longer chained alcohols are considered. As EAN - mixtures with longer chained alcohols show a strong indication of decomposition at temperatures above ~ 363 K, their critical points are not accessible. In order to get an estimate on the locus of the critical temperatures of mixtures with 1-decanol, ethanol as a third component is added. Here we demonstrate the experimental procedure for this determination.

In a first step, the influence of small aliquots of ethanol on the critical temperature of the binary mixture of EAN and 1-octanol is examined by a stepwise titration. It has been observed that the addition of ethanol results in a significant decrease of the critical temperature.

Therefore, EAN-1-decanol binaries with suitable amounts of the third component ethanol are prepared. They are exhibiting cloud point temperatures which are not influenced by thermal decomposition. By a stepwise variation of the amount of ethanol in the different mixtures, a reasonable estimate of the demixing temperatures of the single binary EAN-1-decanol mixtures is possible and, thus, the critical point of the mixture can be estimated.