Thermodynamic properties of 1-butanol + butylamines

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Mixtures of alcohol + amine showed a characteristic concentration-dependence of glass transition temperatures, viscosity and were extremely large exothermic reaction on mixing [1-2]. Hydrogen-bonding between amines and alcohols might be large effect on stability of solution. Also the steric effect and the influences of hydrophobic groups on hydrogen bonding are interesting in understanding of interaction of alcohols and amines. In order to clarify the steric effect on alcohols and amine, excess enthalpies of alcohols + amines were determined and discussed by thermodynamic properties of formation of alcohols-amine complexes, Raman spectrometry, quantum chemical calculation and association model of solution theory.

However most of those have been reported in liquid state and there are a few results of the liquid-solid equilibrium. Butanols and butylamines have four isomers. To reveal the steric effect on alcohols and amine, phase diagrams of 1-butanol and butylamines (*n*-, *sec*- and *iso*-butylamine) have been determined. In this study, to clarify the positional effect of the amino group of butylamines on thermodynamic properties, mixtures of 1-butanol + butylamines were determined. Thermoprofiles of (1-*x*)1-butanol + *x*butylamines were measured by a differential scanning calorimeter (Hitachi High-Tech Science, DSC7000X), and determined the phase diagrams from an analysis of phase transition; glass transition, melting temperature and so on. Also excess enthalpies of mixing of those systems were determined at 298.15 K.

The glass transition temperature of mixtures was increased in portion to the concentration of butylamines less than x=0.4. However their changes of glass transition temperature were greatly different with each mixtures over x=0.5. Excess enthalpies of those mixtures were large exothermic over the whole range of mole fractions and showed unique results by means of those steric effects.

Phase behaviours and excess thermodynamic properties will be discussed.

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