

Abstract

The phase diagram of the system water/phenethyl alcohol (PEA)/Laureth 4 (L4)/glycerol was determined using visual observation, optical microscopy, small-angle X-ray diffractometry, and the vapor pressure of phenethyl alcohol measured by gas chromatographic analysis of headspace vapor at equilibrium. The phase diagram was shown to be dominated by three narrow isotropic liquid solubility regions along the water/glycerol, glycerol/PEA, and PEA/L4 axes. Vapor pressure measurements and tie-line determinations showed the final state of formulations after evaporation of water to be emulsions of glycerol/PEA-in-L4/PEA or L4/PEA-in-glycerol/PEA. PEA was predominantly dissolved in the L4/PEA phase because the chemical potential of PEA in glycerol was high, even at modest concentrations.