Abstract

Nanofoams show, among other intriguing properties, excellent heat insulation. However, due to the large bubble number densities needed to form a nanofoam, current production methods are difficult and very expensive. This work presents a promising new way to use the microemulsion structures for foaming processes called the *Principle Of Supercritical Microemulsion Expansion* (POSME). Here, a compressed supercritical foaming agent acts as oil component in micellar microemulsion systems. In contrast to conventional foaming procedures the high density of the blowing agent in the micelles and the supercritical state should permit the immediate formation and growth of bubbles without mass transport and a nucleation step. Starting with a near critical microemulsion of the type water – propane – polyethyleneglycol mono n-alkylether (C_iE_j), supercritical bicontinuous carbon dioxide microemulsions are obtained for the first time by replacing propane stepwise by carbon dioxide. The general trends in microemulsion phase behavior are verified for systems with carbon dioxide, ethane and propane as well as mixtures of carbon dioxide/propane and ethane/propane. First measurements on water – carbon dioxide – C_iE_j/fluorinated surfactant show that fluorinated surfactants increase the efficiency without changing the overall phase behavior. To solidify the aqueous foams that result from these microemulsions, the influence of a water soluble melamine prepolymer on the phase behaviour of microemulsions was characterized. First foaming experiments following the POSME procedure yielding melamine resin are presented.