Abstract

Recently, the application of microemulsions as *smart* media for organic and inorganic syntheses has received considerable attention. Water swollen micelles can be regarded as nano-sized reaction vessels for the synthesis of metal nanoparticles. However, the effect of the micelles' exchange kinetics on the shape and size of the particles has not yet been clarified. Therefore, I investigated the micelles' exchange kinetics for the non-ionic surfactant based system H_2O – *n*-alkane – C_iE_j (*n*-alkyl polyoxyethylene). The rate constant of the exchange does not depend on the size of the micelles and weakly on their concentration. In efficient microemulsion systems, the exchange kinetics are slowed down considerably. Microemulsion systems are not yet optimized as potential reaction media for highly reactive reagents. Thus, the most reactive component, namely water, was replaced by the inert tetrahydrothiophen-1,1-dioxide (sulfolane). By chosing the long chained surfactants $C_{18}E_6$ and $C_{18}E_8$ as amphiphiles, I was the first to formulate a water-free microemulsion system containing sulfolane – *n*-octane – $C_{18}E_6/C_{18}E_8$. At first, inorganic synthesis of platinum, bismuth and lead nanoparticles was conducted in inexpensive ionic surfactant based microemulsion systems of the type H_2O/salts – oil – ionic surfactant – cosurfactant. Moreover, bicontineous microemulsions comprising H_2O – oil – nonionic surfactant – cosurfactant were effectively used to overcome reagent incompatibilities for the epoxidation of α,β-unsaturated enones. The reaction in the microemulsion systems was up to 35 times faster than in heterogeneous two-phase systems.