

Abstract

The interest in inexpensive transition metal nanoparticles as catalysts in organic chemistry has increased in recent years. Microemulsions prove to be an excellent option for size-controlled synthesis of monodisperse particles, because of their structure on the nano-scale. However, oxidation is a major problem that reduces the catalytic activity of nanoparticles. For these particles to be prepared in the metallic state, new methods have to be found. In this work a new class of nonaqueous inert microemulsions was developed by the systematic replacement of water by dimethyl sulphoxide (DMSO). Due to their good characteristics with respect to the solution properties of the polar phase, they are promising reaction media for the preparation of nanoparticles. The observed shifting of the phase boundaries was compensated by adaptations in hydrophilicity and amphiphilicity of the non-ionic surfactants. The temperature dependent phase sequence of DMSO-microemulsions containing non-ionic surfactants is similar to the inverse temperature sequence of aqueous ionic microemulsions. Small angle neutron scattering experiments prove that long-chained surfactants in DMSO-microemulsions form a sharp amphiphilic interfacial film separating the polar and non-polar domains. The first reductions of cobalt chloride containing DMSO-microemulsions resulted in monodisperse nanoparticles of 3.5 nm. Since dimethyl sulphoxide is an excellent solvent for transition metal salts, inert DMSO-microemulsions are a promising media for the synthesis of various nanoparticles.