Pickering emulsions:  
Alternative reaction medium for catalytic reactions

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A system can be classified into green chemistry, if it produces a minimum of by-products, uses reactants and solvents which are environmentally friendly and uses catalysts which are very substrate-selective [1].

Pickering-emulsions (PEs) are particle-stabilized emulsions. In combination with silica (fumed silica) or halloysites (clay nanotubes) as stabilizing nanoparticles, PEs fulfills the qualifications of green chemistry and opens up new industrial applications.

Halloysites and silica are inorganic nanotubes/nanoparticles with negative charges at the outer surface. The two particle types differ in shape and size. Halloysites are hollow nanotubes (800x50 nm) and silica are compact nanoparticles (150x50 nm). In this study, the hydroformylation of long chain olefins (1-Dodecene) in PEs was used as a model system, to prove the catalytic power of Halloysites [2] and silica. The water phase contains the homogeneous catalyst ([HRh(CO)(TPPTS)3]) and the oil phase (1-dodecane) is presents the reactant. After the hydroformylation the expensive rhodium-catalyst can be easily separated from the product (tridecanal) and can be reused. The effect of these particles was analyzed. In order to understand and to control the catalytic efficiency the essential interfacial interactions between water, oil and nanoparticles and the self-assembly of the particles at the oil/water interface are studied.

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