Abstract

In the modern chemical industry nano-/microstructured systems are increasingly utilized to optimize standard processes such as the production of polyurethane foams or organic reactions with reagent incompatibilities. Due to their thermodynamic stability and their adjustable nanostructure microemulsions are predestined reaction media for such systems. Extensive study of the epoxidation of vitamin K_3 according to *Weitz-Scheffer* in this thesis proved that by applying microemulsions of the type H_2O/NaOH/H_2O_2/borax - organic solvent/vitamin K_3 – surfactant reagent incompatibilities can be overcome. Systematic examination on the rate of turnover as a function of the size of the internal interface A/V indicated, that the rate of turnover increases as a function of A/V. Retaining a constant internal interface the influence of the structure size on the rate of turnover was determined, revealing that the reaction accelerates with swelling droplet size. Based hereupon the *Virgin Interface Synthesis* concept is an auspicious approach for further reaction acceleration. Here a periodic increase of the internal interface is accomplished by ultrasound in a microemulsion under normal pressure or by periodic pressure pulses in a compressible propane microemulsion. It turned out the rate of turnover can be multiplied up to four-times by this VIS concept. In the second part of this work kinetics of polyurethane polymerization were investigated aiming at the industrial bulk production of polyurethane nanofoam from via the POSME procedure. It emerged, that the addition of isocyanate and the polymerization reaction have a crucial influence on the phase behavior of the polyol microemulsions. By mixing a polyol-rich with an isocyanate-rich microemulsion this effect was significantly reduced.