INFLUENCE OF PHASE BEHAVIOR ON THE SELECTIVITY OF HYDROGENATIONS IN $scCO_2$

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Supercritical carbon dioxide ($scCO_2$) is playing an important role in the development of green chemical industrial processes for its environmentally benign nature, nontoxicity, abundance, low cost and wide tuning ability of solvent parameters. It has become of interest that complete miscibility between hydrogen and $scCO_2$ is particularly beneficial for hydrogenation reactions since the reactions in conventional solvents depend on the concentration of dissolved hydrogen and have often been limited by the rate of diffusion of hydrogen from the gaseous to the liquid phase. However, the lower solubility of organometallic complexes in $scCO_2$ prevents $scCO_2$ utilization in homogeneous catalytic synthesis. While, poly ethylene glycol (PEG) can dissolve most metal complexes, as well as, it can also dissolve large amount of CO_2 forming an expanded-liquid at high pressure. Such expansion is accompanied by the changes in the physical properties of the liquid solution, including lowered viscosity, increased gas/liquid diffusion and the solubility of the gases. In addition, PEG has a very limited solubility in $scCO_2$, thus the immobilization and separation of homogenous catalysts is possible in $scCO_2$/PEG system. This paper reviews our recent progresses in the selective hydrogenations of unsaturated aldehydes, nitrocompounds, and aromatic rings in multiphase. The influence of phase behavior on the product selectivity has been discussed in detail.

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