

Supported Ionic Liquid Phase (SILP) systems – novel fixed bed reactor concepts for homogeneous catalysis

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Supported ionic liquid phase (SILP) systems are new materials consisting of an ionic liquid highly dispersed on a porous support. Transition metal complexes can be dissolved in the ionic liquid film, thereby resulting in novel immobilised homogeneous catalysts. The use of a non-volatile, ionic liquid catalyst phase in SILP catalysts results in a stable heterogeneous-type material with selectivity and efficiency like conventional homogeneous catalysts. This makes the catalysts well suited for many industrial homogeneous catalysed processes (e.g. C-C bond forming reactions) in continuous, gas-phase design using fixed-bed technology.

Catalytic SILP materials have been successfully applied in the continuous gas-phase hydroformylation of propene¹, 1-butene² and in the carbonylation of methanol³. The silica-supported SILP Rh-bisphosphine hydroformylation catalyst exhibited good activities and excellent selectivities and was stable for more than 700 hours time on stream. Detailed spectroscopic studies under reaction conditions indicated that the nature of the Rh-complex in the immobilised liquid film is indeed that of a truly homogeneous catalyst⁴. In this contribution we present extended studies including the hydroformylation of industrially attractive Raffinate II with catalytic SILP materials. The possibility of a reaction sequence of hydroformylation followed by isomerisation utilising the SILP concept allows for efficient use of inexpensive raw material in a reactor cascade.

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