

Homogeneous catalysis in thick films of supported ionic liquids

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The use of homogeneous catalysts dissolved in ionic liquids (ILs) is an established field of research. Thin IL films containing dissolved catalyst complexes can be immobilized on solid porous supports, thereby creating a heterogenized catalyst material. Aiming at the deliberate positioning of such supported ionic liquid phase (SILP) catalyst, we carried out investigations of two very similar catalyst complexes: depending on the ligand periphery, the first one is homogeneously dissolved in the IL while the second one strongly enriches at the gas/IL interface. To study these different locations within thick IL films of approximately 1 mm thickness, we investigated the hydrogenation of ethene in a continuous pool-reactor setup.

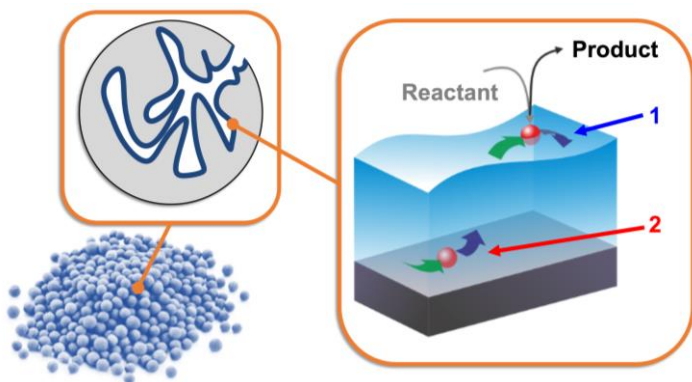


Figure 1: Schematic representation of supported ionic liquid phase (SILP) catalysis with thick ionic liquids films, allowing the controlled location of catalyst complexes at interfaces.

The two complexes dissolved in the IL $[\text{C}_4\text{C}_1\text{Im}][\text{PF}_6]$ showed different activity which can be attributed to their different locations. At 313 K and 0.62 MPa total pressure, the surface-enriched complex was approximately two times more active. However, under these conditions the formation of metal (nano)particles could be observed, with the surface-enriched complex exhibiting a stronger tendency for particle formation compared to the one homogeneously distributed in the IL, as derived from XPS and light-scattering measurements.