**SE-8.1 Advanced Reactor Systems in Practice – Focusing on the SILP-catalyzed Water-Gas Shift Reaction (A)**

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The water-gas shift reaction (WGSR) plays an important role in the technical production of hydrogen gas from fossil fuels via steam reforming, which is still a primary route of hydrogen generation nowadays.[1] Some applications of hydrogen like ammonia synthesis or fuel cells require a low carbon monoxide level, since this compound, which is formed during steam reforming, is acting as a catalyst poison in these processes.
In 2010, Werner et al. published new catalyst systems which are based on the SILP concept and work at ultra-low temperatures and ambient pressure.[2] SILP catalysts consist out of a thin ionic liquid film containing a homogeneous transition metal-complex which is dispersed on a highly porous substrate.[3] With this heterogenization of a homogeneous catalyst complex various advantages of homogeneous and heterogeneous catalysis are combined. However, the subsequent purification of hydrogen still remains an investment-intensive unit operation.
Within the SPIRE project Reactor Optimization by Membrane Enhanced Operation (ROMEO) a new reactor concept is being developed.[4] The goal is to combine the catalytic reaction and separation task within one module to reduce emissions, energy consumption, space requirement and costs. This should be achieved by merge the SILP technology with advanced membrane technology as depicted in Figure 1.

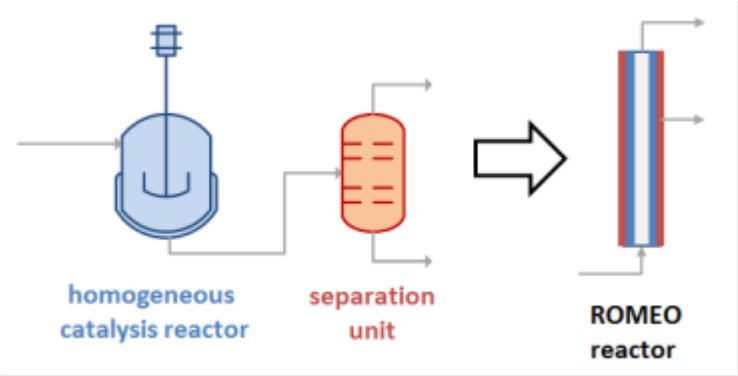


Figure 1: Combination of two standard process steps within the ROMEO project

[1] G. Jacobs, B.H. Davis, Catalysis 2007, 20, 122-285.
[2] S. Werner, N. Szesni, M. Kaiser, R.W. Fischer, M. Haumann, P. Wasserscheid, ChemCatChem 2010, 2, 1399-1402.
[3] M. Jakuttis, A. Schönweiz, S. Werner, R. Franke, K.-D. Wiese, M. Haumann, P. Wasserscheid, Angew. Chem. Int. Ed. 2011, 50, 4492.
[4] http://www.romeo-h2020.eu