Enhancing Metathesis Reaction Performance via Organic Solvent Nanofiltration

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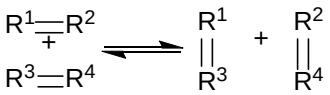
Abstract

Homogeneous catalysis, especially with transition metals, offers several advantages compared to heterogeneous catalysis like higher activity and higher selectivity. Nevertheless, one major drawback is the hurdle of recycling the transition metal from the reaction media and reusing it.

One approach to tackle this challenge is the application of **O**rganic **S**olvent **N**anofiltration (OSN). Ideally, the membrane lets the substrates and products permeate but retains the catalyst complex in its active state inside the reactor system.

Olefin metathesis is a well-known reaction type, where two alkenes swap their alkylidene groups. This very versatile reaction is used in various industrial applications, for example the Shell Higher Olefin Process (here with heterogeneous catalysts) to control the chain length of alkenes. In order to further develop this transformation to its full potential and to overcome the hurdle of catalyst recycling, we combine metathesis with nanofiltration as a means of process intensification and additional selectivity control by reaction engineering.



In this contribution we present our results on the selection of the right catalyst system, optimization of reaction conditions by design of experiments, followed by an upscaling from lab- to miniplant-scale. Additionally we herein present results regarding membrane selection, optimization of process parameters and longtime stability of the catalyst in an OSN miniplant-setup.