Gas-phase Hydroformylation of 1-Butene using Monolithic Supported Liquid-Phase (SLP) Catalyst

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Heterogenization of homogeneous catalysts is a successfully established efficient approach to secure the combination of the most important benefits of homogeneous and heterogeneous catalysis. The Supported Liquid-Phase (SLP) technique is a promising method for this purpose involving the immobilization of thin films of catalytically active liquid films on the large inner surface area of porous support materials [1]. Several SLP systems have shown prominent and durable applicability on industrial scale, for instance, in sulfuric acid production, and olefin oligomerization and alkylations [2]. SLP may also have future application in gas-phase hydroformylation (HyFo) of olefins by syngas to produce aldehydes if formation of high boilers (aldols), which otherwise decrease activity and selectivity during long-term operation, is avoided.

An industrially attractive modular SLP system comprising a SiC monolithic support modified with silica (to provide porosity) [3] and Rh-bpp-sebacate catalyst was recently introduced for the gas-phase HyFo of 1-butene (Fig. 1.). The system shows good catalytic activity with negligible aldol formation and excellent activity toward linear pentanal as the desired product [4].

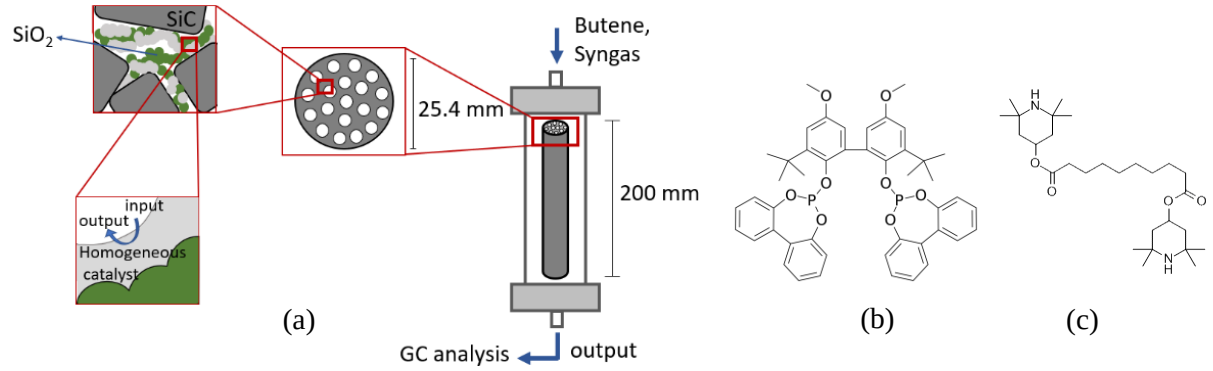

Fig. 1. (a) Schematic drawing of the SiC monolithic support consisting of SiO_2 washcoat after impregnation with Rh-bpp-sebacate catalyst, (b) bpp, and (c) sebacate chemical structures.

In this work, the catalytic performance and durability of the monolithic SLP Rh-bpp-sebacate system has been further optimized by investigating the effect of parameters such as, e.g. support structure variations and catalyst composition.

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References

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