Coupling Catalysis and Membrane

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Abstract

The application of catalytic inorganic membrane reactors show great promise for industrial processes to produce value-added chemicals owing to high thermal and chemical stability. A catalytic membrane reactor combines Reaction and separation in one unit and also synergistically enhances the membrane permeability and catalyst activity, resulting in process intensification. The selective removal of one of the products during the reaction often leads to enhance the yield of reaction by shifting the thermodynamic equilibrium according to Le Chatelier's principle. Gas separation membranes represent one of the most significant developments in the inorganic membrane reasearch area, such as perovskite membranes, Pd/Pd alloy membranes and dual-phase ceramic-carbonate membranes. This lecture will summarize important application and development of O_2 permeable, H_2 permeable and CO_2 permeable catalytic inorganic membrane reactors for various reactions, such as partial oxidation of methane (POM), oxidative dry reforming of methane (ODRM), oxidative coupling of methane (OCM), water gas shift (WGS), propane dehydrogenation (PDH) reaction, CO_2 methanation reaction, reverse water gas shift (RWGS) and NO_x decompositon ($DeNO_x$). The performance, advantages and challenges of catalytic membrane reactors for various reactions are summarized and discussed.

References

[1] Z. Wang, **S. Kawi.** *et al.* J. Membr. Sci. 578 (2019) 36-42.
[2] S. Pati, **S. Kawi.** *et al.* Chem. Eng. Journal. 362 (2019) 116-125.
[3] T. Chen, **S. Kawi**, *et al.* J. Membr. Sci. 581 (2019) 72-81.