

Hydrogen From Biomass and Organic Wastes

Fundamental study to develop and optimize metal/zeolite catalysts for high-efficiency H₂ production from biomass-derived carbohydrates and hydrocarbons, including methane (Catal. Lett., 102, 1-2 (2005), 9 – 13), alcohols and glucose etc (Fig. 11).

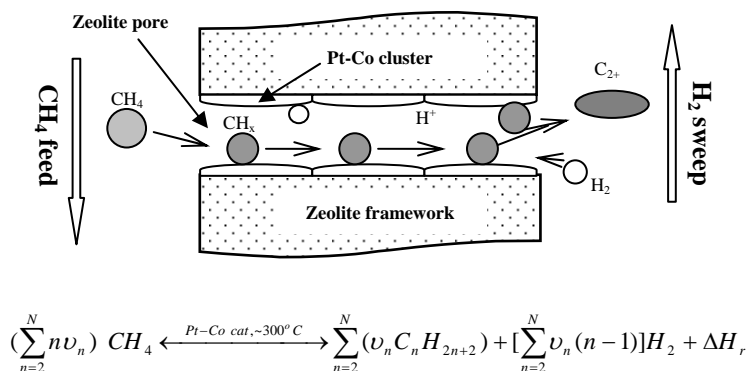


Fig. 11. Conversion of hydrocarbon to hydrogen.

Another method would be to use regenerative SOFC for hydrogen production from a variety of fuels. However, the conventional electrode/electrolytes that work in SOFC in the electricity-generating mode do not work well in the regenerative modes or reverse mode. Alternative, cathodes, anodes, and possibly lower temperature electrolytes are required for efficient operation of the regenerative SOFC. Research will pursue processing and properties of the most attractive materials systems and fabrication of a regenerative SOFC for hydrogen production.

The uses of chemically and thermally stable zeolite membranes that possess small intracrystalline pores of molecular dimensions are highly desirable for H₂ separation from coal gasification products, such as syngas. However, the currently investigated zeolite membranes possess significantly larger pore sizes than the sizes of H₂, CO₂ and CO molecules. The lack of suitable zeolite membranes represents a major obstacle in the development of novel inorganic membrane technology for hydrogen separation.

In this project, we will be developing chemically and thermally stable sodalite (SOD) membranes, which contain small 0.28 nm pores uniquely suitable for highly selective hydrogen separation from other syngas components, such as CO₂, CO and H₂S.