

Composite palladium membrane reactor for water gas shift reaction

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Membrane reactors have the potential for combining the reaction and separation stages of a process in one unit. Experiments on the water gas shift(WGS) reaction were carried out using composite palladium membranes for catalytic membrane reactors. The membrane with an ultrathin palladium film on the surface of the support of a commercial tubular ceramic membrane was prepared by electroless plating technique. The operating optimum conditions were determined at various H₂O molar ratios, temperature, pressure, gas feed flow, and nitrogen sweep gas. The CO conversion results of WGS reaction in the membrane reactor were also compared with those in a traditional reactor without a catalytic membrane. CO conversions increased with an increase in H₂O molar ratio, sweep gas flow rate, and time-factor of the ratio of catalyst to CO feed rate. CO conversions increased more or less with an increase in reaction temperature, while the equilibrium conversions decreased. It was found that the equilibrium conversions could be overcome by using composite palladium membrane reactor.