

Methanol Reforming Membrane Reactor with Pt-containing Silica Composite Membranes.

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To exceed the limitation of intrinsic separation performance derived from the pore structure of the skin layer of composite membranes, γ -Al₂O₃/Pt-SiO₂/stainless steel (SUS) membranes were prepared by the soaking-rolling method. The sweeping gas method as a permeation test was used under atmospheric pressure in both feed and permeate side. While the γ -Al₂O₃/SiO₂(100nm)/SUS membranes fabricated for the purpose of comparison showed the Knudsen-dominated transport characteristics for the CO removal, permeation results of a H₂(99%)/CO(1%) mixture for the γ -Al₂O₃/Pt-SiO₂/SUS membranes presented a remarkable H₂/CO separation factor of 5.22-7.03 between 25°C and 200°C, exceeding pure Knudsen system expected from the mesoporous γ -Al₂O₃ layer, due to the lower CO permeance. In addition, we have applied the composite membranes to the methanol steam reforming membrane reactor for as a energy carrier system for PEMFC. As a result, hydrogen purification and an increase in methanol conversion up to 20% were achieved simultaneously from the membrane reactor system.