

Pd/BCC Composite H₂ Permeable Membrane: Fabrication, Characterization, and Application

조영석, 이찬현, 김윤도, 윤창원, 남석우, 한중희[†]
한국과학기술연구원
(jhan@kist.re.kr[†])

Group VB metals inherently have low surface catalytic activity and hydrogen embrittlement issues, which limited their practical application as a hydrogen permeable membrane. This study overcomes these problems and successfully demonstrates operation of a Pd/BCC composite membranes. The fabricated Pd/Ta composite membrane allowed leak-free operation with close-to-infinite selectivity (purity above 99.999%) from mixed gas (CO, CO₂, H₂O, and H₂) feed. It also presented higher permeability (4.7×10^{-8} mol m⁻¹ s⁻¹ pa^{-0.5}) than that of widely adopted metallic membranes. To prove its full capability, a membrane module was prepared for treating 26 L min⁻¹ of mixed gas feed flow and separating about 6.9 L min⁻¹ of pure hydrogen, which potentially allow operation of 500W-class fuel cell. Leak-free operation of the module was possible under pressurized conditions (< 10 bar), therefore hydrogen embrittlement issues of Ta could be avoided.