407d Palladium Coated Vanadium Alloy Membranes for Hydrogen Separation

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Hydrogen-separating membranes have the potential to facilitate the generation of pure hydrogen for use in fuel cells. Palladium alloy tubes and foils are presently used to purify hydrogen. Due to the high cost of palladium, thin metal films supported on hydrogen-permeable substrates are required to reduce membrane cost. Composite metal membranes were fabricated and characterized with respect to hydrogen permeability, permselectivity, and robustness. Vanadium alloys are attractive membrane materials due to high hydrogen permeability, and resistance to hydrogen embrittlement as compared to pure vanadium. However, surface oxides impede hydrogen entry and exit from the metal. Membranes with high hydrogen permeabilities and complete selectivity for hydrogen were fabricated from vanadium alloy foils such as VTi_5 and $VCu_{1\text{-}10}$ (wt. %), and coated with thin films ($\leq$ 200 nm) of palladium and palladium alloys to protect from oxidation. Hydrogen flux measurements were performed at 320-450°C and metallic interdiffusion was studied using AES.