World Academy of Science, Engineering and Technology
International Journal of Materials and Metallurgical Engineering
Vol:11, No:08, 2017

Microstructure of Hydrogen Permeation Barrier Coatings

Authors : Motonori Tamura

Abstract : Ceramics coatings consisting of fine crystal grains, with diameters of about 100 nm or less, provided superior hydrogen-permeation barriers. Applying TiN, TiC or Al_2O_3 coatings on a stainless steel substrate reduced the hydrogen permeation by a factor of about 100 to 5,000 compared with uncoated substrates. Effect of the microstructure of coatings on hydrogen-permeation behavior is studied. The test specimens coated with coatings, with columnar crystals grown vertically on the substrate, tended to exhibit higher hydrogen permeability. The grain boundaries of the coatings became trap sites for hydrogen, and microcrystalline structures with many grain boundaries are expected to provide effective hydrogen-barrier performance.

Keywords : hydrogen permeation, tin coating, microstructure, crystal grain, stainless steel
Conference Title : ICMMP 2017 : International Conference on Microstructure and Materials Properties
Conference Location : Vancouver, Canada
Conference Dates : August 07-08, 2017