MMC-07: Effect of Oxide Film on the Reduction of Hydrogen Permeation Rate in Stainless Steel

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Characteristics of hydrogen permeation in the stainless steel 304 modified by either facing, ion sputtering, carbon coating or annealing were investigated in order to establish the safehydrogen-energy-infrastructure using welding. A stationary hydrogen flux from the stainlesssteel surface was measured by using a system with an orifice. The pressure difference of thespecimen was able to maintain constant by controlling the gas flow rate from the orifice in lowpressure vessel. The hydrogen permeability was low in two cases of a thin stainless steel with facing and that annealed at 1370 K for 2 hours. In these cases, the specimens' surfaces were considered to play hydrogen trap role and to prevent from pairing hydrogen atoms. On the other hand, high hydrogen permeability was obtained in the case of Argon plasma cleaning low-pressure-vessel side surface. These results suggested that oxide film on the specimens' surface prevent hydrogen desorption.

MMC-08: Fabrication of Composite Material Using Alumina Agglomerated Sludge and Aluminum Powder by Spark Plasma Sintering

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The composite material was fabricated using alumina sludge, industry waste, and aluminum powder by spark plasma sintering (SPS). Sludge of industry waste was treated to change the alminina crystal structure at temperature 1573K for 2 hours. The bending strength of the composite material was investigated by changing the volume fraction of sludge, 0-6% and forming conditions. As a result, it was found that the sludge content mainly affected on the bending strength. The bending strength showed the highest value at 2% sludge content. From the observation of crack propagation using optical microscope, it became clear that the sludge existed as agglomerated powders in the composite material, and this sludge prevented the crack to propagate.

MMC-09: Tensile Strength of Aluminum Borate Whisker / AZ91D Magnesium Alloy Composites Prepared by Comp-casting Process

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Magnesium alloy composites were fabricated by using AZ91D (Mg-9%Mg1-1%Zn) alloy as matrix and aluminum borate (Al4SisB4033) whisker as reinforcement. Process used is compo casting, which is melt stirring in semi-solid state and ingot casting. Then the composites were hot extruded. As the reinforcements in composites were swept out to postliquid phase, the distribution of reinforcement is inhomogeneous. But the reinforcement distributed uniformly in post liquid phase without coalescence. Then, the elastic modulus, tensile strength and elongation of the composites were estimated. As increasing the volume fraction of reinforcement in composites, the elastic modulus and tensile strength increased and the fracture strain (elongation) decreased, which tendency was pronounced compared with the composites fabricated under the condition of molten state. As the reinforcement is gathered in post-liquid phase in the composites, it seems that the high volume fraction of reinforcement in this area affect to these mechanical properties.

MMC-10: Effect of Fiber Surface Structure on Interfacial Reaction Between Carbon Fiber and Alumimum

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Interface between fiber and aluminium and interfacial reaction of carbon fiber reinforced aluminium composites were investigated by high-resolution transmission electron microscopy (TEM). Low and high graphitized carbon fiber reinforced pure aluminium wires and vapor grown carbon fiber (VGCF) reinforced pure aluminium block were prepared by ultrasonic liquid infiltration and hot-press sintering respectively. Heteroatoms, which existed abundantly in the surface of low graphitized carbon fiber, caused lamellae carbon structure pronounced curvature in the surface structure. VGCF surface appeared regular and linear graphitic lamellae. Low graphitized fiber reinforced pure aluminium wire revealed serious interface reaction (A1433 crystal), compared to wire of high graphitized fiber wire. On the other hand the interface of VGCF reinforced pure aluminium block had no A1433 crystal reaction. In order to promote aluminium carbide growth, carbon fiber reinforced wires were heat-treated at 573 K and 873 K for 30min. The interfacial phase of aluminium carbide grew with the rise in the temperature. At high temperature, transmission electron microscopy revealed that aluminium carbide growth was not merely on the interface between carbon fiber and...