Short Communication

Electrochemical Corrosion Behaviors of TiC Particles Reinforced Fe-based Composite Plasma Cladding Layers

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In-situ and ex-situ titanium carbide (TiC) reinforced Fe-based cladding layers were fabricated via the plasma cladding method using nitrogen as the protective and reactant gas. In-situ TiC particles in the cladding layer were prepared using Ti and boron carbide (B₄C) powders as primary raw materials. The compositions, microstructures, and corrosion resistance of the cladding layers were compared. Results showed that in-situ TiC reinforced cladding layers consisted of α -Fe, Cr, Fe₃C, Fe₂₃B₆, Fe₂₃(C,B)₆, TiC and Ti(CN), whereas the cladding layers with ex-situ TiC consisted of α -Fe, Cr, Cr₂₃C₆, TiC, and Ti(CN). TiC and Ti(CN) particles were uniformly distributed in the two types of cladding layers. TiC, Ti(CN), and other ceramic phases reduced the relative area of α -Fe in the anode region of the cladding layer; hence, the surface rust layer was not easily peeled off, and the corrosion rate was effectively reduced. The corrosion resistance of the cladding layers significantly increased due to the formation of TiC particles and other compound phases. The Fe-based plasma cladding layer with in-situ TiC particles exhibited the best corrosion resistance.

Keywords: Plasma cladding, Composite layer, Titanium carbide, Corrosion behaviors

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