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Corrosion and Wear Behavior of Nano-Zirconium (Zr) Coated Commercial Grade Cast Iron by Sol-Gel and Plasma Spray Process

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Abstract

Hard facing with Nickel/cobalt based alloys for steel substrates are widely used for high temperature and pressure applications in chemically reactive environments due to their good corrosion and wear resistance properties. In the present research, the ceramic material, *i.e.*, zirconium, is coated on a hypoeutectic cast iron substrate to improve its corrosion and wear resistance. The substrate was coated with zirconium by sol-gel process as well as by the plasma spray process for comparison purpose. Results of the research indicated that the successful deposition of zirconium on the cast iron substrate by sol-gel deposition technique had improved both corrosion and wear resistance of cast iron. SEM analysis revealed that the coating was denser without any internal cracks indicating the soundness of deposition. Also, sol-gel process of coating indicated better wear resistance as compared with plasma spray coated cast iron. Thus, zirconium coating on the substrate has made cast iron sound (without any surface defects) along with excellent corrosion and wear resistance properties. This has made cast iron suitable for structural and automotive applications.

Keywords

Sol-Gel, Coating, Wear, Corrosion, Zirconium, Cast Iron

1. Introduction

Cast irons are widely used in various industries and automobiles particularly for engine cylinder, cylinder head, hydraulic valve bodies etc. due to their high machinability, good mechanical properties, good damping and wear resistance properties. When exposed to an aqueous corrosive medium the passivation layer



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