

PO2050

High Cr-Ni Cast Iron Deposit with Tantalum Carbide Particles Produced by Plasma Spraying

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The spray material is heated, melted, and accelerated by a high temperature flame in the plasma spraying process. Low-pressure plasma spraying can produce rapidly solidified thick materials because alloy droplets accumulate successively on the substrate, and solidify at a cooling rate in the range of 10^5 - 10^8 Ks⁻¹. Depending on the cooling conditions of the substrate and on the alloy composition, deposits can be produced as metastable phases or extremely fine crystalline phases. Plasma spraying is an attractive method for the production of deposits with in-situ formed fine particles. In recent years, much attention has been paid to high Cr-Ni cast iron with vanadium carbide, which is attractive for use in metal molds and pump parts, due to its high wear resistance and high corrosion resistance. In the present work, high Cr-Ni cast iron alloy powder is low-pressure plasma sprayed to produce high Cr-Ni cast iron base alloy deposits with finely dispersed tantalum carbide particles. The as-sprayed deposit produced on a non-cooled substrate was composed of γ Fe, α Fe and carbide. The fine precipitates in the as-sprayed deposit were carbide. With increasing heat treatment temperature up to 1273 K, the carbide particles coarsened. The as-sprayed deposit produced on a non-cooled substrate had higher hardness than the heat-treated deposits. The wear resistance of deposit decreased with increasing heat treatment temperature.

Keywords

plasma spray
tantalum carbide
particles
rapid solidification
high Cr-Ni cast iron