Rapidly Solidified Thick stainless cast iron alloy deposit with niobium carbide particles produced by plasma spraying

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In the plasma spraying process, the spray material is heated, melted, and accelerated by a high temperature flame. 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 $10^5$-$10^8$ K s\textsuperscript{-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 stainless 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, Stainless cast iron alloy powder was low-pressure plasma sprayed to produce stainless cast iron base alloy deposits with finely dispersed niobium carbide particles. The as-sprayed deposit and deposits obtained by heat treatment of the as-sprayed deposit had niobium carbide particles. The carbide particles in the as-sprayed deposit produced on a water-cooled substrate were finer than that in the as-sprayed deposit produced on a non-cooled substrate. 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.

\textbf{Keywords}
rapidly solidification
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