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The Effect of the Substrate Temperature on the Microstructure Properties of the NiCrAl Coating in Cathodic Arc Deposition

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Abstract

The effect of the substrate temperature in the deposition process of the NiCrAl coating was evaluated on the steel substrate using cathodic arc deposition. The deposition process was conducted at temperatures of 250-700 °C. The coating microstructure properties were studied by scanning electron microscope and the coating phases were characterized by X-ray diffraction analysis for the deposited samples at different temperatures. By increasing the substrate temperature from 250 °C to 700 °C, the coating porosity was reduced from 4.4% to 0.6%. The phase studies showed that the sample deposited at the temperature of 250 °C contained the α -Cr phase and the preferred texture in this phase belonged to the (200) plane. By increasing the substrate temperature, the Cr atoms were dissolved in the γ -Ni phase and the α -Cr phase was not formed in the coating. Comparing the intensity of peaks in the X-ray diffraction analysis for the deposited samples at different temperatures showed that by increasing the substrate temperature, the crystallization degree of the coating was increased.

Keywords: Substrate temperature, Cathodic arc deposition, NiCrAl coating

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