Jet Pulse Electrodeposited Ni-SiC Thin Coatings by Using Experimental System Designed for Potential Industrial Application

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Ni-SiC thin coatings were prepared by using the jet pulse electrodeposition (JPED) method while the jet rate was determined with the Fluent software. Moreover, the effects of jet rate on the surface topography, microstructure, surface hardness, and wear property of the Ni-SiC thin coatings were examined through scanning electron microscopy (SEM), scanning probe microscopy (SPM), transmission electron microscopy (TEM), X-ray diffraction (XRD), Vickers hardness instrument, and abrasion testing machine. The SiC particles revealed diffraction peaks at 34.1°, 41.4°, and 59.6°, corresponding to the planes of (1 1 1), (2 0 0) and (2 2 0), respectively. The SiC and Ni peaks were observed at 19.5 nm and 50.2 nm, respectively, in the prepared Ni-SiC thin coatings at 3 m/s jet rate. Furthermore, it also exhibited significantly larger microhardness value i.e. 886.65 HV as compared to the Ni-SiC coating obtained at 1 m/s i.e. 730.15 HV. There were certain scratches and slight small-sized pits in the coating surface prepared at 3 m/s. In addition, the Ni-SiC thin coating deposited at 3 m/s processed the highest impedance, indicating the best corrosion resistance among all coatings.

Keywords: Ni-SiC thin coating; jet rate; surface topography; abrasion testing; surface hardness

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