Preparation of Ni–P–SiC composite coatings by magnetic field-enhanced jet electrodeposition

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To explore the effect of magnetic field on the properties of Ni–P–SiC composite coatings, Ni–P–SiC composite coatings were prepared on 45 steel by magnetic field-enhanced jet electrodeposition. The surface morphology, microstructure, and composition of the composite coatings were measured by scanning electron microscopy (SEM), energy dispersive spectrometry (EDS), and X-ray diffraction (XRD), respectively. The microhardness was tested using a Duramin-40 hardness tester, and the corrosion resistance was observed under a LEXT4100 laser confocal microscope. The results showed that the surface of the Ni–P–SiC coatings prepared under a magnetic field-enhanced jet electrodeposition was flat. Moreover, we noted improvements in the microhardness, wear resistance, and corrosion resistance of the composite coatings with the increase in the magnetic field strength. At the same magnetic flux density, applying a parallel magnetic field was found to be more effective than applying a vertical magnetic field. When the parallel magnetic field intensity was 0.5 T, the coating surface was uniform and compact, and its microhardness reached the maximum value of 688.8 Hv, with optimal wear and corrosion resistances.

Keywords: Magnetic field; Jet electrodeposition; Ni–P–SiC coatings; Nano-SiC particles; Performance analysis

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