Short Communication

Prediction of Wear Resistance of Ultrasonic Electrodeposited Ni-SiC Nanocoatings using BP-NN Model

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This paper adopts neural network technology to construct a BP-NN (Back-propagation neural network) model with 3×8×1 structure, and the model was used to predict the wear resistance of ultrasonically electrodeposited Ni-SiC nanocoating. The impact of plating parameters on composition and microstructure of the Ni-SiC nanocoatings were investigated by scanning electron microscopy (SEM), atomic force microscopy (AFM), and X-ray diffraction (XRD) and wear testing. The results indicated that when the number of hidden layers and neurons of the BP-NN model are 1 and 8, respectively, and the root mean square error of the BP-NN model was minimal with a value of 1.24%. The prediction value of the BP-NN model was not much different from the experimental value, and the maximum error obtained was 1.51%. When the concentration of SiC particles was taken as 8 g/L, current density was maintained at 2 A/dm², and the temperature was kept at 40°C, the SiC particles were uniformly distributed in the Ni-SiC nanocoating, and the nickel grains of the coating were significantly refined, as indicated by the diffraction peaks of the nickel grains which became wider and shorter.

Keywords: Ni-SiC nanocoating; BP-NN model; microstructure; wear; prediction

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