Microstructure and Properties of Ni-SiC Nanocomposites Fabricated by Ultrasonic-Assisted Electrodeposition

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In this research, Ni-SiC nanocomposites (NCs) were effectively prepared by using ultrasonic-assisted electrodeposition (UAED). Effect of ultrasonic power on surface morphology, microstructure, phase composition and other NC properties was studied by scanning electron and atomic force microscopies, X-ray diffractometry as well as by microhardness, abrasion and electrochemical tests. The results indicated that Ni-SiC-300 NC, deposited at 300 W, showed smooth and fine-grained surface morphology with SiC nanoparticles (NPs) evenly distributed on the NC surface. As ultrasonic power was gradually changed from 100 to 400 W, XRD peaks corresponding to Ni matrix first broadened but then narrowed. Thus, only certain ultrasonic power (equal to 300 W in this case) was beneficial for the optimum Ni grain refinement of the resulting Ni-SiC NCs. Ni-SiC-300 NCs also demonstrated the highest microhardness (equal to 906.7 Hv), the best wear rate (equal to 17.8 mg/min) and the best corrosion resistance judging by its lowest corrosion current density (equal to 0.032 $\mu\text{A}/\text{mm}^2$).

Keywords: Ni-SiC NCs; Surface morphology; Property; Ultrasonic-assisted electrodeposition

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