



# Mechanical properties and wear and corrosion resistance of electrodeposited Ni–Co/SiC nanocomposite coating

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## Abstract

Ni–Co/SiC nanocomposite coatings with various contents of SiC nano-particulates were prepared by electrodeposition in a Ni–Co plating bath containing SiC nano-particulates to be co-deposited. The influences of the nanoparticles concentration, current density, stirring rate and temperature of the plating bath on the composition of the coatings were investigated. The shape and size of the SiC nano-particulates were observed and determined using a transmission electron microscope. The polarization behavior of the composite plating bath was examined on a PAR-273A potentiostat/galvanostat device. The wear behavior of the Ni–Co/SiC nanocomposite coatings was evaluated on a ball-on-disk UMT-2MT test rig. The worn surface morphologies of the Ni–Co/SiC nanocomposite coatings were observed using a scanning electron microscope. The corrosion behavior of the nanocomposite coatings was evaluated by charting the Tafel curves of the solution of 0.5 mol L<sup>-1</sup> NaCl at room temperature. It was found that the cathodic polarization potential of the composite electrolyte increased with increasing SiC concentration in the plating bath. The microhardness and wear and corrosion resistance of the nanocomposite coatings also increased with increasing content of the nano-SiC in the plating bath, and the morphologies of the nanocomposite coatings varied with varying SiC concentration in the plating bath as well. Moreover, the co-deposited SiC nano-particulates were uniformly distributed in the Ni–Co matrix and contributed to greatly increase the microhardness and wear resistance of the Ni–Co alloy coating.

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**Keywords:** Electrodeposition; Ni–Co alloy coating; SiC nano-particulates; Nanocomposite coating; Wear behavior

## 1. Introduction

Ceramic or metal matrix nanocomposites containing dispersed second-phase particulates usually have various special properties such as dispersion hardening, self-lubricity, high temperature inertness, good wear and corrosion resistance, and chemical and

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