

## **Production and Characterization of Electrodeposited Nickel Coatings with TiO<sub>2</sub> Ceramic Nanoparticles**

**Onur Bardakcioglu (Dokuz Eylul University, The Graduate School of Natural and Applied Sciences, Buca, Izmir, Turkey)**

**Sidika Yildirim (Dokuz Eylul University, The Graduate School of Natural and Applied Sciences, Buca, Izmir, Turkey)**

**Tulay Koc Delice (Dokuz Eylul University, The Graduate School of Natural and Applied Sciences, Buca, Izmir, Turkey)**

**Tuncay Dikici (Izmir Katip Celebi University, Department of Materials Science and Engineering, Cigli, Izmir, Turkey)**

**Mustafa Toparli (Dokuz Eylul University, Center for Fabrication and Applications of Electronic Materials (EMUM), Buca, Izmir, Turkey)**

**Erdal Celik (Dokuz Eylul University, Center for Fabrication and Applications of Electronic Materials (EMUM), Buca, Izmir, Turkey)**

**Isil Birlik (Dokuz Eylul University, Department of Metallurgical and Materials Engineering, Buca, Izmir, Turkey)**

**Funda Ak Azem (Dokuz Eylul University, Department of Metallurgical and Materials Engineering, Buca, Izmir, Turkey)**

**Abstract:** Nickel nanocomposite coatings are used in a wide variety of industrial and engineering applications such in the consumer electronics, chemical, computer and telecommunications industries in order to improve corrosion and wear resistance, modify magnetic and other properties. These properties are strongly governed by the volume fraction of the particles codeposited in the coating and many efforts have been made to correlate the amount of codeposited particles to the process parameters. The properties of nickel matrix nanocomposites produced under different conditions of operation as plating time, current density, pH and agitation of plating solution are of particular interest. In this study, the electrodeposition of TiO<sub>2</sub> doped-Ni matrix nanocomposite coatings was carried out from a Watts bath with a composition of nickel sulphate (NiSO<sub>4</sub>.6H<sub>2</sub>O) (225 g/l), nickel chloride (NiCl<sub>2</sub>.6H<sub>2</sub>O) (30 g/l) and boric acid (H<sub>3</sub>BO<sub>3</sub>) (30 g/l). Ammonium hydroxide solution was added for adjustment the pH of the bath. The influence of the current density variation from 1 A.dm<sup>-2</sup> to 20 A.dm<sup>-2</sup> and electroplating time variation from 5 to 20 min. on the structure and morphology of nickel matrix nanocomposite coatings were investigated by X-ray diffraction (XRD) and scanning electron microscopy (SEM) techniques, respectively.

**Keywords:** Nickel-matrix nanocomposite, TiO<sub>2</sub>, electrodeposition, watts bath, XRD, SEM.