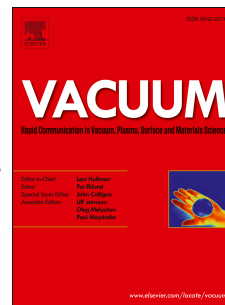


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Morteza Alizadeh, Alireza Teymuri, Erfan Salahinejad



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A novel method to enhance silicon incorporation into nickel electrodeposited coatings

Morteza. Alizadeh^{a,**}, Alireza Teymuri^a, Erfan Salahinejad^b, Fatemeh Alijani^a

^a *Department of Materials Science and Engineering, Shiraz University of Technology, Modarres Blvd., 71555-313, Shiraz, Iran*

^b *Faculty of Materials Science and Engineering, K.N. Toosi University of Technology, Tehran, Iran*

Abstract

It is known that the addition of silicon to nickel coatings can advantageously improve the coatings' characteristics, especially oxidation resistance. However, the incorporation of Si, because of its relatively low electrical conductivity, into Ni-electrodeposited coatings hardly exceeds 1 wt. %. In this work, a new method is pointed out to increase the introduction of Si into Ni-electrodeposited coatings. In this regard, Ni-Si composite coatings were deposited on low-carbon steel by nickel electrodeposition from Watt's baths with the different concentrations of treated and untreated silicon particles. The treated particles were prepared by simultaneous milling of silicon and nickel powders (in 80:20 weight ratio), while the untreated particles were obtained from milling of only silicon particles. The structural characteristics of the produces were studied by scanning electron microscopy, energy dispersive X-ray spectroscopy, and X-ray diffraction. As the most typical finding of the work, it was realized that by using the treated particles, the content of silicon in the deposited composite coating reaches about 9.5 wt. %, although it does not exceed 1 wt. % when using the untreated particles.

Keywords: Composite coatings; Milling; Electrodeposition; Microstructure

* **Corresponding Author:** Tel.:+98 713 7257136; Fax: +98 711 7354520.

Email address: Alizadeh@sutech.ac.ir (Morteza Alizadeh)

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