World Academy of Science, Engineering and Technology
International Journal of Materials and Metallurgical Engineering
Vol:9, No:07, 2015

Effect of Al Particles on Corrosion Resistance of Electrodeposited Ni-Al Composite Coatings

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Abstract : Electrodeposition is known as a relatively economical and simple technique commonly used for preparation of metallic and composite coatings. Electrodeposited composite coatings produced by dispersion of particles into the metal matrix show better properties than pure metallic coatings. In recent years, many researches were carried out on Ni matrix coatings reinforced by ceramic particles such as Ni-SiC, Ni-Al2O3, Ni-WC, Ni-CeO2, Ni-ZrO2, Ni-TiO2 to improve their corrosion and wear resistance. However, little effort has been made on incorporation of metal particles into Ni matrix. Therefore, the aim of this work was to produce Ni–Al composite coating on 6061 aluminum alloy by pulse plating and to investigate the effects of electrodeposition parameters, e.g. concentration Al particles in the electrolyte and current density, on composition and corrosion resistance of the composite coatings. The morphology and corrosion behavior of the coated 6061 Al alloys were studied by means of scanning electron microscope (SEM) equipped with energy dispersive X-ray spectrometer (EDS) and potentiodynamic polarization method, respectively. The results indicated that the addition of Al particles up to 50 g L-1 increased the amount of co-deposited Al particles in nickel matrix. It is also observed that the incorporation of Al particles decreased with increasing current density. Meanwhile, the corrosion resistance of the coatings shows an increment by increasing the content of Al particles into nickel matrix.

Keywords : Ni-Al composite coating, current density, corrosion resistance
Conference Title : ICMMSE 2015 : International Conference on Metallurgy, Materials Science and Engineering
Conference Location : Prague, Czechia
Conference Dates : July 09-10, 2015