Effect of additives on the properties of electrodeposited Ni-Zircon composite coatings

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ABSTRACT

Electrodeposition being a fascinating and handy technique is used widely to perceive the properties of composite coatings in which second phase particles are dispersed in metal matrix. Among the electrodeposited composite coatings, Ni coatings containing inert particles like SiC, Al_2O_3, ZrO_2, CeO_2, TiO_2, diamond, graphite, MoS_2, pumice etc have been studied and reported. The synthesis and properties of electrodeposited Ni-zircon composite coatings is not reported in literature. In the present study, the influence of additives like coumarin and cetyl trimethyl ammonium bromide (CTAB) on the properties of electrodeposited Ni-zircon coatings is reported. Zircon mineral ($ZrSiO_4$) powder was subjected to ball milling to obtain smaller sized particles (average agglomerated particle size -0.131 μm). The ball milled powder was successfully incorporated into the Ni matrix by electrodeposition. The optimized bath and electrodeposition parameters were particle loading of 50 g/L and current density of 0.77 Adm^{-2}. Ni-zircon coating containing coumarin exhibited highest microhardness; however the microstructure revealed the presence of cracks. Potentiodynamic polarization and electrochemical impedance studies showed improved corrosion resistance for Ni-zircon-CTAB coating. It was found that synergistic combination of higher microhardness and corrosion resistance could be imparted to Ni-zircon coating by the addition of CTAB.

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