

Evaluation of the Effect Rare Earth Metal on the Microstructure and Properties of Zn-ZnO-Y₂O₃ Coating of Mild Steel

Authors : A. P. I. Popoola, O. S. I. Fayomi, V. S. Aigbodion

Abstract : Mild steel has found many engineering applications due to its great formability, availability, low cost and good mechanical properties among others. However its functionality and durability is subject of concern due to corrosion deterioration. Based on these Yttrium is selected as reinforcing particles using electroplating process in this work to enhance the corrosion resistance. Bath formulation of zinc-yttrium was prepared at moderated temperature and pH, to coat mild steel sample. Corrosion and wear behaviour were analyzed using electrochemical potentiostat and abrasive test rig. The composition and microstructure of coated films were investigated standard method. The microstructure of the deposited plate obtained from optimum (10%Yttrium) bath revealed fine-grained deposit of the alloy in the presence of condensation product and hence modified the morphology of zinc-yttrium alloy deposit. It is demonstrated that by adding yttria particles, mild steel can be strengthened with improved polarization behaviour and higher resistance to corrosive in sodium chloride solutions. Microhardness of the coating compared to plain mild steel have increased before and after heat treatment, and an increased wear resistance was also obtained from the modified coating of zinc-yttrium.

Keywords : microhardness, zinc-yttrium, coating, mild steel, microstructure, wear, corrosion

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