

# ELECTROCHEMICAL INVESTIGATION OF Zn-Fe ALLOY COATED MILDSTEEL FOR AUTOMOBILE APPLICATIONS

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**Abstract:** Electrodeposition of Zn-Fe alloy coating onto the mild steel (MS), from an acid chloride bath, was studied using Ethyl 1-(4-chlorophenyl)-5-methyl-1*H*-1,2,3-triazole-4-carboxylate (ETC) as an additive for the homogeneity and brightness of the deposit. The Hull cell procedure was used to optimize the bath ingredients and working parameters. This study aims to characterize the corrosion rate of Zn-Fe alloy film in seawater for the application of ecologically friendly sacrificial coatings. The impact of current density on deposit characteristics such as hardness, cathode current efficiency, thickness, and the weight % of metal contents was investigated. The corrosion resistance of the coated films was evaluated using the potentiodynamic polarization method and the results have been discussed. The structural and morphological properties of the coatings were investigated by Scanning electron microscopy, and X-ray diffraction techniques. The surface roughness of the coating was investigated by atomic force microscopy. The coating film containing Zn and Fe content was confirmed by Energy-dispersive X-ray analysis. The results indicate that a new and low-cost chloride bath for Zn-Fe coating exhibits superior corrosion resistance properties and can be implemented in automobile applications.

**Keywords:** electrodeposition, corrosion, AFM, surface morphology, hardness.