



## البحث الثامن

### **Adsorption and Corrosion Behavior of Polyacrylamide and Polyvinylpyrrolidone as Green Coatings for Mg–Al–Zn–Mn Alloy: Experimental and Computational Studies.**

#### **Abstract:**

Herein, the corrosion investigation for various coatings (polyacrylamide (PA), Polyvinylpyrrolidone (PVP) and mix of PA and PVP with the following ratios, 3:1, 1:1 and 1:3 (v/v)) on Mg–Al–Zn–Mn alloy in 0.5 M acidic Na<sub>2</sub>SO<sub>4</sub> aqueous solution were electrochemically studied by means of open-circuit potential (OCP), potentiodynamic polarization (PDP), and electrochemical impedance spectroscopy (EIS) measurements. These utilized coatings are environmentally safe materials. All outcomes demonstrate that the water soluble polymers PVP have minimized the corrosion current significantly and the corrosion potential go towards more positive values using 0.2 mM of organic polymers at 25 °C. Inhibition efficiency of ~ 96% has been reached by means of 0.2 mM of PVP. The standard free energy  $\Delta G_{ads}$  values point toward that the water soluble polymers and their blend display physicochemical adsorption obeying the Langmuir adsorption isotherm. The electrochemical measurements were complemented by Atomic force microscopy (AFM) investigations and Quantum chemical calculations. AFM technique detected the lessening in the surface heterogeneity by the protecting film created on the electrode surface. Lastly, computational calculations display an excessive relationship with the experimental outcomes because of the electron donation influence. The adsorption energy of (PVP) is found to be greater than (PA)

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