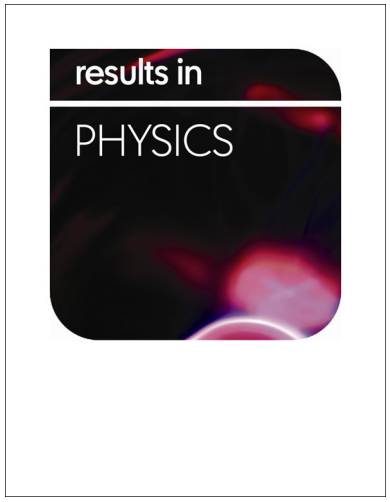

Enhanced corrosion resistance of stainless steel type 316 in sulphuric acid solution using eco-friendly waste product

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ENHANCED CORROSION RESISTANCE OF STAINLESS STEEL TYPE 316 IN SULPHURIC ACID SOLUTION USING ECO-FRIENDLY WASTE PRODUCT

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ABSTRACT

Literature has shown that different organic compounds are effective corrosion inhibitors for metal in acidic environments. Such compounds usually contain oxygen, nitrogen or sulphur and function through adsorption on the metal surface, thereby creating a barrier for corrosion attack. Unfortunately, these organic compounds are toxic, scarce and expensive. Therefore, plants, natural product and natural oils have been posed as cheap, environmentally acceptable, abundant, readily available and effective molecules having low environmental impact. The corrosion resistance of austenitic stainless steel Type 316 in the presence of eco-friendly waste product was studied using weight loss and potentiodynamic polarization techniques in 0.5 M H_2SO_4. The corrosion rate and corrosion potential of the steel was significantly altered by the studied inhibitor. Results show that increase in concentration of the inhibitor hinders the formation of the passive film. Experimental observation shows that its pitting potential depends on the concentration of the inhibitor in the acid solution due to adsorption of anions at the metal film interface. The presence of egg shell powder had a strong influence on the corrosion resistance of stainless steel Type 316 with highest inhibition efficiency of 94.74% from weight loss analysis, this is as a result of electrochemical action and inhibition of the steel by the ionized molecules of the inhibiting compound which influenced the mechanism of the redox reactions responsible for corrosion and surface deterioration. Inhibitor adsorption fits the Langmuir isotherm model. The two methods employed for the corrosion assessment were in good agreement.

Keywords: Stainless Steel, Pitting Corrosion, Inhibition, Sulphuric Acid, Polarization