

Green approach of Anticorrosion Coating of Steel Based on Polybenzoxazine/Henna Nanocomposites

Authors : Salwa M. Elmesallamy, Ahmed A. Farag, Magd M. Badr, Dalia S. Fathy, Ahmed Bakry, Mona A. El-Etre

Abstract : The term green environment is an international trend. It is become imperative to treat the corrosion of steel with a green coating to protect the environment. From the potential adverse effects of the traditional materials. A series of polybenzoxazine/henna composites (PBZ/henna), with different weight percent (3,5, and 7 wt % (of henna), were prepared for corrosion protection of carbon steel. The structures of the prepared composites were verified using FTIR analysis. The mechanical properties of the resins, such as adhesion, hardness, binding, and tensile strength, were also measured. It was found that the tensile strength increases by henna loading up to 25% higher than the tidy resin. The thermal stability was investigated by thermogravimetric analysis (TGA) the loading of lawsone (henna) molecules into the PBZ matrix increases the thermal stability of the composite. UV stability was tested by the UV weathering accelerator to examine the possibility that henna can also act as an aging UV stabilizer. The effect of henna content on the corrosion resistance of composite coatings was tested using potentiostatic polarization and electrochemical spectroscopy. The presence of henna in the coating matrix enhances the protection efficiency of polybenzoxazine coats. Increasing henna concentration increases the protection efficiency of composites. The quantum chemical calculations for polybenzoxazine/henna composites have resulted that the highest corrosion inhibition efficiency, has the highest EHOMO and lowest ELUMO; which is in good agreement with results obtained from experiments.

Keywords : polybenzoxazine, corrosion, green chemistry, carbon steel

Conference Title : ICPC 2023 : International Conference on Polymers and Composites

Conference Location : Venice, Italy

Conference Dates : April 03-04, 2023