

Evaluation of Pelargonium Extract and Oil as Eco-Friendly Corrosion Inhibitor for Steel in Acidic Chloride Solutions and Pharmacological Properties

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Abstract : Corrosion is a natural occurring process where it can be defined as the deterioration of materials properties due to its interaction with its environment. Corrosion can lead to failures in plant infrastructure and machines which are usually costly to repair. In terms of loss of contaminated products which will cause environmental damage and possibly costly in terms of human health. The driving force that causes metals to corrode is due to the natural consequence of their temporary existence in metallic form. There is a growing trend in utilizing plant extracts and pharmaceutical compounds as corrosion inhibitors. Exquisite identification of the essential oil of aerial parts of Pelargonium was obtained using hydrodistillation and identification using GC (gas chromatography) and GC/MS (gas chromatography-mass spectrometry). The oil was predominated by Citronellol (22.8%). The inhibitory effect of essential oil and extract of Pelargonium was estimated on the corrosion of mild steel in 1M hydrochloric acid (HCl) using weight loss, Electrochemical Impedance Spectroscopy (EIS) and Tafel polarization curves. Inhibition was found to increase with increasing concentration of the essential oil and extract of Pelargonium. The effect of temperature on the corrosion behaviour of mild steel in 1M HCl with addition of essential oil and extract was also studied and the thermodynamic parameters were determined and discussed. Values of inhibition efficiency were calculated from weight loss, Tafel polarization curves, and EIS. All results are in good agreement. Polarization curves showed that essential oil and extract of Pelargonium behave as mixed type inhibitors in hydrochloric acid. The results obtained showed that the essential oil and extract of Pelargonium could serve as an effective inhibitor of the corrosion of mild steel in Hydrochloric acid solution. To avoid any surprise of toxicity, the majority compounds have been studied by using POM analyses.

Keywords : corrosion inhibition, mild steel, pelargonium oil, extract, electrochemical system, hydrodistillation, side effects, POM Analyses

Conference Title : ICCIS 2015 : International Conference on Chemical Industry and Science

Conference Location : Jeddah, Saudi Arabia

Conference Dates : January 26-27, 2015