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INVESTIGATING GREEN INHIBITORS FOR ACIDIC CORROSION OF CARBON STEEL

by

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Abstract

This study is intended to investigate Khalas palm date pits extract as a green corrosion inhibitor alternative to commercial inhibitors. Inhibition efficiency of obtained extract was investigated on carbon steel grade S355JR immersed in different corrosive mediums of 2 molarity hydrochloric acid (*HCl*) solution and sea water solution. Along with other ingredients in palm date pits, Polyphenolic compounds have a significant anti-oxidation property and was found effective in reducing corrosion rate. Due to its common industrial applications, Carbon steel was used in this investigation as the corroding medium, while 2M *HCl* and sea water solutions were used separately as the corrosive mediums. Soxhlet apparatus was utilized to continuously extract the palm date pits while minimizing waste of extraction solvents. N-hexane, as a non-polar solvent, was used for de-fattening the palm date pits. Separately, a mixture of polar solvents, includes methanol, acetone, water and formic acid; was used in polar extraction process. Corrosion rate in this work was measured and calculated based on weight loss method as recommended by ASTM standards. The results of this work illustrated that Khalas date pits extract is effective in reducing corrosion rate of carbon steel in 2M *HCl* acidic environment. Corrosion inhibition efficiency of 52% has been achieved for carbon steel grade S355JR with 8000 ppm of Khalas palm date pits solid extract, as an optimum concentration in 2M *HCl* solution. In identical corrosive medium, implementing Khalas palm date pits liquid extract has achieved 72% at 16000 ppm optimum concentration without changing the acidity of the corrosive medium. When compared efficiency of Khalas palm date pits solid and liquid extracts, at optimum concentrations, with a commercial liquid passivating inhibitor (Corrshield NT4292) at the same concentrations, 79.9 - 80.7% higher inhibition efficiency was obtained with the liquid form of green inhibitor in the same acidic environment. As a part of further investigation on the liquid form of extract, effect of temperature on inhibition efficiency was also examined. The efficiency of Khalas date pits liquid extract was found to decrease with increasing the temperature of corrosive medium from 72.44% at 28.5 °C to 41.45% at 78 °C. The extract's optimum concentration was kept constant at 16000 ppm during this experiment. On the other hand, Khalas palm date pits liquid extract was found to have higher corrosion inhibition efficiency in sea water solution (up to 99.5% at 24000 ppm concentration of extract) than in 2M *HCl* solution.

Keywords: Green inhibitor, eco-friendly inhibitor, Khalas palm date pits, solvent extraction, anti-oxidant, recycling.