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Corrosion Inhibition, Hydrogen Evolution and Adsorption Properties of 2-(4-Bromophenyl)-2-Oxoethyl 4-Chlorobenzoate on the Corrosion of the 18% Ni M250 Grade Maraging Steel under Weld Aged Condition in 2.0 M HCl Solution

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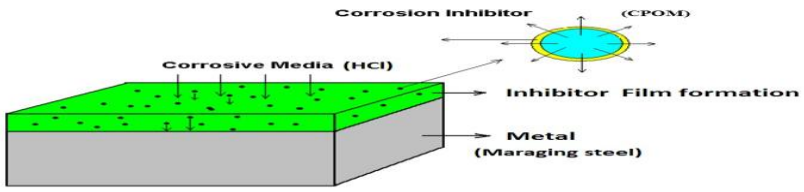
ABSTRACT

The corrosion and corrosion inhibition of maraging steel under weld aged condition in 2.0 M HCl solution by 2-(4-Bromophenyl)-2-oxoethyl 4-chlorobenzoate (CPOM) was studied using potentiodynamic polarization technique and electrochemical impedance spectroscopy. Polarization results showed that corrosion current density, i_{corr}, and hydrogen evolution reaction decreases with increasing concentration of inhibitor in 2.0 M HCl solutions, indicating a decrease in the corrosion rate. Electrochemical impedance spectroscopy (EIS) measurements also confirmed this behaviour. Using the potentiodynamic polarization technique, the inhibitor was proved to have a mixed-type inhibition character for weld aged maraging steel by suppressing both anodic and cathodic reactions on the metal surface. The inhibition efficiency was found to increase with increase in CPOM concentration but decreased with the temperature, which is suggestive of physical adsorption mechanism. Both activation and thermodynamic parameters were calculated and discussed. The adsorption of CPOM on weld aged maraging steel surface obeys the Langmuir adsorption isotherm equation. Surface morphological studies of the weld aged maraging steel electrode surface were undertaken by scanning electron microscope (SEM) and energy dispersive X-ray spectroscopy (EDS).

Graphical Abstract: The inhibitor 2-(4-bromophenyl)-2-oxoethyl 4-chlorobenzoate (CPOM) forms thin film on the metal surface by adsorbing. This thin layer of film acts as a barrier between the acid medium and the metal surface to prevent metal from corrosion. Schematic view on behaviour of corrosion inhibitor shown in below figure.



Keywords: Maraging steel, CPOM, Corrosion rate, EIS, SEM, EDS.