Synthesis and Evaluation of Maleic Anhydride-Methyl Oleate Copolymer as a Corrosion Inhibitor for C-steel in 0.1 M HCl Solution

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The present study investigated the synthesis of a copolymer of maleic anhydride and an ester of oleic acid. Poly (maleic anhydride-co-methyl oleate) was prepared via the free radical polymerization of maleic anhydride with methyl oleate. The prepared copolymer was characterized via FTIR and GPC and thermal analyses (TGA and DTA). TGA demonstrated that the prepared copolymer was thermally stable up to 146 °C. Electrochemical measurement tests, including potentiodynamic polarization tests, revealed that the prepared copolymer was successfully applied as an organic corrosion inhibitor for C-steel in 0.1 M HCl solution at 298 K, 308 K, 318 K and 328 K. Potentiodynamic polarization measurements revealed that this copolymer was a mixed-type corrosion inhibitor. Its inhibition efficiency was measured on the basis of potentiodynamic polarization curves via the electrochemical technique. Results demonstrated that the corrosion inhibition efficiency of poly(maleic anhydride-co-methyl oleate) increased with concentration and decreased with increasing temperature. Inhibition efficiency reached 94.8% with 20 ppm poly (maleic anhydride-co-methyl oleate) at 298 K. The adsorption of this copolymer on the C-steel surface was chemical adsorption and obeyed the Langmuir adsorption isotherm.

Keywords: copolymer, free radical polymerization, organic corrosion inhibitor, potentiodynamic polarization, Langmuir adsorption isotherm.

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