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Influence of 1-butyl-1-methylpiperidinium tetrafluoroborate on St37 steel dissolution behavior in HCl environment

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ABSTRACT

The efficacy of 1-butyl-1-methylpiperidinium tetrafluoroborate (BMPTFB) in retarding St37 steel corrosion in HCl environment has been examined using potentiodynamic polarization (PDP), electrochemical impedance spectroscopy (EIS), dynamic-EIS (DEIS), scanning electron microscope (SEM), and Fourier transform infrared spectroscopy (FTIR) techniques. Results from all applied methods reveal that BMPTFB is effective in suppressing St37 dissolution in the studied corrosive medium. Inhibition

efficiency of 88% has been achieved by 4 mM BMPTFB. From DEIS results, BMPTFB is found to perform better as corrosion inhibitor at longer immersion time. The charge transfer resistance of the metal is raised in the presence of 4 mM BMPTFB from 378 to 744 Ω cm² at 1 h and further increased to 867 Ω cm² at 4 h. BMPTFB, according to PDP result behaves as mixed-type corrosion inhibitor. Corrosion inhibition by BMPTFB is via adsorption which can best be explained using El-Awady kinetic/thermodynamic

adsorption isotherm. K_{ads} and ΔG_{ads} values indicate that physisorption is the mechanism of adsorption of BMPTFB molecules onto St37 surface. The presence of BMPTFB molecules on St37 surface has been verified by SEM and FTIR.

KEYWORDS:

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