Experimental and Theoretical Studies of 1-vinyl-3-hexylimidazolium Iodide ([VHIM]I) as Corrosion Inhibitor for the Mild Steel in Sulfuric Acid Solution

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In order to explore the corrosion inhibition mechanism of 1-vinyl-3-hexylimidazolium iodide with different concentration for mild steel in 0.5M H₂SO₄ at 298K, experimental and theoretical studies were carried out. Not only weight loss but also electrochemical experiments reveal that 1-vinyl-3-hexylimidazolium iodide ([VHIM]I) has higher inhibition efficiency. And all experiments have good consistency. The inhibition efficiency was more than 96% comparing with the blank when the concentration was 5mM. It indicates that [VHIM]I adsorbed on the surface of invested metal by forming a film to protect metal. In addition, SEM observation and ATR-IR spectra was used to further confirmed the above. The Langmuir adsorption isotherm was the most proper adsorption model for the adsorption of [VHIM]I molecule on mild steel surface. Moreover, theoretical calculation and molecular dynamic (MD) simulation also manifest that [VHIM]I was absorbed mightily on the metal surface in a parallel mode.

Keywords: corrosion, inhibitor, mild steel, Electrochemical experiments, molecular dynamic simulation, sulfuric acid solution.

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