2-(2-chlorophenyl)-1H-Benzimidazole as a New Corrosion Inhibitor for Copper in Sulfuric Acid

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A benzimidazole derivative namely 2-(2-chlorophenyl)-1H-Benzimidazole (CPBI) was investigated for corrosion inhibition of copper in 0.5 mol L⁻¹ H₂SO₄ solution using electrochemical methods, scanning electron microscope (SEM), and laser scanning confocal microscope (LSCM). We found that the adsorption of CPBI molecules on copper conforms to a Langmuir type adsorption isotherm and belongs to a mixed type inhibitor. With the addition of 5 mmol L⁻¹ CPBI, the maximum efficiencies of 92.3% was obtained, whereas 5 mmol L⁻¹ benzimidazole (BIM) only have 70.1% ability. The topography maps of SEM and LSCM are consistent with the electrochemical results. In addition, molecular dynamics simulation and quantum chemical calculation further reveal the adsorption and inhibition mechanism of CPBI from a microscopic level.

Keywords: Corrosion inhibition, Copper, acid, Langmuir isotherm, MD

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