Inhibition Effect and Mechanism of 2-(3-bromophenyl)-1-phenyl-1H-Benzimidazole on Copper Corrosion in Acidic Solution

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The inhibition effect of (2-(3-Bromophenyl)-1-phenyl-1H-benzimidazole, BPB) was investigated for inhibiting copper corrosion in 0.5 mol L⁻¹ H₂SO₄ solution, compared with traditional corrosion inhibitor benzimidazole (BIM). Various methods were used including electrochemical methods, scanning electron microscope (SEM), Langmuir type adsorption isotherm, quantum chemical calculation, and molecular dynamics simulation. We found that BPB belongs to a mixed type inhibitor. The adsorption of BPB on Cu conforms to a Langmuir adsorption isotherm. The maximum efficiencies of 70.1% for BIM was improved to 97.0% at 5 mmol L⁻¹. SEM confirms the electrochemical results. Molecular chemical calculation further reveals the inhibition mechanism of BPB at microscopic level and explain its greater inhibition ability than BIM.

Keywords: Inhibitor, Pure copper, H₂SO₄, Corrosion, Simulation.

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