Structural Origin of Corrosion Inhibition Effect over 2-(2-Hydroxyphenyl)benzothiazole on Steel in HCl Medium

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The inhibition effect of 2-(2-Hydroxyphenyl)benzothiazole (HBT), a newly synthesized benzothiazole derivative, on mild steel in 1 M HCl medium has been investigated by utilizing weight loss measurements, electrochemical methods and morphology characterization. The results indicate that HBT exhibited a superior corrosion inhibition efficiency, which reached approximately 95% with the addition of 0.07 mM HBT. Electrochemical tests illustrate that HBT is a mixed-type inhibitor. According to the Langmuir adsorption isotherm, the thermodynamic and kinetic parameters of the adsorption process complied with a physical-adsorption mechanism. Furthermore, computational calculations based on density functional theory reveal the relation between the electronic properties and the inhibition efficiency. In combination with the value of pK_a , the protonic form of HBT in corrosive medium was predicted.

Keywords: mild steel, benzothiazole derivative, electrochemical measurement, computational study, corrosion inhibition

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