Corrosion Inhibition Effect of N-(4-diethylaminobenzyl) Quaternary Ammonium Chitosan for X80 Pipeline Steel in Hydrochloric Acid Solution

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Two water-soluble chitosan derivatives of quaternary amine salt chitosan and N-(4-diethylaminobenzyl) quaternary ammonium chitosan were synthesised, characterised and deployed as corrosion inhibitors for X80 pipeline steel in 1 M hydrochloric acid solution. DAC exhibits better corrosion inhibition performance due to more adsorption centres and more stable adsorption. The potentiodynamic polarization curves revealed that the inhibitors are mixed inhibitors dominated by the anodic reaction. Electrochemical impedance spectroscopy revealed that the corrosion inhibition process is charge-transfer control. The adsorption of inhibitors obeys the Langmuir adsorption isotherm. The thermodynamic parameters of adsorption and surface analysis (SEM, X-ray photoelectron spectroscopy and contact angle) are also discussed.

Keywords: chitosan derivative; corrosion inhibitor; electrochemical; surface analysis; X80 pipeline steel

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