

Hydrophobic-tailed bicycloisoxazolidines: A comparative study of the newly synthesized compounds on the inhibition of mild steel corrosion in hydrochloric and sulfuric acid media

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ABSTRACT

The cycloaddn. reactions of the cyclic nitrones 1-pyrroline 1-oxide and 3,4,5,6-tetrahydropyridine 1-oxide with alkenes, 11-phenoxy-1-undecene and 11-p-methoxyphenoxy-1-undecene, afforded cycloaddn. products (bicyclic isoxazolidines) in excellent yields. One of the cycloadducts on reaction with propargyl chloride and ring opening with zinc in acetic acid afforded quaternary ammonium salt and aminoalc., resp. All the new inhibitor mols. in the presence of 400 ppm at 60 °C achieved inhibition efficiencies, detd. by gravimetric method, in the range 99-99.6% and 85-99% for mild steel in 1 M HCl and 0.5 M H₂SO₄, resp. Comparable results were obtained by the electrochem. methods using Tafel plots and electrochem. impedance spectroscopy for the synthesized compds. The isoxazolidine derivs. were also found to be good inhibitors of mild steel corrosion in synthetic brine. Neg. values of $D G_{ads}$ in the acidic media ensured the spontaneity of the adsorption process. While the corrosion inhibition by these mols. was predominantly under cathodic control in 1 M HCl, the inhibition in 0.5 M H₂SO₄ was found to be under anodic control. The isoxazolidines and their derivs. were found to be among a rare class of mols., which provide suitable inhibition mechanism for the corrosion inhibition in HCl as well as in H₂SO₄ media.