Synthesis and application of curcumin-based zinc complex for corrosion inhibition of mild steel in alkaline media

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A metal complex was prepared from zinc acetate dihydrate and curcumin by using the reflux method. The corrosion inhibition behaviour of the zinc–curcumin complex in 1 M NaOH on a mild steel sample was evaluated by conventional weight loss method and potentiodynamic studies. Through SEM analysis, the shape of the layer adsorbed on the mild steel surface was studied. Through EDX analysis, the adsorbed film's elemental composition was determined. The greatest result 98% was reached at 150 mg l^{-1}, indicating that inhibition efficiency increases as the inhibitor's concentration rises. The Langmuir's adsorption isotherm is followed by adsorption nature of the complex over the sample surface.

Keywords: Adsorption, corrosion, curcumin, metal complex, weight loss method.

The synthesized metal complex (zinc–curcumin, Zn–CU) contains curcumin as the organic ligand having hetero atom oxygen, lone pairs of electrons and conjugated pie bond arrangements. The present study evaluates the electrochemical effectiveness of zinc-based complexes as corrosion inhibitors for mild steel in 1 M NaOH solution through weight loss method, scanning electron microscopy (SEM), energy dispersive X-ray (EDX) and potentiodynamic polarization method.

Experimental method

Materials used

Curcumin longa was purchased from a supermarket. All chemicals and reagents were purchased from Sigma Aldrich