Self-Assembled Monolayers of Alkanethiol as Inhibitors against Copper Corrosion in Synthetic Acid Rain

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The adsorption and corrosion inhibition of alkanethiols self-assembled monolayer on the copper surface in simulated acid rain were investigated by electrochemical techniques. Self-assembled monolayer (SAM) was formed by 1-octanethiol (OT), 1-dodecanethiol (DT) and 1-octadecanethiol (ODT) molecules on copper surface. The experimental results showed that inhibition efficiency increases simultaneously with increase of concentration and chain length of thiols. At the concentration of 0.5 mmol L⁻¹, 1-octadecanethiol (ODT) acts as effective corrosion inhibitor with inhibition efficiency of ~ 90%. The adsorption of alkanethiol self-assembled monolayer on the copper surface was investigated by polarization measurements. The adsorption of SAMs on the copper surface followed Langmuir isotherm and the standard Gibbs energy indicated that the adsorption mechanism of OT, DT and ODT on copper is the hybrid type of physical and chemical adsorption. Values of Gibbs energy ranging from -24 kJ mol⁻¹ for OT to -32 kJ mol⁻¹ for ODT indicate that the chemisorption part in the adsorption mechanism prevails with the increase of alkanethiols chain length.

Keywords: self-assembled monolayer; copper; acid rain; electrochemical techniques

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