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研究报告

云南甜龙竹竹叶提取物在盐酸中对钢的缓蚀作用

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摘要: 云南甜龙竹竹叶提取物 (DBLE) 可作为一种环境友好型植物缓蚀剂, 用红外光谱 (FTIR) 表征了DBLE的主要官能团。采用失重法、动电位极化曲线、EIS和SEM研究了 DBLE在1.0 mol/L HCl溶液中对冷轧钢的缓蚀作用。结果表明: DBLE具有良好的缓蚀作用, 最大缓蚀率达93%, 且在钢表面的吸附符合Langmuir吸附等温式。通过Van't Hoff方程和Arrhenius公式分别求出了吸附热 ΔH_{ads} 和表观活化能 E_a , 并据此讨论了缓蚀作用机理。DBLE为混合抑制型缓蚀剂; EIS谱呈半圆容抗弧, 电荷转移电阻随缓蚀剂浓度的增加而增大。SEM再次表明DBLE对钢具有好的缓蚀作用。

关键词: 云南甜龙竹 提取物 盐酸 钢 缓蚀 吸附

INHIBITION EFFECT OF DENDROCALAMUS BRANDISII LEAVES EXTRACT ON STEEL IN HYDROCHLORIC ACID SOLUTION

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Abstract: Dendrocalamus brandisii leaves extract (DBLE) can be used as an environmentally-friendly plant inhibitor. Fourier transform infrared (FTIR) spectroscopy was employed to study the main functional groups of DBLE. The inhibition effect of DBLE on the corrosion of cold rolled steel (CRS) in 1.0 mol/L hydrochloric acid (HCl) solution was studied by weight loss, potentiodynamic polarization curves, electrochemical impedance spectroscopy (EIS), and scanning electron microscope (SEM) methods. The results show that DBLE is a good inhibitor, and the maximum inhibition efficiency is up to 93%. The adsorption of DBLE on CRS surface obeys Langmuir adsorption isotherm. The experimental data have been treated with Van't Hoff and Arrhenius equations. The adsorption heat ΔH_{ads} and apparent activation energy E_a are also calculated, and the inhibitive mechanism is discussed in detail according to the parameters. Polarization curves reveal that DBLE behaves as a mixed-type inhibitor. EIS spectra exhibit one capacitive loop and charge transfer resistance value increases with the inhibitor concentration. SEM results further confirm the good inhibitive ability of DBLE.

Keywords: dendrocalamus brandisii extract hydrochloric acid steel inhibition adsorption

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