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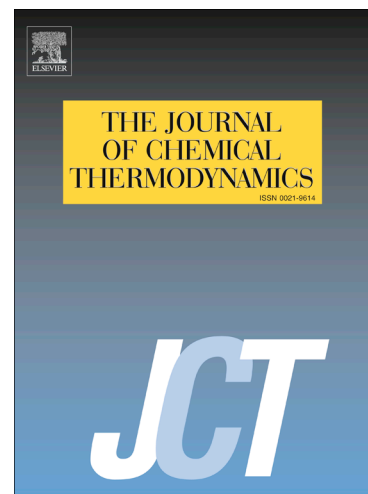
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Evaluation of physical and chemical adsorption using electrochemical noise technique for methylene blue on mild steel

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Abstract

Adsorption behaviour of Methylene blue (MB) on mild steel in hydrochloric solution has been investigated by weight loss, electrochemical impedance spectroscopy, electrochemical noise (EN), scanning electron microscopy and Raman spectra. The potentiodynamic polarization studies revealed that MB acted as a mixed type inhibitor. Thermodynamic results indicated that MB adsorption mechanism changed from physically adsorption to chemisorption mechanism with different concentrations. A parameter of pitting active energy C_{AE} was proposed to evaluate the pitting nucleation/growth process initially increases with increasing MB concentration (0.000159 wt.% - 0.000638 wt.%) when follows physical adsorption and reaches a maximum value at 0.1 mmol/L, then decreases with further increasing MB concentration (0.00318 wt.% - 0.159 wt.%) when chemisorption mechanism was obeyed. This work supplied a new criterion to distinguish the physical and chemical adsorption behaviour.

Keywords: mild steel; adsorption; methylene blue; electrochemical noise

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