Inhibition Activity of Three Kind of Antibiotics for Carbon Steel Corrosion in Acetic Acid Environment

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The inhibition mechanism of carbon steel in acetic acid medium in the presence of amoxicillin, cefaclor or cephradine has been studied with the application of weight loss measurements, potentiodynamic polarization curves, EIS, and SEM. In order to investigate the corrosion mechanism more deeply, we characterized the frontier molecular orbital energy (E_{HOMO} , E_{LUMO}), Mulliken atomic population analysis and charge density difference by using DFT study. In the case where the spatial structure is similar in resistance, the effects of cephradine on cephradine and cefaclor were as follows: the inhibitory effect of cephradine in the three drugs was the best and its inhibition rate was 87.7%. The maximum of cefaclor and amoxicillin is only 63.5% and 52.1% at the same concentration. Electrochemical test indicated that cephradine and cefaclor behaved as cathode type inhibitors and amoxicillin behaved as mixed type inhibitor. These results of experimental and theoretical calculations were consistent and they showed that cephradine was the most effective inhibitor.

Keywords: Antibiotic, Carbon steel, Corrosion inhibition, Acetic acid, Theoretical calculation

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