Short Communication

Influence of Fe^{3+} Diffusion on the Rate of Corrosion of Carbon Steel Imbedded in Porous Media in Acidic Solutions

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In this work, rates of corrosion of a steel disc placed underneath a porous bed of inert particles in acidified FeCl_3 solution were measured. Variables studied were particle size (from 10 to 85 mesh), bed height (from 0.5 to 5 cm) and FeCl_3 (depolarizer) concentration (from 0.1 to 1 M). The rate of corrosion was found to decrease by an amount ranging from 9 to 84 compared to the case without deposit. The rate of corrosion was found to increase with increasing particle size (d) and FeCl_3 concentration, while increasing bed height (x) was found to decrease the rate of corrosion. The rate constant of the partially diffusion-controlled of steel (k) was correlated to bed height and particle diameter. Implication of the present results for the corrosion of underground structures such as pipelines, storage tanks, cables, etc. by acid rain and industrial waste solutions was highlighted. The importance of the present work for minimizing under-deposit corrosion in storage tanks and pipelines handling slurries was pointed out. The relevance of the present study to corrosion of underground steel pipelines buried in the river bed and sea bed was noted.

Keywords: Diffusion-controlled corrosion; Underdeposit corrosion; Storage tank corrosion; Slurries pipeline corrosion; Porous materials; Contacts

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