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Electrochemical impedance spectroscopy of iron corrosion in H₂S solutions

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Abstract

Corrosion of iron exposed to H₂S saturated solution at pH 4 was studied by electrochemical impedance spectroscopy, weight loss coupons and surface analysis. Hydrogen permeation was also used as indirect means of evaluating the intensity of the proton reduction reaction leading to hydrogen entry into the metal.

Since corrosion in this type of test solution results in the rapid build-up of a conductive and highly porous iron sulfide scale, a specific contribution of the film has to be considered. An impedance model was thus proposed. The faradaic anodic impedance consists of a two-step reaction with charge transfer and adsorption – desorption. An additional contribution, associated with the conductive and highly porous iron sulfide film was added in parallel. This contribution, mostly visible in the

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