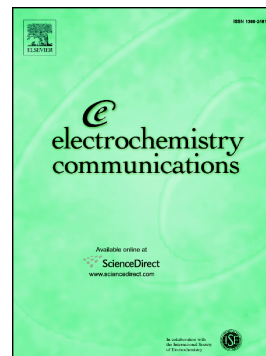


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Quantitative analysis of the polarization behavior of iron in an aerated acidic solution using SECM

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Abstract: The apparent corrosion current of pure iron in aerated 5 mM HClO₄ + 0.1 M NaClO₄ solution was separated into Fe oxidation, proton reduction and oxygen reduction currents using SECM in a modified tip generation/substrate collection (TG/SC) mode. The oxidation current density of Fe was 1.11×10^{-3} A/cm², equal to the sum of proton reduction and oxygen reduction current density, around 5.26×10^{-4} and 5.84×10^{-4} A/cm², respectively, implying that oxygen reduction and proton reduction are equally important at open circuit potential (OCP). Moreover, oxygen reduction was suppressed on the Fe electrode in the potential range between -0.7 and -1.1 V vs Ag/AgCl because of the inhibitory effect of the proton reduction reaction and a potential-dependent surface effect, then the suppression is weakened and oxygen reduction is enhanced. Finally, the Fe corrosion current was dominated by oxygen reduction and Fe oxidation at potentials more positive than -0.6 V.

Keywords: Polarization behavior; Iron; Acidic solution; SECM

1. Introduction

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