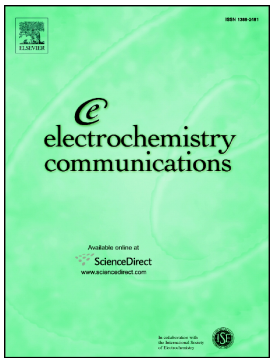

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Quantitative analysis of the polarization behavior of iron in an aerated acidic solution using SECM

Qinhao Zhang[1], Pan Liu[1], Zejie Zhu[1], Zhenni Ye[1], Jianqing Zhang[1],

Fahe Cao[1,*], Xiaogang Li[2]

1. **Department of Chemistry, Zhejiang University, Hangzhou, 310027, China**
2. **Institute for Advanced Materials and Technology, University of Science and Technology Beijing, Beijing 100083, China**

Abstract: The apparent corrosion current of pure iron in aerated 5 mM $HClO_4$ + 0.1 M $NaClO_4$ 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/cm^2, equal to the sum of proton reduction and oxygen reduction current density, around 5.26×10^{-4} and 5.84×10^{-4} A/cm^2, 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

*Corresponding author. Tel.: +86-571-87952318, Fax: +86-571-87951895.
E-mail address: nelson_cao@zju.edu.cn (Fahe Cao)