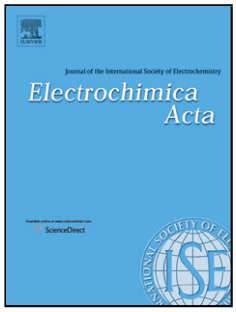

Title: EFFECT OF IMPURITIES ON THE ENHANCED CATALYTIC ACTIVITY FOR HYDROGEN EVOLUTION IN HIGH PURITY MAGNESIUM

Author: S. Fajardo G.S. Frankel

PII: S0013-4686(15)00603-9
DOI: http://dx.doi.org/doi:10.1016/j.electacta.2015.03.021
Reference: EA 24547

To appear in: *Electrochimica Acta*

Received date: 11-12-2014
Revised date: 2-3-2015
Accepted date: 3-3-2015

Please cite this article as: S.Fajardo, G.S.Frankel, EFFECT OF IMPURITIES ON THE ENHANCED CATALYTIC ACTIVITY FOR HYDROGEN EVOLUTION IN HIGH PURITY MAGNESIUM, Electrochimica Acta http://dx.doi.org/10.1016/j.electacta.2015.03.021

EFFECT OF IMPURITIES ON THE ENHANCED CATALYTIC ACTIVITY FOR HYDROGEN EVOLUTION IN HIGH PURITY MAGNESIUM

S. Fajardo[*, 1] and G.S. Frankel

Fontana Corrosion Center, The Ohio State University (OSU)

2041 College Rd., Columbus, Ohio, 43210, USA

*Corresponding Author: fajardopanizo.1@osu.edu (S. Fajardo).

[1]ISE member.

Abstract

The accumulation of impurities more noble than magnesium (Mg) during dissolution has been suggested to be responsible for the enhanced catalytic activity of hydrogen evolution reaction on anodically polarized Mg surfaces. The effect of impurities on the so-called Negative Difference Effect was studied by galvanostatic experiments coupled with simultaneous measurements of H_2 gas collection on electrodes of high purity (99.98% Mg) and ultra-high purity Mg (99.9999% Mg). The concentration of impurities was shown to have a strong effect on the anodic hydrogen evolution (HE), as the HE rates decreased with increasing purity of the Mg. However, HE rates were very large for both Mg electrodes when they were subjected to anodic polarization. These observations demonstrate that, even though the concentration of impurities influences anodic HE on dissolving Mg surfaces, this phenomenon cannot be fully explained in terms of impurity enrichment. The effects of Fe enrichment and the corrosion product film are shown to play a small role in the enhanced HE rates during anodic polarization. The large enhancement of HE