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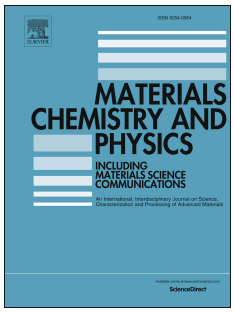

Probing the corrosion mechanism of zinc under direct current electric field

Xin Zhang, Junxi Zhang, Nianwei Dai, Yan Yang, Xujie Yuan, Fahe Cao, Jianqing Zhang

PII: S0254-0584(17)30965-3

DOI: 10.1016/j.matchemphys.2017.12.017

Reference: MAC 20199

To appear in: *Materials Chemistry and Physics*

Received Date: 8 May 2017

Revised Date: 29 November 2017

Accepted Date: 10 December 2017

Please cite this article as: X. Zhang, J. Zhang, N. Dai, Y. Yang, X. Yuan, F. Cao, J. Zhang, Probing the corrosion mechanism of zinc under direct current electric field, *Materials Chemistry and Physics* (2018), doi: 10.1016/j.matchemphys.2017.12.017.

Probing the corrosion mechanism of zinc under direct current electric field

Xin Zhang[a], Junxi Zhang[a,*], Nianwei Dai[a,b] , Yan Yang[a]

Xujie Yuan[c], Fahe Cao[d], Jianqing Zhang[d]

[a] *Shanghai Key Laboratory of Materials Protection and Advanced Materials in Electric Power,, Shanghai University of Electric Power, Shanghai 200090, China*

[b] *Department of Materials Science, Fudan University, Shanghai 200433, PR China*

[c]*CCS-DNV Technology Institute, Shanghai 201417, China*

[d]*Department of Chemistry, Zhejiang University, Hangzhou, 310027, PR China*

Abstract: The influence mechanism of a direct current (DC) electric field on the corrosion behaviour of zinc in a simulated industrial environment was studied by using weight loss measurement, electrochemical tests, XRD and SEM/EDS techniques. The results show that the corrosion rate of zinc increased with the increase of DC electric field intensities. The main corrosion products formed on the sample in $ZnSO_4$ solution are $Zn(OH)_2$, ZnO, $Zn_5(OH)_6(CO_3)_2$ and $Zn_4SO_4(OH)_6{\cdot}5H_2O$. It was found that the DC electric field enables OH^- and SO_4^{2-} ions to migrate from the solution/electrode interface to the upper layer of the solution quickly. Thus it can change the reaction site of the formation of $Zn_4SO_4(OH)_6{\cdot}5H_2O$ and can increase the quantity of the porous hexagonal plate $Zn_4SO_4(OH)_6{\cdot}5H_2O$. All these features can promote the corrosion rate of zinc.

Keywords: Atmospheric corrosion; Zinc; Corrosion products; DC electric field; ions migration

1. Introduction

It is largely recognised that zinc is a vital metal which is widely used in corrosion protection and energy materials. Its most common use is in the application of zinc coating to carbon steel as a result of its favorable corrosion properties and relatively low price [1, 2]. Much research on the

[*]Corresponding author: Tel.: +86 1337 1895 961; Fax: +86 21 65700719
E-mail address: zhangjunxi@shiep.edu.cn (J. Zhang)