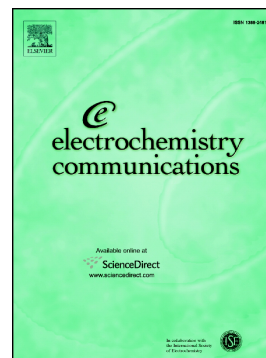


Accepted Manuscript

Understanding multi-element alloy passivation in acidic solutions using operando methods

Katie Lutton, Kateryna Gusieva, Noemie Ott, Nick Birbilis, John R. Scully



PII: S1388-2481(17)30140-6
DOI: doi: [10.1016/j.elecom.2017.05.015](https://doi.org/10.1016/j.elecom.2017.05.015)
Reference: ELECOM 5948
To appear in: *Electrochemistry Communications*
Received date: 26 April 2017
Revised date: 18 May 2017
Accepted date: 22 May 2017

Please cite this article as: Katie Lutton, Kateryna Gusieva, Noemie Ott, Nick Birbilis, John R. Scully , Understanding multi-element alloy passivation in acidic solutions using operando methods, *Electrochemistry Communications* (2017), doi: [10.1016/j.elecom.2017.05.015](https://doi.org/10.1016/j.elecom.2017.05.015)

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

Understanding multi-element alloy passivation in acidic solutions using *operando* methodsKatie Lutton^{1,2}, Kateryna Gusieva^{1,2}, Noemie Ott³, Nick Birbilis³, John R. Scully^{1,2}¹Center for Electrochemical Science and Engineering²Department of Materials Science and Engineering

University of Virginia, Charlottesville, VA 22904

³Department of Materials Science and Engineering

Monash University, VIC, Australia 3800

Corresponding author email address: kml2re@virginia.edu (K. Lutton)

Abstract

The kinetics of passivation and dissolution of many corrosion resistant engineering alloys remain incompletely characterized. Clarification of such kinetics and the unique role of alloying elements were investigated upon Ni-22% Cr and Ni-22% Cr-6% Mo, wt%, in an acidic chloride-free sulfate environment using simultaneous electrochemistry, on-line Inductively Coupled Plasma-Mass Spectroscopy (ICP-MS), and Single Frequency-Electrochemical Impedance Spectroscopy (SF-EIS). The combination of methods enabled *in-operando* tracking of the total current densities for (i) oxidation, (ii) cation ejection by multiple paths, and (iii) oxide film growth during non-steady state passivation. An improved and physically accurate interpretation of passivation processes is presented and clarifies and alters the frequently made assumption that Cr₂O₃ is the dominant oxide on Ni-Cr alloys throughout oxidation.

Keywords: passivation, nickel-chromium alloys, single-frequency electrochemical impedance, spectroelectrochemistry, selective dissolution, *operando*

1. Introduction

The investigation of aqueous passivation of metals and alloys under varying experimental conditions for the purposes of assessing passive film thickness and composition is nominally carried out by AC or DC electrochemical techniques [1–4], ellipsometry [5–7], neutron reflectometry [8], X-

Download English Version:

<https://daneshyari.com/en/article/4766434>

Download Persian Version:

<https://daneshyari.com/article/4766434>

[Daneshyari.com](https://daneshyari.com)