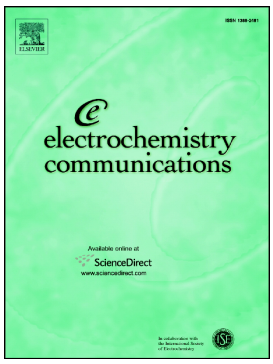

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R. Lopez-Sesenes, I. Rosales, J.G. Gonzalez-Rodriguez

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Effect of crystal orientation on the corrosion behavior of Mo_3Si single crystals in 0.5 M H_2SO_4

R. Lopez-Sesenes[1], I. Rosales[2] J.G. Gonzalez-Rodriguez[2*]

1.-Universidad Autonoma del Estado de Morelos, Facultad de Ciencias Quimicas e Ing., Av. Universidad 1001, Col. Chamilpa; 62209-Cuernavaca, Mor., Mexico.

*Corresponding author e-mail: ggonzalez@uaem.mx

2.- Universidad Autonoma del Estado de Morelos, CIICAp, Av. Universidad 1001, Col. Chamilpa; 62209-Cuernavaca, Mor., Mexico

Abstract

The corrosion behavior of Mo_3Si single crystals with crystallographic orientations <100>, <110> and <111> in 0.5 M H_2SO_4 was analyzed using potentiodynamic polarization curves, electrochemical impedance spectrosopy, and electrochemical noise measurement. The corrosion behavior was different for each crystal orientation. The plane most susceptible to both uniform and localized types of corrosion was the (111) plane; the (110) plane exhibited the lowest susceptibility to uniform corrosion; and the (100) plane was the least susceptible to localized corrosion. These results were explained by differences in surface energy and the number of atoms per unit area.

Keywords: Single crystals, corrosion, electrochemical noise.

1. Introduction

The need to produce materials with excellent mechanical properties is a worldwide problem. Industries such as power generation and aircraft turbine manufacture, where temperature plays a significant role in the structural integrity of components, require materials with good mechanical properties and corrosion resistance. The materials used must have the capacity to support extreme temperatures and function in aggressive environments, resisting molten salt corrosion, sulfidation, carburization, halogen and hydrogen attack, among others [1].