Effect of Crystallographic Orientation on the Corrosion Behavior of Mo₃Si Single Crystals in NaCl Solution

R. Lopez-Sesenes¹, I. Rosales², J. Uruchurtu-Chavarin², V.M. Salinas-Bravo³,
J.G. González-Rodríguez^{2*}

¹ Universidad Autónoma del Estado de Morelos, FCQeI., Av. Universidad No. 1001, Col. Chamilpa, Cuernavaca, Morelos, Mexico. C.P. 62209.

² Universidad Autónoma del Estado de Morelos, CIICAp. Av. Universidad No. 1001, Col. Chamilpa, Cuernavaca, Morelos, Mexico. C.P. 62209.

³ Instituto Nacional de Electricidad y Energías Limpias, Interior Internado Palmira, Cuernavaca, Mor., Mexico

*E-mail: ggonzalez@uaem.mx

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The corrosion behavior of polycrystalline and Mo₃Si single crystal in its crystal orientations, namely [100], [110] and [111] was evaluated in 0.05 and 0.5 M NaCl solutions. For this, electrochemical impedance spectroscopy, (EIS), potentiodynamic polarization curves, and electrochemical noise analysis (ENA) were used. Parameters calculated from the different techniques such as polarization, noise, and charge transfer resistance had a highest value for the [100] single crystal, whereas the lowest value was for the polycrystalline material. Although single crystals exhibited a higher corrosion resistance than polycrystal, all the different materials were highly susceptible to pitting corrosion. This difference in corrosion behavior was explained in terms of difference in surface energy values and in the number of atom density.

Keywords: Molybdenum silicides, single crystals, corrosion, crystal orientation, corrosion, electrochemical techniques.

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