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Electrochemical behavior in acidic medium of Al-2.0 wt% Fe aerospace alloy treated by laser surface remelting

Moisés Meza Pariona and Katiele Tives Micene
State University of Ponta Grossa, Brazil

In this research, we carried out a study of the corrosion of Al-2.0 wt% Fe alloy treated by laser surface remelting (LSR) and were compared with untreated samples (substrate). In this research, LSR without protective coating with a 2 kW Yb-fiber laser (IPG YLR- 2000S) was used. Therefore, corrosion potential testing, micro and macro polarization, cyclic voltammetry and electrochemical impedance spectroscopy (EIS) were performed. The morphological and chemical characterizations of the base material (substrate) and of the material treated by LSR were made using a scanning electron microscope and optical microscopy. The results showed that the laser surface treatment affected the Al-2.0 wt. %Fe alloy leads to the formation of a structure with more compact, homogeneous and fine microstructure. Furthermore, with increased surface hardness, roughness reduction, corrosion rates was approximately 10 times smaller when compared with the untreated alloy in the aerated media 25°C and solution of H₂SO₄ 0.1 mol/L. The resistance polarization measures the charge transfer at the interface electrode/solution and similar results were found in both experiments carried out by the techniques polarization curves which involves determining the Tafel constant and by the EIE technique, and the treated sample by LSR showed about 11 times greater than the untreated material. By the electrochemical impedance technique was possible to evaluate the oxide layer formed on the surface of Al-2.0 wt. %Fe alloy treated by LSR, as a protective film against corrosion of this alloy treated by LSR in the middle of H₂SO₄ 0.1 mol/L compared with not treated alloy. In equilibrium conditions the sampled treated showed high capacitive effect in relation to the untreated sample at higher frequencies. In both samples also presented the inductive effect at low frequencies and it is much more noticeable in the treated sample that the untreated sample.

Biography

Moisés Meza Pariona is an Associate Professor in the Department of Materials Engineering at State University of Ponta Grossa, Brazil. He is the supervisor of undergraduate students and Master's degrees. His educational details are: Degree in Physics, Master's, Doctorate and Post-doctorate in Engineering and Materials Science. His work in research recast aluminum alloys with laser is characterized by different techniques: Optical microscopy, SEM, micro hardness, X-rays, atomic force, corrosion and electrochemical impedance, etc. He has published several research articles in national and international journals.

mmpariona@uepg.br

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