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Microstructural investigation of the anodized (TSA) Al-Li alloys sealed in a cerium solution

¹M.Terada; ^{1,2}F.M.Queiroz; ²V.H.Ayusso; ³A.Astarita; ²I.Costa

¹Escola Politécnica da Universidade de São Paulo – EPUSP – São Paulo – Brazil;

²Instituto de Pesquisas Energéticas e Nucleares – IPEN/CNEN – São Paulo – Brazil;

³University of Naples Federico II, Department of Chemical, Materials and Industrial Production Engineering, Naples – Italy

Abstract

The AA2198 is a third generation of Al-Li alloy developed for use in the aircraft industry. It is highly susceptible to localized corrosion and it is usually protected by anodizing. Sealing treatments of the anodic layer provide further protection. In this study, samples of the AA2198 alloy were anodized in tartaric sulfuric acid (TSA) solution and subsequently sealed, either in boiling water or in a solution with cerium ions. The surface of the treated samples was investigated by Field Emission Gun-Scanning Electron Microscopy and X-ray energy dispersive analysis. Defects were found in the anodic layer due to the complex microstructure of the AA2198 alloy. The corrosion resistance of the anodized and sealed samples was studied by electrochemical impedance spectroscopy in 0.5 mol.L⁻¹ NaCl solution and compared to that of anodized and unsealed samples. EIS results showed that the sealing treatment in cerium solutions resulted in increase in impedance with time of immersion. Surface observation and EDX analysis showed increase in cerium content with time of test at the defects in the anodic layer sealed in cerium containing solutions and the increasing blockage of the defects in this layer. The EIS results also showed that the impedance associated to this type of samples increased with time whereas it decreased for sealed samples in boiling water. The surface observation and EIS responses indicated a healing process associated to sealing in the cerium solution.