Correlating microstructure and corrosion modes of AA7075 alloy prepared by laser additive manufacturing: a comparative approach

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Abstract

Modern metal manufacturing has seen a transformation because to additive manufacturing (AM), often termed as 3D printing. This technique has lately become popular for creating metallic components out of a range of metallic alloys has experienced exponential growth in terms of development and application. Among the many advantages as low carbon fingerprint, net shape manufacturing, effective material utilization, adaptability to small-scale (prototyping), and the capacity of exploring alloy compositions not previously achievable through traditional ways. In this sense the aeronautical sector has a big interest on AM of light and mechanically resistant aluminum alloys that are widely used in aeronautics for wings and structural parts. However, corrosion is a major concern in this kind of aluminum alloys. The AM produces a different microstructure that comprises distinct porosity, dislocation networks, grain shapes, residual stress, and surface roughness and this kind of differences could be correlated with the corrosion resistance. In this study, the corrosion resistance of additive manufactured (AMed) AA7075 was evaluated and compared by immersion tests in sodium chloride solution and monitored by electrochemical impedance spectroscopy (EIS) and the localized corrosion susceptibility was studied by immersion in three test solutions, specifically sodium chloride solution (3.5% NaCl), EXCO solution, according to ASTM G34-18, and a solution for intergranular corrosion (IGC) test recommended by ASTM G110-15. The results

present the correlation between corrosion resistance, microstructure and surface finishing.

Keywords: Additive manufacturing, SLM, Corrosion, AA7075 alloy.

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