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R.V. Lakshmi, S.T. Aruna, C. Anandan, Parthasarathi Bera, S. Sampath

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EIS and XPS studieson the self-healing properties of Ce-modified silica-alumina hybrid coatings: Evidence for Ce(III) migration

R. V. Lakshmi[a], S. T. Aruna[a]*, C. Anandan[a], Parthasarathi Bera[a], S. Sampath[b]

[a] Surface Engineering Division, CSIR-National Aerospace Laboratories, Bengaluru560017, India.
[b] Department of Inorganic and Physical Chemistry, Indian Institute of Science, Bengaluru560012, India.

Abstract

Cerium nitrate added silica-alumina hybrid sol-gel coatings have beenexplored for the corrosion protection of AA2024-T3. The self-healing property of the coating is investigated experimentally by electrochemical impedance spectroscopy and exfoliation test. The results confirm that coatings containing 0.005 M cerium nitrate inhibitor offers superior protection to the surface. Increase in the surface concentration of Ce species in the corrosion tested coating,as evaluated from X-ray photoelectron spectroscopy (XPS) studies,provides a strong evidence for the outward migration of cerium ions from the coating.Improved corrosion protection observed is attributed to the combined effect of the stable barrier nature of the coating and the corrosion inhibiting nature of Ce^{3+} ions.

Keywords: Silica-alumina;Pitting corrosion; Cerium nitrate; AA2024; EIS;XPS