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PII: S0257-8972(13)00417-9
DOI: doi: 10.1016/j.surfcoat.2013.04.063
Reference: SCT 18531

To appear in: *Surface & Coatings Technology*

Received date: 11 December 2012
Accepted date: 29 April 2013

Please cite this article as: E. Roussi, A. Tsetsekou, A. Skarmoutsou, C.A. Charitidis, A. Karantonis, Anticorrosion and Nanomechanical Performance of Hybrid Organo-Silicate Coatings integrating corrosion inhibitors, *Surface & Coatings Technology* (2013), doi: 10.1016/j.surfcoat.2013.04.063

Anticorrosion and Nanomechanical Performance of Hybrid Organo-Silicate Coatings integrating corrosion inhibitors.

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Abstract

Corrosion protective sol–gel silica coatings were developed on AA2024-T3 alloy by in situ cross-linking with hyperbranched poly(ethylene imine). Coatings with or without corrosion inhibitors (2-mercaptobenzothiazole or 2-mercaptobenzimidazole) and of two different thicknesses (1-1.5 and 3-3.5 μm, respectively) were obtained. Potentiodynamic Scans and Electrochemical Impedance Spectroscopy (after immersion in Harrison's solution for up to 4 weeks) were employed to evaluate the anticorrosion performance of coatings, whereas their thickness, morphology and integrity were assessed by Scanning Electron Microscopy and Atomic Force Microscopy. Further the depth sensing nanoindentation technique was employed to measure the hardness and reduced modulus of coatings and the obtained data were analyzed to indicate their wear resistance, plastic deformation and mechanical integrity. In all cases, coatings of high quality with good barrier properties (impedance modulus reaching up to 10^6 Ohm·cm^2 at