Corrosion protection for Aluminum surfaces of use in the aircraft industry by hybrid Sol-Gel/Cerium nanocomposite coating

Reference	Presenter	Authors (Institution)	Abstract
04-075	Rafael Emil Klumpp	Klumpp, R.E. (Instituto de Pesquisas Energéticas e Nucleares); Viveiros, B.G. (Instituto de Pesquisas Energéticas e Nucleares); Silva, R.M. (Instituto de Pesquisas Energéticas e Nucleares); Magnani, M. (Universidade do Estado de São Paulo - Júlio de Mesquita); Antunes, R.A. (Universidade Federal do ABC); Costa, I. (Instituto de Pesquisas Energéticas e Nucleares);	Localized corrosion is a threat for aluminum alloys structures used in the aircraft industry. Toxic and carcinogenic surface pre-treatments based on hexavalent chromium have been widely used due to its highly effective corrosion protection properties. However, since it has been increasingly banished from use, there is great interest in the development of surface pre-treatments by clean technology to replace those that generate toxic residues. In this work, a novel eco-friendly surface treatment based on an hybrid sol-gel/Cerium nanocomposite coating was proposed with the great advantage over other treatments proposed carried out in literature that consists in one single step process. The effect of this newly developed treatment on the morphology, chemical composition and corrosion resistance of an Alclad alloy (AA1230) surface used in the aeronautic sector was evaluated. Scanning Electron Microscopy (SEM) and Atomic Force Microscopy (AFM) analyzed surface morphology, whereas corrosion resistance was studied by electrochemical techniques and Neutral Salt-Spray Test (NSST). Chemical composition of the surface after treatment was analysed by X-ray photon electron spectroscopy (XPS). The results showed high corrosion resistance of the treated surface comparable to that provided by chromated surfaces. Besides, high adhesion of the treated surface to a varnish, indicated that it is a viable alternative for replacement of chromate layers obtained from solutions with hexavalent chromium ions. Advantages of the treatment are environmentally friendly, effective corrosion protection and low costs.

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