

Session	Advanced Coating Technologies (II)
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Chair	Hasan İsmail



INVITED SPEAKER

Smart Multilayer System Based on PEO and Sol-Gel Process for AZ31B Mg Alloy

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Biography

Prof. Dr. Alicia Durán is degree in Physics by UNC (Argentina) and PhD in Physical Sciences from UAM (Spain), developing her professional career at the Institute of Ceramics and Glass (CSIC).

She is Research Professor of CSIC and responsible of the research group GlaSS, a group of excellence, in the higher 10% among the 1600 research groups of CSIC (<http://glass.icv.csic.es>). The Glass group is the Spanish reference in Glass science and technology, with close relation with national and international glass field centres and industries, in particular with Spanish glass companies and their associations, ANFEVI and VIDRIO ESPAÑA.

Alicia has more than 295 publications in WOK. She was Treasurer of ICG from 2002 to 2016 and President of the International Commission on Glass (ICG) on 2018-2021. From this position she nominated 2022 as International Year of Glass 2022 at United Nations, being the chair of the IYOG. Among the prizes she received the Gottardi Prize in 1988. In the last years she received the Phoenix Award, being named Glass Person of the Year 2019 and bestowed with the Otto-Schott Award in 2022 as well as the ICG President's Award in 2022.

Abstract

Magnesium alloys have become promising materials for different applications due to their light weight. The use of lightweight materials is a viable and suitable option to reduce the overall weight of vehicle bodies and therefore their energy consumption. Nevertheless, the high chemical reactivity of Mg alloys makes them very susceptible to corrosion, limiting their widespread use.

Under this perspective, the aim of this work was to develop a smart integrated protective system to provide long-term protection to Mg alloys. The smart system was performed by depositing a first oxide layer using the Flash-plasma electrolytic oxidation process (F-PEO) followed by the sealing of the F-PEO coating using a glass-like CexOY sol and finally, the deposition of an inorganic-organic hybrid SiO₂ coating. The F-PEO coating was obtained using an environmentally friendly electrolyte using phosphate and carbonate salts. The glass-like CexOY coating was developed using cerium acetate as precursor and the SiO₂ hybrid coating was obtained by hydrolysis and condensation reactions of tetraethoxysilane (TEOS) and 3-(glycidylxypropyl) trimethoxysilane (GPTMS), SiO₂ nanoparticles.

Different techniques were used to characterize the smart integrated protective system such as SEM, optical microscopy, etc. Finally, Electrochemical Impedance Spectroscopy (EIS) and Scanning Kelvin Probe Microscopy (SKPFM) were performed to characterize the corrosion resistance of the smart coatings using a highly concentrated 3.5% wt. NaCl. EIS and SKPFM measurements confirmed that the integrated multilayer coating provides long-term corrosion protection to Mg alloys (more than 20 days) through a mechanism that involves the migration and precipitation of cerium ions (Ce³⁺ /Ce⁴⁺) into CeO₂ crystalline species.



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Notes

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