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Modification of surface chemistry on ZnMgAl alloy by means of atmospheric pressure plasma

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The development of ZnMgAl coatings for steel is aimed to improve the corrosion resistance and adhesion properties for application such as the automotive, house hold appliance, and aerospace industry. In general, the surface of ZnMgAl alloy is covered by a thin oxide layer (MgO, Al2O3 and ZnO and their hydroxides) that exhibit special electronic properties that make them suitable for the direct application of thin organic coatings without the need for application of a chemical conversion process [1]. Plasma surface modification technology has been widely using to enhance interfacial surface properties. Recently, Giza et al [2] investigated the plasma induced surface modification on the MgZn2 alloy. The chemical composition of the surface oxide was compared to the surface state after sequences of reductive and oxidative plasma treatments by means of in-situ IRRAS and ex-situ XPS. Also the chemical composition of the passive film and its electronic properties as displayed by its work function could be significantly modified by the applied plasma processes [2]. In this contribution we present a study of the characterization of the oxide film of novel ZnMgAl alloy as function of different plasma parameters (i.e. fluence, potential, duration and gas composition). The goal is to understand the extend to which the complex surface oxide film can be adjusted in terms of composition, thickness and morphology by plasma treatment. Moreover, we study the influences of oxidative, reductive and sequential plasma treatments on the band gap, surface potential and the resulting corrosion potential of oxide films on ZnMgAl alloys, which would enable tailoring of these properties for various technical applications.

References:
[1] R. Hausbrand, M. Stratmann, M. Rohwerder, Corros. Sci. 51 (2009) 2107.
[2] M. Giza, and G. Grundmeier, Plasma Processes and Polymers 8 (2011) 607-616.

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