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Novel Nanometer Thin Films On Magnesium Alloy Prepared By Ultra-Shallow Nitrogen Implantation Using PECVD MethodMarcin Grobelny¹, Małgorzata Kalisz¹, Robert Mroczyński², Magdalena Szymańska¹¹Motor Transport Institute, Warsaw, Poland ²Institute of Microelectronics and Optoelectronics, Warsaw University of Technology, Warsaw, Poland

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The low density of magnesium alloys makes them especially attractive especially for the automotive, electronic and aeronautical industries. Unfortunately, magnesium alloys have a strong susceptibility to atmospheric, galvanic and pitting corrosion and need to be protected with anticorrosive coatings. Traditionally magnesium and magnesium alloys have been protected with chromium-based coatings with the consequent problem of pollution by Cr(IV) ions. The development of new corrosion resistant coatings, by using clean and environmentally friendly processes is very important and strategic for the European industry due to environmental, health and economic considerations.

In this context plasma technology, including: Plasma Enhanced Chemical Vapor Deposition (PECVD) are becoming increasingly popular.

In this paper, magnesium alloys AZ91 were treated using nitrogen plasma (N₂ and NH₃) generated in PECVD reactor. Then, some of magnesium alloys samples were oxidized in oxygen plasma, and for some magnesium alloys samples SiO₂ layer was deposited (in PECVD reactor).

The obtained coatings were investigated using various characterization methods. Mechanical properties have been tested by means of nanoindentation, the electrochemical properties were based on analysis of the voltammetric curves and electrochemical impedance spectroscopy, the microscopic examination was performed by using the techniques of SEM / EDS.

Keywords

magnesium alloy
electrochemical properties
PECVD method
nitrogen implantation
corrosion