PEO layers on Mg-based metallic glass for decreasing hydrogen evolution

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Abstract:

The amorphous Mg-based alloys may be used as metallic biomaterials for resorbable orthopedic implants. The Mg-Zn-Ca metallic glasses demonstrate fast and variable in time corrosion rate in simulated body fluid. Due to phase composition of the Mg-based materials, the mechanism of corrosion is different. In this work as substrate for coatings the Mg66Zn30Ca4 alloy was chosen. In previous studies [1] the Mg66Zn30Ca4 metallic glass characterized good mechanical strength and high glass forming ability. This work reports on the surface modification of a Mg66Zn30Ca4 metallic glass by plasma electrolytic oxidation (PEO). Results of immersion tests in Ringer's solution allowed to determine the amount of evolved hydrogen in a function of time for base Mg66Zn30Ca4 metallic glass and sample with PEO coating. In comparison to the non-coated Mg66Zn30Ca4 alloy, the sample with PEO layer showed a significantly decreased hydrogen evolution volume. The hydrogen evolution rate of the studied samples decreased during the following immersion time. The possible reason of this phenomena is formation of corrosion products layers on surface samples, which act as protection layer.

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Key words:

Amorphous magnesium alloys, corrosion rate, plasma electrolytic oxidation, hydrogen evolution