CORRELATIONS BETWEEN MATERIALS, METHODS, AND CLINICAL NEEDS REGARDING THE COATINGS FOR BIODEGRADABLE MG ALLOYS

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Biodegradable magnesium alloys appear to be a novel class of metallic biomaterials. Their application in orthopaedic field may lead to the reduced use of permanent metallic implants made of stainless steel and titanium alloys avoiding in this way implant removal surgeries and significantly reducing the costs [1]. The aim of the current study is to evaluate the performance of different bioceramic, polymeric and composite coatings on biodegradable magnesium alloy. Coatings with calcium phosphates or bioactive glasses present many advantages, among which one can find the reduction of the corrosion rate under "in vivo" or "in vitro" conditions and the promotion of calcium phosphate deposition [2]. Also, doping calcium phosphates with trace elements in various couple combinations may impart implants also with antimicrobial properties.
In this study, we shown the biodegradation behavior of some biodegradable magnesium alloys before and after surface modifications by different ceramic, polymeric and polymeric-based composite coatings. The chemical composition, uniformity, thickness, and stability of the layers generated on the magnesium alloys surface significantly influence their corrosion behavior. The obtained results demonstrated that bioceramic coatings reduce the corrosion rate of the magnesium alloys and could offer a way to predict their biodegradability. Our study reveals that bioceramic and polymer-based composite coatings could act in a beneficial way to improve the biofunctional properties required for the magnesium alloys to be used as biomaterials for manufacturing orthopedic implants used for bone fracture fixation. The prepared samples are recommended for in vivo tests prior to potential applications in clinical studies.

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References

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