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A study on pre-calcified magnesium alloy in simulated body fluid

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ABSTRACT

As a lightweight metal with mechanical properties similar to natural bone, Mg and its alloy are potential biodegradable materials and are widely used as biocompatible, degradable implants for load-bearing applications. In addition, magnesium alloys can gradually be dissolved and adsorbed after implanting. Although Mg has many attractive properties as an implant material, it exhibits poor corrosion properties, and its rapid corrosion can result in the loss of mechanical integrity before tissue healing. Surface modification of magnesium alloys, such as depositing bioceramic coatings, is regarded as an effective method to improve their corrosion resistance. Dicalcium phosphate dihydrate (DCPD) and hydroxyapatite (HA) coatings were deposited on the substrate surfaces of magnesium alloy with a solution treatment. Two coating morphologies existed at the coated substrate surfaces, which was attributed to the different titration rate of the coating process. The microstructure evolution and electrochemical behaviour of the DCPD coatings in a simulated body fluid (SBF) were characterized by SEM, TEM, and electrochemical method. It is important to note that the morphologies in the DCPD coatings after the SBF incubation had changed dramatically. The structure of the DCPD coatings and the formation mechanisms of hydroxyapatite (HA) coatings were investigated in detail.

KEYWORDS: magnesium, coatings, SBF solution, degradation