Date: 2012-11-30
Session: Research: Biomaterials VI
Time: 10:30 - 12:00
Room: Rashid B

Abstract no.: 31794

A NOVEL BIO-DEGRADABLE POLYMER MEMBRANE TO CONTROL THE DEGRADATION OF MG-BASED METALLIC BIOMATERIAL FOR ORTHOPAEDIC IMPLANTATION

Kelvin YEUNG[1], Hoi Man WONG[1], Paul CHU[2], Kenneth CHEUNG[1], Keith LUK[1]
[1]The University of Hong Kong, Hong Kong (HONG KONG), [2]City University of Hong Kong, Hong Kong (HONG KONG)

Biodegradable metallic materials such as magnesium-based alloys are the potential candidates of replacing the currently used non-degradable metallic implants. However, the fast degradation rate and hydrogen gas release may hinder its use. To remedy these complications, our group has developed a controllable biodegradable polymer coating, polycaprolactone (PCL), onto magnesium alloy surface. This study aims to investigate the surface mechanics, in-vitro and in-vivo properties of the modified magnesium alloys. The polymer membrane was prepared by mixing 3.33% and 2.5% (w/v) PCL and dichloromethane. A 60°C heat treatment was conducted after the deposition process on the magnesium alloys. The surface adhesiveness of the heat-treated membrane was evaluated by scratching and tape tests. The corrosion resistance properties of the polymer-deposited magnesium alloys were studied by electrochemical test. The in-vitro and in-vivo responses were studied by GFP osteoblast culture and rat model for 2 months. The corrosion resistance of the treated magnesium alloy was enhanced, as the corrosion current density of the treated sample was 10-fold lower than that of the untreated samples. Moreover, the treated surface was well tolerated by osteoblasts in-vitro and high volume of new bone formation was found on the treated samples in-vivo. The surface adhesiveness of polymer coating was significantly improved by heat treatment procedures. In conclusion, the new polymer coating was able to enhance the corrosion properties of magnesium alloy as well as its conductivity in-vitro and in-vivo.