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Magnesium/hydroxyapatite nanocomposites for biomedical applications

Mg and its alloy have shown great potential for orthopaedic and cardiovascular applications due to their excellent biocompatibility and biodegradability. However, they corrode too quickly *in vivo*, which limits their clinical use. Hydroxyapatite (HA) is a natural bone component and the addition of HA into Mg alloys has been demonstrated to enhance corrosion resistance. In the present work, Mg/HA nanocomposites were designed based on a new concept of corrosion protection mechanism and fabricated by a novel casting-deformation route, which combined high shear solidification and severe plastic deformation. High purity Mg-2Zn-0.1Mn-0.5Ca (wt%) was used as the matrix alloy and HA nanoparticles of 30-50 nm in diameter were added into the matrix melt by using a rotor stator mixer, which rotated at 5,000-20,000 rpm during mixing. Cylindrical composite ingots (ϕ60×100 mm) were cast in a steel mould at a mixing and pouring temperature of ~670°C. The as-cast composite ingots were then extruded at 350°C into a square bar with a cross-section of 15×15 mm, which were further deformed by equal channel angular extrusion (ECAE). Optical and electron microscopy was carried out to characterize the microstructure of the fabricated Mg/HA nanocomposites. Mechanical properties were tested by uniaxial compression tests at room temperature. Polarization and immersion tests were conducted in the Hank solution at 37°C, according to ASTM-G31-T2, to study the *in vitro* corrosion behaviour of the material. The fabricated Mg/HA nanocomposites exhibited a fine grain structure and uniform global HA particle distribution with largely enhanced both mechanical properties and corrosion resistance.

Biography

Yan Huang is a Senior Lecturer in Materials Science at Brunel University London. He obtained his PhD degree in 1990, and served till 1996 as a Lecturer/Associate Professor in Northeastern University, China. Before joining Brunel in 2010, he worked as a Technical Director at Confae Technology Ltd., from 2004 to 2010 and as a Research Associate/Fellow at the University of Manchester from 1996 to 2004. He has extensive experience in physical metallurgy and metallic biomaterials and published over 100 peer reviewed journal papers and conference proceedings.

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