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Developing bioceramics for medical applications

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Bioceramics are ceramics, glasses, glass-ceramics and ceramic (or glass) matrix composites for biomedical applications. Ground-breaking research on bioceramics was conducted in the 1970s and early 1980s and subsequently there has been a phenomenal growth of bioceramics as viable materials for the repair and reconstruction of human body tissues, especially hard tissues. Various bioceramics have been developed for dental, orthopaedic, cardiovascular and other medical applications. Bioinert bioceramics such as alumina and zirconia ceramics are now proven materials for artificial hip joints. Bioactive bioceramics, represented by hydroxyapatite (HA), Bioglass(and A-W glass-ceramic, have been used clinically for many years now for hard tissue repair. With the worldwide interest in tissue engineering, previously overlooked biodegradable (and also bioactive) bioceramics such as tricalcium phosphate (TCP) and a few glasses have attracted great attention. Multifunctionality is another trend in current bioceramic research. For example, bioactive bioceramics, in the form of non-porous structures, porous scaffolds or coatings, can be loaded with anti-bacteria drugs for the prevention of bacterial infection. Rapid progresses in nanoscience and nanotechnology have also greatly advanced bioceramics R&D in recent years. The biomedical application of ceramics is not confined to tissue repair or regeneration. For example, radioactive glass microparticles can provide localized radiotherapy for cancer treatment. Magnetic bioceramic particles can be used to treat tumors by hyperthermia. And silica-based delivery vehicles are developed for the controlled and sustained release of drugs. This talk on bioceramics will review the past achievements, present the current status, and discuss possible future developments.

Biography

Min Wang is a Professor in the Department of Mechanical Engineering and Programme Director of the Medical Engineering Programme at The University of Hong Kong. His research interests include biomedical materials, tissue engineering, controlled release, and bionanotechnology. He has a large number of publications in peer-reviewed journals and conference proceedings and has given many conference presentations, including more than 110 invited talks, at international conferences. He is an elected fellow or academician of professional societies in the UK, USA, Hong Kong and the world (FIMMM, 2001; FIMEchE, 2007; FHKIE, 2010; FBSE, 2011; AIMBE Fellow, 2012; WAC Academician, 2013).

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