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Degradation control of biodegradable biomaterials using nanotechnology

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Abstract

In this ageing population, the use of implants for repair of fractured bone tissues has been increasing rapidly. Traditionally, implant materials such as stainless steel and titanium alloys are used for temporary mini-implant applications in orthopaedics and dental maxillofacial fixation. Due to the risk of toxic metallic ion release through corrosion and/or wear, these implants are removed surgically after the tissues have healed completely. However, it is well known thatany surgical process poses risk to the patient. Biomaterials that support tissue regeneration and healing by material degradation and simultaneous implant replacement by the surrounding tissues can resolve these problems. Magnesium is a suitable material for biodegradable implant applications if its degradation rate is controlled. In fact, the biocompatibility and mechanical properties of magnesium are very attractive for such applications. A considerable amount of work, especially on conventional methods such as alloying and coating, has been done to control the high degradation rate of magnesium in body fluid. However, nanotechnology has proven to enhance the performance of magnesium-based alloys significantly. In this talk, the advancement made on magnesium-based biomaterials using nanotechnology for potential temporary mini-implant applications will be discussed.

Biography

Bobby Mathan received his Ph.D. from the Indian Institute of Technology (IIT) Bombay in 2005. His Ph.D. dissertation was on developing a phenomenological model for the environment-assisted cracking mechanism in high strength aluminium alloys used in aircraft structures. He won the Best Ph.D. Thesis Award from the National Association of Corrosion Engineers (NACE), India Section. After completing his Ph.D., he worked as a post-doctoral fellow at the Helmholtz Research Centre in Germany. His research focus was on understanding the localized corrosion behaviour of advanced magnesium alloys. In November 2006 he joined Monash University as a post-doctoral fellow, where he worked on magnesium-based biodegradable biomaterials. In February 2009 he joined JCU as a Lecturer of Chemical Engineering. He is currently the Head of Chemical Engineering in the School of Engineering and Physical Sciences.

Bobby is the group leader of the *Biomaterials and Engineering Materials (BEM)* laboratory at JCU. His current research interests include electrochemical engineering, biomaterials, corrosion, wastewater treatment, environment-assisted cracking, polymer coatings and failure analysis of engineering materials. He has written four book chapters and published over 50 papers in journals and peer-reviewed conference proceedings.

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