Biomaterials R & D: A Personal Experience and a Brief Outlook

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Abstract

The development of modern biomaterials started more than 40 years ago. Over the past few decades, we have witnessed extensive efforts in biomaterials R & D. Some of these efforts have paid off and hence patients benefit now from new and high performance biomaterials. However, there is still much room for further explorations into better biomaterials for various applications: tissue repair, tissue regeneration, drug delivery, cancer detection and treatment, etc. There are many strategies in biomaterials R & D for improving the biomaterials currently in use and for designing and developing new biomaterials. In this seminar, some of our work in the following selected areas will be presented:

- Metallic implants provide the strength and toughness which are required in load-bearing parts of the body. However, there are concerns over ion release and corrosion products from implantable metals. Research has been conducted on forming coatings on metals using various techniques. Some coatings can produce bioactivity for metal implants, thus promoting bone formation *in vivo*, and at the same time limit cytotoxic ion release.
- Using natural tissues as templates, novel, "designer" biomaterials can be developed. Many non-porous bioactive ceramic-polymer composites have already been investigated for bone substitution. Particulate bioceramics (e.g., hydroxyapatite) can be incorporated into biocompatible (and biodegradable) polymers. By choosing constituent materials for composites and controlling processing parameters, the biological and mechanical performance of bioactive composites can be tailored to meet various clinical requirements.
- Tissue engineering holds the promise to solve problems of tissue loss and organ failure. One key issue in scaffold-based tissue engineering is the development of scaffolds for seeding cells and for tissue growth. There are a number of polymers for tissue engineering scaffolds and various techniques have been used to produce scaffolds. One strategy is to use industrial processes to produce good-quality bioactive nanocomposite scaffolds. These scaffolds with suitable surface modifications exhibit enhanced biological performance.

On the basis of our own biomaterials research and in the context of worldwide biomaterials R & D, an outlook will be given in areas in which we have been conducting our research work.

About the Speaker

Min Wang was awarded *BSc* and *PhD* (both in Materials Science and Engineering) by Shanghai Jiao Tong University and the University of London, respectively. Currently, Dr.Wang is a professor at The University of Hong Kong and a guest/adjunct professor of several universities in mainland China. He is a Chartered Scientist (*CSci*) and Chartered Engineer (*CEng*), UK, and a fellow (*FIMMM*, since 2001) of the Institute of Materials, Minerals & Mining, UK, a fellow (*FIMechE*, since 2007) of the Institution of Mechanical Engineers, UK, a fellow (*FHKIE*, since 2010) of the Hong Kong Institution of Engineers, a Fellow of Biomaterials Science and Engineering (*FBSE*, from 2011) of the International Union of Societies for Biomaterials Science and Engineering, and a fellow (*AIMBE Fellow*, from 2012) of the American Institute for Medical and Biological Engineering. Dr. Wang's research interests include biomedical materials, tissue engineering, controlled release, and bionanotechnology, and he has published a large number of research papers and many book chapters. He has given many presentations, including more than 80 invited talks, for his research work at international conferences. He has also given more than 80 research seminars in universities, research institutes and hospitals in Europe, USA, Asia and Australia. Dr.Wang is a member of three Technical Committees of the International Organization for Standardization (ISO) and has served in various professional societies. He has been Chairman and Organizer of symposia in three World Biomaterials Congresses (Sydney, Australia, 2004; Amsterdam, the Netherlands, 2008; and Chengdu, China, 2012).