

## Guest Editorial: Composites in medicine (Special Issue for the Symposium on Composites in Medicine at ACCM-5)

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The 5th Asian–Australian Conference on Composite Materials (ACCM-5) was held in Hong Kong on November 27–30, 2006. In parallel with the European Conference on Composite Materials (ECCM) series, ACCM series of conferences draw biennially researchers from major countries/territories in Asia and Australia and have been providing a forum for presenting most recent achievements and advances in composite science and technology, and for discussing and identifying key and emerging issues for future pursuits. Leading experts in the composites field from Europe and North America are invited to give plenary or keynote talks in ACCM conferences and research groups in as well as outside Asia and Australia come to participate in the conferences. Like ECCM conferences, it has been a tradition to organise thematic symposia in ACCM conferences. But it was at the ACCM-5 that a thematic symposium on composites for medical applications was firstly held in ACCM conferences. Professor Jang-Kyo Kim, the ACCM-5 Conference Chairman, invited me to organise a biomedical composites symposium in the conference and I was fortunate to have the support of friends who served in the International Scientific Committee (ISC) of our symposium. These ISC members were Serena M. Best of the University of Cambridge, UK; Chong-Pyoung Chung of Seoul National University, Korea; Paul Ducheyne of the University of Pennsylvania, USA; Michael K.A. Khor of Nanyang Technological University, Singapore; Shi-Pu Li of Wuhan University of Technology, China; Feng-Huei Lin of National Taiwan University,

Taiwan; Bruce K. Milthorpe of University of New South Wales, Australia; and Akiyoshi Osaka of Okayama University, Japan.

Beginning with the pioneering work by Bonfield et al. in the early 1980s of using hydroxyapatite as the bioactive and reinforcing phase in high density polyethylene to produce a bone analogue for human hard tissue substitution, a variety of bioactive composites consisting of bioceramics and biomedical polymers have been produced and investigated for human tissue repair by various groups around the world. Biological materials in human bodies are natural composites, which have served as templates for the development of tissue-substituting materials. Bioactive composites have advantages over conventional tissue replacement materials such as metals, polymers and ceramics in that their mechanical and biological properties can be tailored to meet specific clinical requirements. Producing bone analogues using polymers as matrices has been extended to producing bioactive composites for tissue replacement or regeneration using metallic or ceramic matrices. The utilisation of bioactivity of bioceramic particles in composites has also led to investigations into producing new materials such as bioactive bone cements and bioactive dental materials. More recently, bioactive ceramic particles have been incorporated into biodegradable polymers to form scaffolds for potential tissue engineering applications. In separate developments over the past few decades, structural bioinert composite materials such as carbon fibre reinforced polyetheretherketone and zirconia/alumina composite have also been investigated for orthopaedic or dental applications. These materials are developed primarily to meet the mechanical requirements for the tissues to be substituted. Undoubtedly, the international biomaterials community has embraced biomedical composites and more and more researchers are

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adopting the composite approach in developing new biomaterials.

The R & D of biomedical composites involves the application of engineering principles to solve clinical problems. This is an interdisciplinary endeavour requiring the participation of researchers from materials science and engineering, mechanical engineering, chemical engineering, biology, physiology, and clinical sciences. The Symposium on Composites in Medicine at ACCM-5 has provided an international forum for researchers from Australia, Canada, mainland China, Germany, Hong Kong, Korea, Japan, Singapore, UK, etc. to present their most recent results and to interact with each other. The papers presented in the symposium covered the manufacture, characterisation, evaluation (non-biological and biological), and clinical assessment of various biomedical composites which can be potentially used in orthopaedics, dentistry, etc. Altogether, there were five sessions of oral presentations in the symposium with a significant number of poster presentations.

After ACCM-5, on the basis of the quality of their work and also their presentation and discussions made at the Symposium on Composites in Medicine, potential contributors to the Special Issue of *Journal of Materials Science: Materials in Medicine* were invited to write full-length papers for the Special Issue. These authors were encouraged to write about their recent work on biomedical composites which is different from the work which they had published in the ACCM-5 conference proceedings [*Advances in Composite Materials and Structures* (ISBN

0-87849-427-8), Edited by J.K. Kim, D.Z. Wo, L.M. Zhou, H.T. Huang, K.T. Lau and M. Wang, Trans Tech Publications, Switzerland, 2007]. All corresponding authors adhered to the deadlines that we set for the Special Issue and all submissions went through Journal's normal peer-review process. As the Guest Editor of *Journal of Materials Science: Materials in Medicine* for this Special Issue, I would like to thank all authors to prepare and revise, whenever required, the manuscripts for our consideration of inclusion in the Special Issue. I want to express my sincere gratitude to all reviewers of submissions for the Special Issue. These reviewers are busy people but they assisted us greatly by submitting their review reports in a timely fashion. I thank deeply Professor William Bonfield, the Editor-in-Chief of the Journal in 2005, for immediately agreeing to publish a Special Issue of the Journal for our symposium when I contacted him. I am very grateful to Dr. Serena Best for her friendship, unswerving support and timely advice on publishing the Special Issue. I would like to thank the Editorial Office of the Journal at the Department of Materials Science and Metallurgy, University of Cambridge, UK, especially Mrs. Christine Carey, and also staff of the Journal based in the US for their help and advice without which we would not be able to publish this Special Issue within the timeframe that we originally set.

The next ACCM conference (ACCM-6) will take place in September 2008, at Kumamoto City, Kyushu, Japan. I hope that ACCM-6 will host another successful symposium on biomedical composites for the Asian–Australian composites R & D community.