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BIORESORBABLE METALS – A PANACEA FOR REGENERATIVE MEDICINE

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Abstract

Tissue engineering and nanotechnology are synonymous in transforming the biomaterials field. New bioresorbable materials have emerged with unprecedented beneficial outcomes for a variety of tissue engineering applications. Ideal bioresorbable 'smart' scaffolds and implants enabling soft and hard tissue regeneration still remain elusive. In particular, critical sized segmental bone and tracheal defect healing, reconstruction and regeneration still presents major challenges. Bioresorbable metals are a new exemplar in biodegradable systems. This presentation will discuss the efforts to engender bioresorbable metallic scaffolds and strategies to generate devices with tailored multifunctional load bearing and ultra-high ductility (UHD) attributes demonstrating the potential for achieving mineralized tissue regeneration and tracheal healing, reconstruction as well as restoration. Results of the in-vitro and in-vivo assessment in relevant animal models will be presented and discussed highlighting the efficacy of these systems offering a palette of revolutionary clinically relevant treatment options for myriad debilitating traumatic bone and tracheal related injuries and ailments.

Speaker

Professor Kumta obtained his Bachelor of Technology in Metallurgical Engineering from the Indian Institute of Technology, Bombay, India in 1984 followed by M.S. and Ph.D. degrees in Materials Science and Engineering from the University of Arizona in 1987 and 1990, respectively. He joined Carnegie Mellon University as an Assistant Professor in 1990 and rose to Full Professor with tenure in 1999 serving on the faculty of the Department of Materials Science and Engineering and the Department of Biomedical Engineering. At CMU, he initiated the very first hard and soft materials synthesis, processing, fabrication, structure and property characterization research programs targeting electronic packaging, electronic materials, electrocatalysis, energy storage and conversion. In 1998, he spearheaded the tissue engineering initiative leading to the creation of the Bone Tissue Engineering Center (BTEC) in 2003 and the Department of Biomedical Engineering in 2004. He joined University of Pittsburgh in 2007 and is currently the Edward R. Weidlein Chair Professor in the Swanson School of Engineering and the School of Dental Medicine.

His main research interests are in syntheses, structures, and properties of nanostructured materials for electrochemical, electronic, optical, hard and soft tissue engineering, biomineralization, non-viral gene and drug delivery, biosensors, and embryonic stem cell applications. Professor Kumta is the 1993 recipient of the NSF Research Initiation Award (RIA) and a Fellow of the American Ceramic Society (ACerS) and the American Institute of Medical and Biological Engineers (AIMBE). He has edited/co-edited 10 books, given more than 167 invited presentations, 535 conference presentations, and is the author and co-author of more than 321 refereed publications. He is credited with generating ~$51.6M in research funding from federal, state, city, national research laboratories, and industrial sponsors. He is the former Editor-in-Chief of Materials Science and Engineering, B, Advanced Functional Solid-State Materials, an international journal by Elsevier, and a position he held from 1999-2017.

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