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New technology for toughened and reinforced PLLA with phosphorous glass to form nanocomposites for bioresorbable vascular scaffold applications

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Bare Metal Stents (BMS) and Drug Eluting Stents (DES) are the established technologies in cardiovascular therapy. There are, however, clinical complications associated with these technologies, such as, early stage restenosis, very late thrombosis and risk associated with revision surgery. In light of these challenges research focus has turned to the development of bioresorbable vascular scaffold (BVS) technologies. Abbott has developed one PLLA biodegradable polymeric stent that is made from PLLA. One drawback of the PLLA is brittle because its glass transition is about 65^{0}C. To overcome the problem, we firstly toughened PLLA then reinforce the materials by employing resorbable bioglass. Through a systematic study involving 14 organisations, we have successfully developed a family of toughened and reinforced polyesters with controlled degradation rate. This presentation will report the development of a reinforced resorbable therapeutic cardiovascular stent application to address the known limitations of cardiovascular technologies. We aim to deliver a bioresorbable stent with intrinsic toughness for handling and deployment via balloon angioplasty, radial strength, controlled drug-release technology to suppress restenosis and surface functionalisation to promote endothelialisation to reduce risk of thrombosis. We present the novel synthetic polymer-glass composites developed as candidate stent-core materials and describe both their preparation and the characterisation of their mechanical behaviour, *in vitro* degradation and cytocompatibility.

Biography

X Zhang, Royal Society Industry Fellow of University of Cambridge, has over 33 years combined academia (17 years) and industrial (16 years) experience in advanced materials science and technology, an expert in polymer and polymeric hybrid materials science and technology. He is also Head of the Lucideon Cambridge School of Advanced Materials and Head of Medical Materials and Devices. He is the author of three books *"Inorganic Biomaterials", "Inorganic Controlled Release Technology"* and *"Science and Principles of Biodegradable and Bioresorbable Medical Polymers - Materials and Properties"* (to be published by Elsevier). He undertook his PhD and postdoctoral research at Cranfield University, where he studied materials physics and micro-mechanics and micro-fracture mechanics of polymeric hybrid (organic and inorganic) materials. His industry experience was gained in leading international healthcare companies, where, as Principal Scientist, his work covered almost all aspects of medical materials and devices from R&D and manufacturing support to failure analysis and QC. Prior to joining Lucideon, he worked as Director of a technology company, in the field of nano-conductive materials and diagnostic medical devices.

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