# Novel Highly Bioactive 3D Printed Ceramic Scaffolds for Bone Regeneration

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**Abstract**

An ongoing challenge in bone tissue engineering is to create porous constructs (scaffolds) with large and interconnected pores necessary for vascularisation and bone formation while supporting the static and cyclic loads present in vivo. A wide variety of 3D scaffolds of different structures and material properties has been reported in the literature for bone regeneration; however, these have struggled to meet the requirements for adequate pore geometry and bioactivity combined with the mechanical strength necessary for bone regeneration under load. Bone is able to achieve these properties via its unique anisotropic structure and truss architecture. We used a three dimensional (3D) printing technology to fabricate glass-ceramic scaffolds with distinct pore geometries. We have taken a step towards meeting the combined requirements for bone regeneration under load through our development of the Sr-HT-Gahnite ceramic, which is bioactive. We recently optimised our 3D printing technology to fabricate ceramic scaffolds with different internal geometries, which simultaneously display the properties of high mechanical strength and bone-like architecture. This presentation will discuss our three dimensional (3D) printed ceramic scaffold and their efficacy in treating large bone defects under load. Our technologies open avenues for skeletal and soft tissue regeneration in various clinical applications.

**Biography**

Hala Zreiqat is a Professor of Biomedical Engineering at the University of Sydney; a National Health and Medical Research Council Senior Research Fellow; Co-Director of the Shanghai-Sydney Joint Bioengineering and Regenerative Medicine Lab at Shanghai JiaoTong; Honorary Professor Shanghai Jiao Tong University and Adjunct Professor Drexel University. Her research is on the development of novel engineered materials and 3D-printed platforms that mimic tissue structures, particularly in orthopaedic, dental, and maxillofacial applications. Her pioneering development of innovative biomaterials for tissue regeneration has led to one awarded (US) and 8 provisional patents, and several collaborations with inter/national industry partners. She has received several awards, including the Order of Australia; the 2018 New South Wales Premier's Woman of the Year; The King Abdullah II Order of Distinction of the Second Class - the highest civilian honour bestowed by the King of Jordan (2018); Eureka Prize winner for Innovative Use of Technology (2019); Fellow of the Australian Academy of Health and Medical Sciences (2019); Fellow of International Orthopaedic Research (FIOR); and University of Sydney Payne-Scott Professorial Distinction (2019).