

Project: 4D imaging of Additive Manufacturing of Bioglass by Lithographic Printing

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Abstract: Bioactive glasses are used clinically for bone regeneration, but they are only commercially available as a powder or putty. Large porous scaffolds are needed. Currently porous glasses can be made via direct ink write printing, but their architectures are limited to 3D grid-like structures.

Complex architectures of porous ceramics can be produced by lithographic 3D printing machines developed by Lithoz GmbH, which use a photocurable resin. 3D design files direct the curing beam and sintering is used to burn out the resin and fuse the powders. We have carried out pilot studies with Lithoz to print Bioglass. Commercial bioglasses crystallise on sintering, losing their bioactive properties. This collaboration will design an optimal combination of new bioactive glass compositions that sinter without crystallisation and investigations of the effect on the process variables (glass composition, particle size, glass loading and lithographic binder type) on the sintering efficient, mechanical properties and biodegradation. Architectures tested will be gyroid structures for porous scaffolds with interconnected pores of 300 microns, and bone screw designs.