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Additive manufacturing of biocompatible ceramics

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ABSTRACT

Considering that the ageing of the population is not going to stop, the need for biocompatible materials is continuously increasing, especially in the field of bone substitutes as well as in the fabrication of surgery tools. The Optoform process is an additive manufacturing technology able to shape most of the common biocompatible ceramic materials such as hydroxyapatite (HA) and tricalcium phosphate (TCP). Those ceramic materials are largely studied to substitute bone defects or as voids fillers while stronger bioinert materials like alumina and zirconia can find applications in surgery tools or in dentistry. The Optoform process allows building a component, layer by layer, from CAD data, leading to significant advantages: 1) the manufacturing of elements with a complex geometry and with a controlled porosity that would be impossible to demold or to machine; and 2) short delays of production for customized part with the desired characteristics and design. The quality control of these parts is essential for medical use and is certified by the control of each step of the manufacturing process: synthesis of biocompatible ceramic powders, preparation of photo-curable resin based paste, shaping of the part by Optoform and subsequent thermal treatment for debinding and sintering.

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