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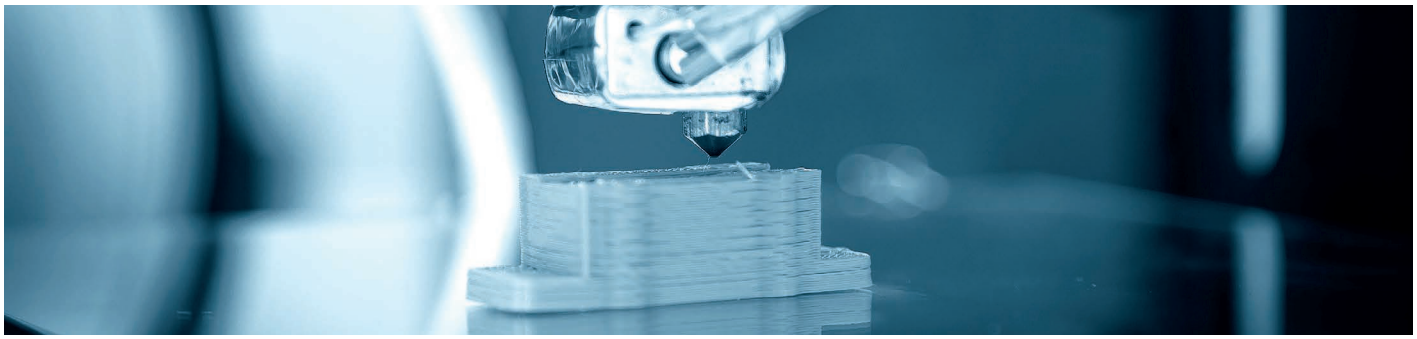

Ink for 3D printing

uic.es/patents

Goal

The group is looking for a license agreement and collaboration partners.

Patent

International patent application.
Priority date: 3-10-2022

Reference

EP22382919

Contact

gmasbaga@uic.es

Introduction

Silica 3D printable materials are an interesting option in bone tissue engineering as they allow for the development of custom-made scaffolds with high bioactivity and osteogenic properties. However, all pure silica scaffolds currently require the use of a sintering step, which reduces the specific surface and porosity of the scaffolds while also limiting their biological activity and drug encapsulation. Therefore, we have proposed a method to obtain pure silica-based scaffolds using a mild temperature as a trigger to start the reaction. This is carried out in a way that the reaction can be controlled and slowed down by lowering the temperature after the gel step; achieving a long printing window and the ability to store the prepared ink for a long period, maintaining the mesoporosity, bioactivity and biocompatibility of silica-based materials.

Description

We developed a pure silica 3D printable material using mild temperatures (50–70 °C) through the sol-gel reaction of tetraethyl orthosilicate (TEOS). The pure silica ink had a printing window of several hours and could be stored without a substantial loss of printability. Moreover, the inks showed a high shape fidelity and a proportionate contraction without losing the printed shape. The scaffolds also maintained high bioactivity and biocompatibility, proving that the sol-gel reaction and printing parameters did not negatively affect those properties. Therefore, pure silica materials could be printed in 3D, showing potential for their use in bone regeneration.

Advantatges

- Sol-gel pure silica materials could be 3D printed to obtain scaffolds.
- The nature of the reaction and the discovered parameters allow a long printing window, of up to 36 h.
- The sol-gel pure silica ink can be stored at –20 °C for a month without losing printability, and has a long printing window.
- The sol-gel pure silica 3D printed scaffolds maintained the bioactivity and biocompatibility seen in other silica-based materials.

Current stage of development

Technical validation was completely in-vitro and long shelf-life was confirmed. Up-scaling is on-going.