Jungbin Lee, Mater Sci Nanotechnol 2017, 1:2

3D printing technique using photo-curable ceramic suspension for porous bio-ceramic scaffolds

Jungbin Lee
Korea university, South Korea

In this study, CaP (calcium phosphate) comprising of hydroxyapatite (HA) and β-tricalcium phosphate (β-TCP) was mixed with HDDA (1,6-Hexanediol diacrylate) which is a photo-curable monomer. The suspension contains a high content of ceramic (50 vol% or more) and to have flowability applicable to 3D printing, Decalin (Decahydronaphthalene, diluent) was added. In the case of diluent, as the content increases, the shrinkage decreases and the shape reproducibility increases, but the specific percent of the monomer in ceramic suspension is reduced, the strength of green body is lowered, so the composition was optimized for the green body to have sufficient strength. The ceramic/monomer suspension has a suitable viscosity for 3D printing (Tape-casting principle). The content of photo initiator (P.P.O.) and exposure time were evaluated using photo-DSC, finally, the photo curing behavior was optimized. Porous ceramic scaffolds produced by suspension with ceramic content of 45 vol% and 50 vol% were sintered at 1250^{0}C and evaluated. As a result of observing the microstructure using scanning electron microscope, the sintered body was maintained well without deformation or defects, as the content of ceramic increased, the micro pores was decreased, and it was densified. The result of three point bending test, all group (45 vol% & 50 vol%) had the same porosity (55±0.13 vol%), as the content of ceramic increased, it had high mechanical strength. We produced porous calcium phosphate scaffolds using the uniformly-mixed suspension with high content of ceramic and the problem of precipitation of ceramic particles in the suspension was solved by tape-casting technique. It is expected to be used not only for ceramic scaffold with high quality, but also for various fields (structure, environment and energy) using ceramic materials.

Biography

Jungbin Lee is a PhD candidate in the Department of Bio-convergence engineering from Korea University, South Korea. He is interested in biomedical 3D printing techniques and biomaterials for tissue regeneration.

jungbin15@nate.com

Notes: