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Scientific Tracks & Abstracts

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Method for manufacture photocurable hydroxyapatite slurry that can be applied into stereolithography and physical evaluation according to scaffolds structure

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In this study, hydroxyapatite (HA) slurry was prepared and optimized to construct an auxetic three-dimensional (3D) scaffold for bone tissue reconstruction. The HA suspensions were divided into five groups according to their HA content. The HA 35 vol% slurry was selected with optimal flowability through rheological evaluation. This study demonstrated the applicability of an optimized HA suspension using commercially available stereolithography (SLA). Disc samples made with HA 35 vol% slurry exhibited the highest flexural strength and relative density.

Final sintered HA discs showed no cytotoxicity through cell adhesion evaluation. In addition, three supports (auxetic, circle, frame) were prepared using the optimized HA slurry. The prepared auxetic scaffold showed a 245% improvement in breaking strength compared to the circle scaffold and showed a significant difference from other types of scaffolds in osteocytes proliferation and differentiation experiments. The HA slurries proposed here are generally applicable to commercialized SLAs. This study will be helpful for future research on scaffolds including various biomaterials and designs manufactured using additive manufacturing techniques.

Biography

Jin-Ho Kang has completed B.S and M.S from the department of biomedical engineering, Inje University, Republic of Korea. He has completed his PhD at the age of 31 years from the department of prosthodontics, School of Dentistry, Chonnam National University, Republic Korea. He is a post-doctoral student of Chonnam National University, Republic Korea. Jinho Kang has researched ceramic 3D printing for many years and is focusing on medical device manufacturing research through a biomedical engineering approach.

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New nanotechnologies for Energy saving and Resiliency of the Built Environment

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The focus of this paper deals with innovative material and construction systems that incorporate nanotechnologies for improving their energy-saving performance. Recent developments in the world of phase change materials, specifically on organic PCMs, such as paraffin and bio-PCM aerogel, are presented; laboratory works are presented together with pilot projects in Toronto, where PCM-based systems have been incorporated in high-performing buildings. Then, the paper shows recent advancements in super-insulating materials, specifically focusing on aerogel-enhanced blankets and panels, which have been developed at the BeTOP laboratory of the Ryerson University in Toronto, Ontario. Finally, the paper explores the potentialities of including innovative thermochromic coatings at the urban scale and shows the mutual benefits between buildings and communities that could be obtained through the adoption of previously mentioned nanotechnologies. The goal is to describe a pathway towards more sustainable and resilient communities. Using Toronto as a test case, the paper aims to comprehensively show that nanotechnologies offer a paradigm shift at the different scales of the built environment.

Biography

Umberto Berardi is a Professor and the Director of the BeTOP lab and group at Ryerson University in Toronto (Ontario, Canada), and has been Nominated as a Canada Research Chair in Building Science for the period 2020-2025. His main research interests are related to the study of innovative solutions and new materials for improving the performance within the built environment. In the first years of his career, Berardi often worked on natural materials for acoustic applications and on sustainable design through natural materials. Recently, he has been focusing on integrating nanotechnologies into building systems. He has mainly focused on organic PCMs, such as paraffin and bio-PCM, and on granular and monolithic aerogel.

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