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Mineralized biomimetic collagen/alginate/silica composite scaffolds for tissue engineering

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The natural biopolymers, collagen and alginate, have been widely used in various tissue regeneration procedures. However, their low mechanical and osteo inductive properties represent major limitations of their usage as bone tissue regenerative scaffolds. To overcome these deficiencies, biomimetic composite scaffolds were prepared using a mixture of collagen and alginate as a matrix material, and various silica weight fractions as a coating agent. The composite scaffolds were highly porous and consisted of interconnected pores, with a mesh-like structure. After incubation in simulated body fluid, various levels of bone-like hydroxyapatite (HA) on the surface of the composite scaffolds developed in proportion to the increase in silica content coating the scaffolds, indicating that the composite scaffolds have osteo-inductive properties. The composite scaffolds were characterized in terms of various physical properties and biological activities using pre-osteoblasts (MC3T3-E1). The mechanical improvement of a composite scaffold in compressive mode was ~2.4-fold in the dry state compared to the collagen/alginate scaffold. Cell proliferation on the composite scaffold was significantly improved by ~1.3-fold compared to the mineralized collagen/alginate scaffold (control). These results suggest that mineralized biomimetic composite scaffolds have potential for use in tissue regeneration.

Biography

GeunHyung Kim from April 2008–present is an Associate Professor at the Dept. of Biomechatronic Engineering, SKKU, South Korea. From Feb. 2005 – March 2008, he was the Senior Researcher at Korea Institute of Machinery and Materials (KIMM), South Korea. From Mar. 2004 – Feb. 2005, he was a Senior Researcher at Samsung Electronics Inc., South Korea. In Dec. 2003, he did his PhD in Mechanical Engineering from University of Wisconsin-Madison, USA.

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