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Fabrication and Characterization of Porous Hydroxyapatite Scaffold for Tissue Engineering by Microwave Sintering Process

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Porous hydroxyapatite scaffold (PHS) was fabricated by replica method, where polyurethane foam has filaments coated with a HAp suspension. A subsequent thermal treatment removed the organic materials, remaining the HAp ceramic in the substratum. And then, microwave processing of the PHS was investigated in a dual frequency microwave sintering furnace. Through the optimization of sintering conditions, such as the sintering temperature and holding time, the microstructure and material properties of the PHS were investigated such as pore sizes, grain size, relative density, compressive strength and elastic modulus. The obtained results were compared to those of the conventional sintering process and also revealed that microwave processing was a promising method to fabricate PHS for tissue engineering application.

Keywords: HAp, scaffold, microwave sintering, material properties

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Synthesis of Cholesterol biosensors using COx-immobilized ZnO nanoparticles

김기은, 이명기, 곽우철, 노경민, 김민석, 김강일, 유민규, 성윤모†

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Biosensors using enzyme are becoming increasingly important due to their applications in biological and chemical analyses, clinical detection, and environmental monitoring. Especially, nanomaterials have the unique advantages in immobilizing enzyme and being able to retan their bioactivity. We chose ZnO as the material for biosensors not only because it has great advantages such as having large gap (3.37eV), good biocompatibility and high fluorescence intensity but also because it is easy to synthesize water-soluble NPs compound with other fluorescent materials. So we made the biosensor for the cholesterol detection using ZnO nanoparticles fabricated by using polyol method. In order to bioconjugate, we modified the surface of ZnO by using mercapto acetylacetonate and then immobilized cholesterol oxidase on the carboxyl-terminated ZnO. We detected uniform size distribution and spherical morphology by using HRTEM after stained by 1% silver nitrate. FT-IR and AFM were used to know the successfully modified surface and high immobilization efficiency. Photoluminescence spectroscopic data revealed that the PL intensity of these bioconjugates was remarkably increased in the presence of cholesterol compared with absence of nanoparticles. When cholesterol molecules were oxidized, hydrogen peroxide was produced and then this peroxide decomposed into water and electrons were provided in this process. Produced electron cause the increase of the PL intensity of QDs. Through this mechanism we could sense cholesterol and measure enzyme activity

In the result, we made the cholesterol sensor with high sensitivity, activity and stability.

Keywords: ZnO, nanoparticle, cholesterol, biosensor, COx