PREPARATION AND CHARACTERISATION OF POROUS HYDROXYAPATITE FROM BOVINE BONE USED AS BONE SUBSTITUTE MATERIALS

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Abstract

Porous hydroxyapatite has been commonly used as bone substitute materials. It can be made by removing an organic phase of bovine cancellous bone, while preserving the trabecular structure and bone mineral. In this study, the organic phase was removed by two methods. First method, treated with 5% NaOCl solution for 48 hrs. Second method, fired at 1200 °C for 2 hrs. The morphology, crystalline phase and chemical composition of two different treated bone specimens were analysed by using scanning electron microscopy (SEM), x-ray diffraction (XRD), Fourier transform infrared spectroscopy (FTIR), respectively. The porous hydroxyapatite derived from chemical treatment method showed the morphology, crystalline phase and chemical composition close to the natural untreated bovine cancellous bone which are critical determinants of the biologic response.

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DISSOLUTION/PRECIPITATION BEHAVIOR OF HYDROXYAPATITES PREPARED FROM
CATTLE BONE ASH

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Abstract

The dissolution-precipitation behaviors of hydroxyapatites (HA) derived from calcined cattle bone with and without chemical treatments (MP and TP respectively) were studies under human physiological condition. Both specimens were incubated in simulated body fluid (SBT) at 37 °C with a sample surface area to solution volume ratio of 0.1 cm.\(^{-1}\). 5% CO\(_2\) was used to adjust pH of this solution to 7.40 ± 0.05. The characteristics of MP and TP specimens were examined before and after incubation in SBF. The phase present and functional group of both specimens did not change after incubation for 90 days, but the Ca : P ratio and bulk density decreased, hence the porosity increased. Furthermore, the newly formed precipitates appeared on the surface of both specimens after incubation for 30 days and covered all over the surface in 90 days. From the chemical analysis, it was found that these newly formed precipitates were calcium phosphate compound containing carbonate group in phosphate site structure, the phase of this compound was similar to natural cattle bone.

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KORAT SPECIAL CLAY

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Abstract

In searching for clay used in ceramic industry, the clay has to be characterized and heat-treated. The evaluated results will indicate its application. In this study, Korat clay depositing at Suranaree University of Technology (SUT) was collected and divided into three groups; i.e. white clay, reddish brown clay, and the mixture of the two types. All of them were washed through 150 mesh sieve and dried prior to characterization. To study the behavior under heat-treatment, only the mixed clay was fabricated into test bars and fired at 600-1,200°C. From our study, these clays changed their colors to brown after firing at 1,200°C due to iron oxide content (2.63% for the white and 5.98% for the reddish brown clay). The glassy phase was found after heat-treatment at 1,100°C. The highest fired density of the mixed clays was 2.12 g/cm³. Its compressive strength and bending strength were 173 ± 2.0 MPa and 59 ± 1.8 MPa respectively. When the temperature was increased to 1,200°C, the density decreased to 1.18 ± 0.04 g/cm³ and the strength decreased to 44 ± 2.2 MPa and 15 ± 1.1 MPa for the compressive and bending tests. The clay linearly expanded 53% corresponding to 40% porosity at 1,200°C. The product exhibiting these characteristics after high temperature heat-treatment is very promising for light weight aggregate production to be used in light weight concrete, light weight brick or as filter aids.

CALCIUM PHOSPHATE GLASS-COATED HYDROXYAPATITE

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Abstract

Calcium phosphate glass-coated hydroxyapatite (HA) has been developed as bone replacement. The coating glass serves two purposes: to accelerate the bonding between the implant and the bone tissue and to enhance the strength of hydroxyapatite.

In this study, a silica-free phosphate glass with suitable characteristics was coated on HA ceramic by dipping the specimens in the molten phosphate glass at the temperature of 1000-1100°C and cooled in the furnace. After coating, SEM observation confirmed a good adherence between the glass and the HA substrate. No surface crack was observed and the mechanical strength has also been improved.

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