Nanocomposites and nanomaterials

Preparation and evaluation of porous granules of composite material based agglomerated biogenic hydroxyapatite

O.R.Parkhomey, N.D.Pinchuk

Frantsevich Institute for Problems of Materials Science of NAS of Ukraine.
Krzhyzhanovsky Str., 3, Kiev-03142, Ukraine.Ukraine.
E-mail: npinchuk@ukr.net

The problem of bone defects replacement which were obtained as a result of the musculoskeletal system injuries or diseases is an actual problem in modern medical materials science. Bioactive materials used to solve the problem must have following properties: they must be biocompatible, bioresorbable, osteoconductive, osteoinductive, structurally similar to natural bone and easy to use. Different calcium phosphate materials have such properties and can be used for such applications [1]. Biogenic hydroxyapatite is one of such materials that has bioactive properties, and it also preserves the nanostructure of the natural bone tissue's mineral component.

The aim of this work is preparation of porous granules of bioactive glass-ceramic composite based on agglomerated biogenic hydroxyapatite for use in medical materials science. As a starting material we used biogenic hydroxyapatite micro-granules with a particle size in the range of 160-1000 μm. Glass was added in an amount of 15-30 % wt. to strengthen the hydroxyapatite particles. All components of the initial charge were mixed and sintered at the temperature of 800 °C, then the resulting sintered material was crushed to granules of the required size.

By varying the initial composition of the charge, as well as other hydroxyapatite process parameters we obtained porous, highly porous and ultraporous composites based on agglomerated biogenic hydroxyapatite reinforced with glass phase. The density and porosity of the resulting materials were studied. *In vitro* studies in physiological saline were performed also. The obtained results confirmed the possibility of using the obtained materials as fillers of bone defects.

1. *Habraken W., Habibovic P., Epple M., Bohner M.* Calcium phosphates in biomedical applications: materials for the future? // Materials Today–2016.-19.-2. – 69-87.