Physico-chemical nanomaterials science

In vitro solubility of bioactive glass-ceramics

O.R. Parkhomey, N.D. Pinchuk, O.E. Sych

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

Bioresorbable materials are promising and widely used for filling bone defects in orthopedy, traumotology and stomatology due to ability to resorb of them by an organism and filling voids with newly-formed bone tissue. The bioresorption rate of material may be different, but controlled according to the material application.

Bioactive glass-ceramic composites based on nanostructured biogenic hydroxyapatite (BHA) or synthetic calcium phosphates mixture (SCPM) with addition of sodium borosilicate glass (31.5 wt. %) were prepared at 800 ºC [1]. It was established that hydroxyapatite keeps the phase composition for BHA-composites. In the case of using SCPM formation of glass ceramics (calcium silicate, sodium calcium silicates, melilite, sodium silicate, sodium borate, hydroxyapatite) took place. The pore size distributions in the structure of both type of glass-ceramic composites showed a significant difference at similar total porosity (32-35%) [1].

The aim of the work was to carry out in vitro study of composites, i.e. determination of their solubility and pH of saline (0.9 % NaCl) at 36.5 °C.

It was established that solubility rate of composites based on SCPM is significant higher (100 times) than those for composites based on BHA due to phase composition and structural peculiarities. Moreover, solubility rate of composites based on BHA increases from 0.06 to 0.07 wt. %/day with increasing of experiment from 2 to 7 days. On the other hand, solubility rate of composites based on SCPM is maximum in the first 2 days (7.54 wt. %/day) and eventually decreases down to 2.56 wt.%/day. The results of measuring pH value of saline after solubility investigation correlate with the results of solubility.

Thus, it was established that prepared composites are bioresorbable and are promising for medical use.

1. *Parkhomey O.R., Pinchuk N.D., Sych O.E., Tomila T.V., Tovstonoh H.B., Gorban' V.F., Yevych Ya.I., Kuda O.A.* Preparation and structural-mechanical properties of bioactive glass ceramics composites // Powder metallurgy. – 2016. – **3/4**. - P. 62-76.