DISSOLUTION-PRECIPITATION SYNTHESIS OF MAGNESIUM WHITLOCKITE FROM AMORPHOUS CALCIUM PHOSPHATE

Gabrielė Eglė Budžytė[1], Rūta Raišelienė[1], Inga Grigoravičiūtė[1], Aivaras Kareiva[1], Aleksej Žarkov[1]

[1]Institute of Chemistry, Vilnius University, Naugarduko 24, LT-03225 Vilnius, Lithuania
gabregle@gmail.com

Calcium phosphates (CPs) represent the most widespread class of ceramic biomaterials used for bone regeneration purposes due to their excellent biological performance and similarity in chemical composition to natural bone. Magnesium whitlockite (Mg-WH, $Ca_{18}Mg_2(HPO_4)_2(PO_4)_{12}$) can be considered as a Mg-substituted CP, which naturally occurs in humans. This compound is known to be the second most abundant biomineral in human body. Despite the presence of high content of Mg-WH in the human body, it is not so widely used in clinics, basically due to the challenges in the preparation of this material. Nevertheless, in recent years, Mg WH attracted significantly more attention as a number of studies reported various synthetic approaches and characterization of Mg-WH. It was demonstrated that Mg-WH possesses some superior properties compared to those of frequently used biomaterials such as calcium hydroxyapatite (HAp, $Ca_{10}(PO_4)_6(OH)_2$) or tricalcium phosphate (TCP, $Ca_3(PO_4)_2$). Remarkable member of the CPs family is amorphous CP (ACP), which is metastable and highly reactive due to its non-crystalline nature. Consequently, ACP can be used as a precursor for the synthesis of other phosphate-based materials. In the present work, we report the synthesis of Mg-WH using ACP as starting material. Phase conversion of ACP to Mg-WH occurs in an aqueous medium in the presence of Mg ions. The influence of synthesis parameters such as temperature, duration and concentration of Mg ions was investigated in detail. The phase crystallinity and purity was analyzed using powder X-ray diffraction and FTIR spectroscopy. The morphological features and chemical composition of the synthesized products were studied by SEM/EDX analysis.