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LARGE AMOUNT SYNTHESIS OF MAGNESIUM WHITLOCKITE NANOPOWDERS FROM AN ENVIRONMENTALLY FRIENDLY INITIAL REACTANT

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Thousands of people annually have health problems related to bone fractures caused by osteoporosis, trauma, cancer, and various diseases, that frequently require surgical treatment for bone regeneration [1]. Calcium phosphate (CaP) compounds are widely studied and used as bone substitutes due to their similar composition to the inorganic part of bone, their biocompatibility, and ease of fabrication [2]. The most popular and investigated substitutes are hydroxyapatite (HA), tricalcium phosphate (TCP), octacalcium phosphate (OCP), and biphasic calcium phosphate (BCP). Magnesium whitlockite (Mg-WH, $\text{Ca}_{18}\text{Mg}_2(\text{HPO}_4)_2(\text{PO}_4)_{12}$) occupies a significant place in the mineral part of human bone, induces osteogenic differentiation, rapid bone formation, and undoubtedly has outstanding substitute properties [3]. Due to the mentioned properties, Mg-WH is relevant in medicine: in bone reconstruction and treatment procedures.

The main idea of our investigation was to synthesize a large amount of Mg-WH nanopowders via a simple, inexpensive, low-temperature dissolution-precipitation (DP) method from an environmentally friendly gypsum ($\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$) powder as a starting material. DP synthesis is appropriate for the fabrication of CaP material as well as Mg-WH compound [4]. The obtained product was investigated by powder X-ray diffraction (XRD) analysis, scanning electron microscopy (SEM), Fourier-transform infrared spectroscopy (FTIR), Brunauer–Emmett–Teller (BET) measurements, and Energy-dispersive X-ray (EDX) analysis.

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