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Use of marble waste to obtain biphasic bioceramics based on calcium and magnesium phosphates

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The ornamental stone industry generates a huge amount of marble waste every year around the world, which requires sustainable disposal. This work aimed to synthesize and characterize a new biphasic calcium-magnesium phosphate bioceramic using marble waste from the ornamental stone industry as an alternative carbonate precursor. The calcium-magnesium phosphate bioceramics were synthesized using a wet chemical precipitation method at different concentrations of HNO3. After the synthesis step, the resulting powders were characterized in terms of X-ray diffraction (XRD), scanning electron microscopy (SEM), thermogravimetric analysis (TGA), Fourier transform infrared spectroscopy (FTIR) and average crystallite size. For the conditions studied, the results showed that the use of marble waste allowed the obtaining of binary mixtures of the type ß-CCP (ß-Ca2P2O7, ß-calcium pyrophosphate)/magnesian whitlockite ((CaMg)3(PO4)2). The new biphasic phosphate powders presented average crystallite size in the range of 42.56 nm to 57.55 nm. Thus, it is possible to use marble waste in an environmentally friendly way to obtain calcium-magnesium phosphate bioceramics for biomedical applications.