

## عنوان مقاله:

Preparation and characterization of Sr-Ti-hardystonite (Sr-Ti-HT) nanocomposite for bone repair application

## محل انتشار:

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## خلاصه مقاله:

Objective(s): Hardystonite (HT) is Zn-modified silicate bioceramics with promising results for bone tissue regeneration. However, HT possesses no obvious apatite formation. Thus, in this study we incorporated Sr and Ti into HT to prepare Sr-Ti-hardystonite (Sr-Ti-HT) nanocomposite and evaluated its in vitro bioactivity with the purpose of developing a more bioactive bone substitute material. Materials and methods: The HT and Sr-Ti-HT were prepared by mechanical milling and subsequent heat treatment. Calcium oxide (CaO), zinc oxide (ZnO) and silicon dioxide (SiO<sub>2</sub>) (all from Merck) were mixed with molar ratio of 2:1:2. The mixture of powders mixture was then milled in a planetary ball mill for 20 h. In the milling run, the ball-to-powder weight ratio was 10:1 and the rotational speed was 200 rpm. After synthesis of HT, 3% nanotitanium dioxide (TiO<sub>2</sub>, Degussa) and 3% strontium carbonate (SrCO<sub>3</sub>, Merck) were added to HT and then the mixture was ball milled and calcined at 1150°C for 6 h. Simultaneous thermal analysis (STA), X-ray diffraction (XRD), Transmission electron microscopy (TEM) and Fourier transform infra-red spectroscopy (FT-IR) performed to characterize the powders. Results: XRD and FT-IR confirmed the crystal phase and silicate structure of HT and TEM images demonstrated the nanostructure of powders. Further, Sr-Ti-HT induced apatite formation and showed a higher human mesenchymal stem cell (hMSCs) adhesion and proliferation compared to HT. Conclusion: Our study revealed that Sr-Ti-HT with a nanostructured crystal structure of 50 nm, can be prepared by mechanical activation to use as biomaterials for orthopedic applications.

## کلمات کلیدی:

Apatite formation, Hardystonite, Mechanical activation, Mesenchymal stem cells, Nanocomposite

## لینک ثابت مقاله در پایگاه سیویلیکا:

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