

Obtention of poly(vinylidene fluoride) and hydroxyapatite biofilaments for biomedical applications

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Poly(vinylidene fluoride) (PVDF) is a polymer that β crystalline phase is polar and presents piezoelectricity, phenomenon that also occurs in natural process of bone regeneration [1, 2]. Hydroxyapatite (HAp) is a calcium phosphate studied in orthopedic biomaterials due to its bioactivity [3]. In the present work, we studied the combination of PVDF-HAp in different concentrations to produce a composite in filament format to be used in 3D printing. The HAp used was obtained from bovine bone ashes and mixed with PVDF in a low energy alumina ball mill, the powders were consolidated at 170 °C for one hour in the form of pellets of about 10 mm. The pellets were melted in an extruder at a temperature of 220 °C and rotation of 18 rpm to obtain filaments of 1.75 mm in diameter. The characterization techniques used were Fourier Transform Infrared Spectroscopy (FTIR), Scanning Electron Microscopy (SEM), Energy Dispersion Spectroscopy (EDS) and in vitro bioactivity assays. The FTIR results showed that the filaments present a β phase greater than 60%, and the extrusion process allowed the uniform consolidation of the filaments, according to SEM images. The bioactivity of the filaments was verified by the growth of a layer of apatite on their surface.

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References:

- [1] BONADIO, T. G. M. et al. Polyvinylidene fluoride/hydroxyapatite/ β -tricalcium phosphate multifunctional biocomposite: Potentialities for bone tissue engineering. **Current Applied Physics**, v. 17, n. 5, p. 767-773, 2017.
- [2] TANDON, B. et al. Fabrication and characterization of stimuli responsive piezoelectric PVDF and hydroxyapatite-filled PVDF fibrous membranes. **Molecules**, v. 24, n. 10, p. 1903, 2019.
- [3] MIYAHARA, R. Y.; GOUVÊA, D.; TOFFOLI, S. M. Obtenção e caracterização de cinza de ossos bovinos visando à fabricação de porcelana de ossos-bone china (Preparation and characterization of bovine bone ash for the fabrication of bone china). **Cerâmica**, v. 53, p. 234-239, 2007.