

# Chemical Engineering: From Materials Engineering to Nanotechnology

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## Properties of P (HB-HV) / nanodiamonds as material for orthopedic use

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This current study aims to develop a biocomposite to be used as an orthopedic device, using poly(3-hydroxybutyrate-co-3-hydroxyvalerate) P(HB-HV), a biodegradable copolymer, with 94%HB and 6%HV, as matrix; and nanodiamonds (ND) with primary grains of 4-6nm, as reinforcement. The nanodiamonds were previously encapsulated by P(HB-HV) and specimens were prepared using an injection molding machine. The biocomposite P(HB-HV) probes were analyzed by XRD, TGA, flexural testing and compression DMA tests. The distribution of nanodiamonds on the specimen fracture surface were investigated by SEM.

The SEM micrographs allowed us to concluded that the encapsulation of nanodiamonds by P(HB-HV) was successfully performed, promoting a better interface and distribution in the polymeric matrix. The presence of ND in the polymeric matrix decreased the P(HB-HV) crystallinity, inhibiting the crystallite growth. The mechanical properties obtained from flexural test and DMA of the injection-molded specimens were promise to material for bone filling. Evaluated by in vitro testing, all formulations were non-cytotoxic.

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