

Nanocomposites and nanomaterials

Biocompatible coating obtained from hydroxyapatite nanoparticle by detonation spraying

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Hydroxyapatite (HAP) is one of the most promising materials for implants coating in orthopedics and dentistry due to its excellent biocompatibility. Carbonate substitution in apatite matrix has particular importance, since the mineral phase of bone, dentin and enamel is mainly composed from HAP containing 4-6% carbonate. Detonation spraying of carbonate-containing hydroxyapatite (HAP) nanoparticles has been used to produce a HAP coating comprising of nanostructured surface. The influence of different condition of coating on characteristics of obtained surfaces was determined using scanning electron microscopy, X-ray powder diffraction, Raman spectroscopy and electron paramagnetic resonance spectroscopy. It was found that the coatings consisted of tetracalcium phosphate (TTOC) and apatite (Ap). The ratio (TTOC/Ap) on the surface depended slightly on the degree of crystallinity of the initial powder and processing parameters of the coating preparation. The apatite phase contained defects localized on the 6-fold axis and consisted of hydroxyapatite and oxyapatite. Technological factors contributing to the transformation of hydroxyapatite powder structure during coating formation by detonation spraying are discussed. The obtained knowledge is crucial for controlling the biological performances implants.