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Comparative structural refinement of nanocrystalline hydroxyapatite

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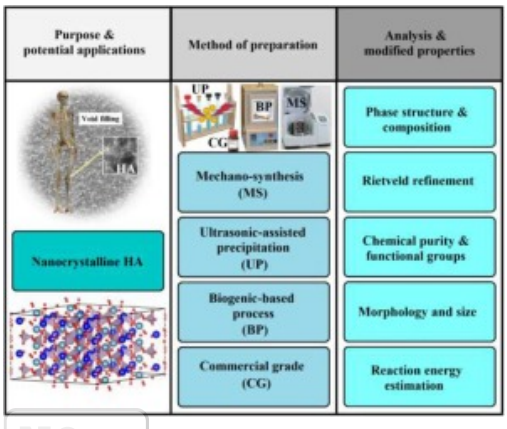
Abstract

An attempt was made to make a comparative structural refinement of nanocrystalline HA between the mechano-synthesis (MS), ultrasonic-assisted precipitation (UP), biogenic-based process (BP), and commercial grade (CG). Rietveld refinement of XRD patterns illustrated the main characteristic peaks of hexagonal HA. The anisotropic crystallite sizes were observed, where the smallest crystallite sizes of $D_{\langle 001 \rangle}$ (24.5±3.1 nm) and $D_{\langle 100 \rangle}$ (17.7±1.1 nm) were recorded in the 7h MS specimen. On the contrary, the highest $D_{\langle 001 \rangle}/D_{\langle 100 \rangle}$ ratio of 7.68 was achieved for the UP HA, showing HA crystals preferentially grew in the *c*-axis direction. The narrow particle size distribution of the 7h MS specimen, with an average diameter of 9±2 nm, was smaller than the crystallite size estimated from the refined XRD pattern, indicating the single-crystal feature. Overall, MS HA holds great promise as an effective medical strategy for treating bone cavities.

Graphical abstract



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