

Hydroxyapatite-bisphosphonate Nanocrystals

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Bone resorption is strongly inhibited by bisphosphonates [1], a family of compounds with physicochemical properties and structure very similar to those of pyrophosphates, which are widely used to treat a variety of diseases with excess bone resorption [2].

Although the mode of action has yet to be fully elucidated, it is known that bisphosphonates bind very strongly to hydroxyapatite (HA), and as a result are taken up by bone [3]. We have investigated the interaction of hydroxyapatite with alendronate, a bisphosphonate used for treatment of various diseases of bone metabolism. Hydroxyapatite nanocrystals with an alendronate content up to about 7% wt have been prepared through direct synthesis in aqueous solution. The results of TEM investigation indicate that alendronate affects the morphology of the hybrid crystals, which exhibit much smaller dimensions than HA crystals. On the other hand, the values of the lattice constants of the apatitic phase, as well as the coherence lengths of the perfect crystalline domains, evaluated by the line broadening of the 002 and 310 reflections, are not significantly affected by alendronate incorporation. These composite materials can be suitable for potential application as a local bisphosphonate delivery system.

[1] Russell R.G.G., Rogers M.J., *Bone*, 1999, **25**, 97–106. [2] Fleisch H., *Bisphosphonates in bone disease, from the laboratory to the patients*, Academic Press, San Francisco, 2000. [3] Lin J.H., *Bone*, 1996, **18**, 75–85.

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