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GREEN SYNTHESIS OF HYDROXYAPATITE NANOPARTICLES FOR BIOMEDICAL APPLICATION: A BRIEF REVIEW

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Hydroxyapatite (HAp) (Ca10(PO4)6(OH)2) is a bioactive ceramic composed primarily by calcium and phosphate. This biomaterial is the main component of the mineral phase of bones and teeth's of animal and humans. HAp has a wide range of applications, such as environmental and biomedical ones, tissue engineering involving bone repair, bone augmentation, coating of implants, and fillers for bones and teeth. Apart from these uses, HAp can function as a drug delivery system due to its porous nature, which gives the nanoparticles a larger surface area. These applications of HAp are linked to some properties, such as non-toxicity, non-anti inflammatory, osteointegrity, high volume surface, biocompatibility, and others. In the last years, some scientific literature has been citing HAp as a biomaterial for bone repair, drug delivery, and bone tissue engineering. As the advances of nanotechnology, the use of hydroxyapatite with nanometric size has enhanced HAp based materials. However, in order to obtain HAp nanoparticles with a specific shape, morphology, size, and textural properties, organic templates have been applied, even that most of them are toxic and expensive. Throughout the last decade, several synthetic procedures have been developed and improved, such as solid-state synthesis, sol-gel, hydrothermal, and mechanosynthesis. The mechanochemical synthesis is a simple procedure. However, in this synthesis, it is required high temperatures as well as it is difficult to obtain nanoparticles dimensions. Furthermore, sol-gel and hydrothermal synthesis are the most used methods to obtain nanoparticles. However, to obtain nanoparticles with a certain morphology, shape, and textural properties, it is required expensive, toxic, organic compounds, such as a surfactant. Recently, special attention has been given to the application of plant extracts as templates and reducing agent in the synthesis of metal oxide nanoparticles. However, the applications of plant extracts as a template for hydroxyapatite nanoparticles synthesis are not extensively described in the literature. Therefore, this brief review of literature aims to discuss the past, present, and future of green synthesis of hydroxyapatite nanoparticles, and its influence in biomedical applications.