

## Biomimetic and antibacterial composite for orthopedic implants

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**Abstract.** *The present paper shows how the development of synthetic nanostructured biomaterials, such as multisubstituted hydroxyapatite (msHAP) with Mg<sup>2+</sup>, Zn<sup>2+</sup> and Sr<sup>2+</sup> ions is important and beneficial at the same time for the normal functioning of the body. Moreover, the paper discusses a broad topic of major importance in orthopedic and dental surgery, namely the incorporation of msHAP into the polymeric matrix of poly lactic acid (PLA). This composite is used in order to cover the surface of the titanium implant in order to obtain bone integration and heal bone fractures. The review also highlights the importance of improving silver nanoparticle (SNPs) coating in order to combat postoperative infections. Through such approaches, medicine has managed to evolve considerably, and the contributions brought by great personalities and young researchers in the field have increased its area of applicability.*

**Keywords:** multi-functional hydroxyapatites, orthopedic (medical) implants, silver nanoparticles

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### 1. Introduction

Materials science is a vast and intensely studied field as evidenced by the advances made in medicine. Composite materials have managed to bring surprising benefits in orthopedic and dental surgery by meeting the most important criteria of biocompatibility and osseointegration. These properties allow doctors to solve problems with implants [1].

Bone is a most complex and well-organized structure. It is a very well developed system, made up of bone components with the role of protection of organs and soft tissues, ensures mechanical resistance and allows the mobility of the whole body [2]. In terms of chemical composition, the major component is the inorganic phase containing the most stable form of calcium phosphate, hydroxyapatite. The organic phase such as collagen, water and other components are also present. Bone hardness is given by hydroxyapatite and the necessary flexibility is provided by collagen fibers. Bone contains essential minerals calcium and phosphorus that ensure bone reshaping when injuries are likely to allow it. In the case of severe bone diseases due to imbalances in the body or