

# Functionalized Biomimetic Nanohydroxyapatite as Ingredient for 3D Bioinks

**José María Alonso<sup>1</sup>**

Virginia Sáez-Martínez,<sup>1</sup> Africa García-Barrientos,<sup>1</sup> Nagore Martínez de Cestafe,<sup>2</sup> Sara Mchichou,<sup>1,3</sup> Raúl Pérez-González.<sup>1</sup>

<sup>1</sup>i+Med S. Coop, Parque Tecnológico de Alava. C/Albert Einstein 15, nave 15, 01510, Vitoria-Gasteiz, Spain.

<sup>2</sup>Unikare Bioscience, Parque Tecnológico de Alava. C/Albert Einstein 15, 01510, Vitoria-Gasteiz, Spain.

<sup>3</sup>Dpto. Química Orgánica I, Centro Joxe Mari Korta. UPV/EHU. Avda. Tolosa 72, 20018, San Sebastián, Spain.

[jalonso@imasmed.com](mailto:jalonso@imasmed.com)

i+Med is cooperative society of scientists established in 2014 and focused on the development and commercialization of biomedicine solutions for the controlled release of drugs, vitamins, growth factors and other active compounds.

i+Med develops own products as well as drug products and medical devices for third parties. The company holds two patents on nanogels with biomedical applications and manufactures medical devices with CE Marking.

The main research lines of the company include controlled release, functional coatings, active nanoparticles and biomaterials. In this regard i+Med produces biomimetic nanohydroxyapatite (nHAp) and functionalized nanohydroxyapatite for biomedical applications [1].

nHAp is a natural mineral produced by the organism. I+Med has applied a synthesis method that mimics the physiologic biosynthesis conditions to get biomimetic nanoparticles avoiding toxic residues. The main property, apart from the nanometric size that helps to get better into the inner layers of the tooth enamel, is their spheroidal shape that increases the biocompatibility (Figure 1).

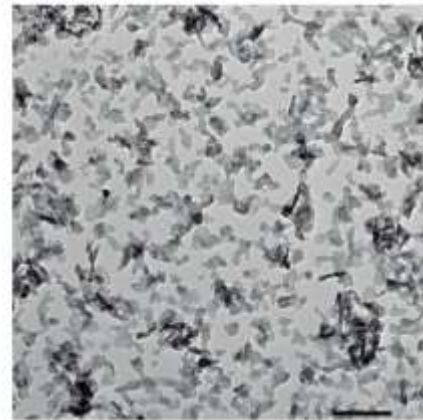
An analogous approach has been employed for the synthesis of metals functionalized nHAp. This kind of nHAp

display applications not only in Odontology but also in Prosthetics and Traumatology. The latter is due to their antibacterial properties which prevents infections in prosthesis implantation and their ability to promote (osteogenesis). Moreover, nHAp has been successfully incorporated by Unikare (i+Med's sister company) to commercially available bioinks for processing by bioprinting technologies. Resulting bioinks are promising candidates as biomaterials additive manufacturing solutions for biomedical products and tissue engineering.

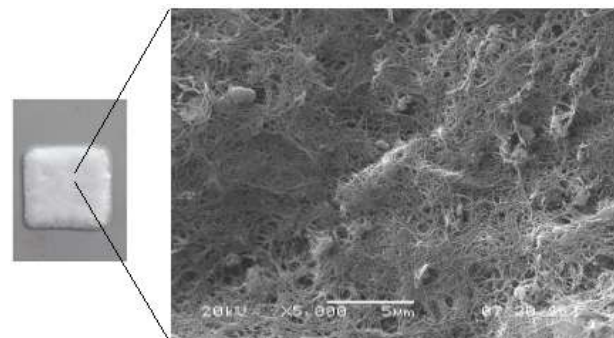
## References

- [1] K. Lin, J. Chang. Hydroxyapatite (HAp) for biomedical applications. Woodhead Publishing, 2015, 3.

## Figures



**Figure 1:** TEM image of synthesized nHAp.



**Figure 2:** Collagen-nHAp Bioink