Title: Biomimetic nano-apatites: crystal structure and chemistry modulated by molecular constraints influencing cell fate and metabolism

PI: Simone Sprio, Anna Tampieri

Research Group: Bioceramics and Bio-hybrid Composites – ISTEC-CNR

Curriculum: Scienze Chimiche

Location: Istituto di Scienza e Tecnologia dei Materiali Ceramici ISTEC-CNR, Faenza

Contact: web: www.istec.cnr.it
          email: simone.sprio@istec.cnr.it

Project description
The project intends to develop new apatitic nanomaterials with physicochemical properties and crystal structure enabling signalling mechanisms regulating the cell chemotaxis and directing the fate and metabolism of stem cells towards specific phenotypic differentiation and activation of physiological behavior leading to regeneration of biological tissues such as bone.

This goal will be met thanks to the adoption of synthesis conditions at low temperature and of bio-relevant molecular constraints able to yield nano-apatites with non-stoichiometric, metastable compositions, and to modulate the crystal structure, with the goal to obtain enhanced biomimesis of biological tissues thus behaving as a “living inorganic crystal” with superior regenerative ability.

The project will also investigate new chemical processes enabling supramolecular self-assembling phenomena at low temperature, to generate devices made of biomimetic nano-apatites retaining nanostructure and physicochemical features yielding enhanced osteoinductivity and inherent antibacterial properties for advanced applications in regenerative medicine.

The Ph.D candidate will gain theoretical and practical skills in inorganic chemistry, nanomaterial synthesis and processing, and in various characterization methods, in terms of physicochemical, structural, mechanical and in vitro biological properties.

Some relevant publications

Collaborations/Network:
• Prof. Maria-Pau Ginebra, Universitat Politècnica de Catalunya, Spain;
• Prof. Christophe Drouet, Institut National Polytechnique de Toulouse, France;
• Prof. Livia Visai, Università degli Studi di Pavia, Italy;
• Prof. Antonella Gervasini, University of Milan, Italy.