PhD in Materials Science and Technology

Research Title: BIOBASED INJECTABLE AND PRINTABLE POLYMERIC HYDROGELS

Funded by	Politecnico di Torino
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Context of the research activity	Hydrogels are three-dimensional hydrophilic polymeric networks absorbing and retaining a large amount of water, which can be used as scaffolds for cell-therapy or for tissue regeneration. For these types of applications, it is mandatory that hydrogels are cytocompatible. Nowadays there are few in-situ forming hydrogels available for long-term encapsulation that are completely biocompatibley. we propose the use of photopolymerizable precursors leading to chemically crosslinked hydrogels. The use of photocrosslinkable hydrogels could be limited by the toxicity of photoinitiators and the short penetration depth of UV-light. For this reason we propose the use of visible light to promote the precursor photocrosslinking, which is able to penetrate to a higher thickness with respect to UV-light, and the use of a new generation of non-aromatic visible light photoinitiators from natural resources. The use of this type of photocurable formulations could also assure the survival of encapsulated cells in the hydrogel precursors and will open the way to the formulation of in-situ forming injectable hydrogels. The next step will be the 3D printing of hydrogel precursors by using of a bio-plotter.
Objectives	The objective of the PhD project is to make a significant contribution in the development of new biobased injectable or 3D-printable hydrogels characterized by ultrafast formation rate, controlled microstructure, biocompatibility and good mechanical properties. The objective is both the design and synthesis of new materials and exploiting advanced technologies.
Skills and competencies for the development of the activity	The candidate should posses deep knowledge in Materials Science and in particular on polymer based materials. A basic knowledge of polymeric hydrogels is also requested. The candidate will work in a laboratory running experiments on the photopolymerization of different formulations for the hydrogel preparation.