Piano di attività e progetto di ricerca

The preparation of self-assembled fibrillary network (SAFiN) hydrogels has recently received a great attention due to the wide applicability of this class of soft materials. The principal constituents of SAFiN gels are low-molecular-weight gelators (LMWG), that are small compounds whose chemical structure can be easily changed producing materials with different properties. Usually, LMWGs have a molecular weight lower than 1000 Da, a specific stereochemistry and can self-assemble thanks to weak interactions, including hydrogen bonds, π-π stacking and Van der Waals force. Hydrogel formation usually takes place through the slow formation of fibers that entrap the solvent and all the species dissolved or suspended in it. According to the molecules and to the experimental conditions, SAFiN may produce also other biocompatible materials having interesting properties, like fibers and adhesive films.

As these materials are very biocompatible, they may be used for several applications. For instance, a good application of these materials is microencapsulation that is a technology aiming to protect sensitive compounds from environmental elements. It is widely used in pharmaceutical and cosmetic industries. Another interesting application is the production of biocompatible adhesive films that may be used for skin care formulations.

The aim of this project is to identify simple and cheap molecules derived from amino acids that are able to aggregate under different conditions to form a wide variety of materials. The materials will be characterized and used for several applications.

The activity of the scholarship holder starts with the synthesis of the compound by chemical reactions in solution or in the solid phase, purification and characterization of the final compound. Then the ability of the new compound to form supramolecular materials (gels, fibers, adhesives, etc.) is tested using several techniques, like microscopy, rheological analysis, analysis of the mechanical properties, X-ray analysis of the supramolecular structure. Finally, the applications in cosmetic formulations will be studied.