Research Doctorate (Ph.D.) in Chemical Sciences
XXXV Ciclo – Academic Year 2019-2020

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Project Information

1. Research project title

Hybrid nanostructured systems: supramolecular organization, chemical-physical properties and applications in nanomedicine.

2. Key words

Inorganic-organic nanoparticles, lipids, nanostructured systems, theranostic, interaction with proteins and membranes.

3. Research project abstract

The project aims to develop and characterize hybrid nanostructured systems formed by inorganic nanoparticles and lipids. The aim of the project is to develop materials with specific chemico-physical properties for applications in diagnostics and medical therapy. The intrinsic chemico-physical properties of inorganic nanoparticles (NP), such as magnetic, fluorescent or oxidizing/prooxidant ones, can be modulated by structuring the individual entities in ordered phases (cubic, hexagonal, etc.). The process is promoted by an appropriate coating of the nanoparticle surface with amphiphilic molecules. The individual NPs and their more complex structures can become multifunctional entities able to perform, selectively, different specificities such as those of imaging agents and/or therapeutic carrier; on the other hand, lipid-based systems are characterized by high versatility and the possibility of selectively responding to external stimuli (temperature, electromagnetic radiation). Considering that these systems will be designed for potential medical applications, a crucial aspect of the research project will also cover the study of their interaction and their effects on components of biological systems, with particular attention to proteins and model membranes.