STRUCTURAL AND FUNCTIONAL STUDY OF THE NANO-BIO INTERFACE IN 2- AND 3-D SYSTEMS

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Keywords: *Self Assembled Monolayer, polymer brushes, biocompatibility, Bionanomedicine*

One of the largest barriers to the progress in Bionanomedicine has been the lack of knowledge on the properties of the interface between nanomaterials and the biological environment. Proteins present in the biological fluids are considered the first element that can disturb both, the surface properties and the functions for which nanoparticles are designed [1]. To prevent this, surfaces are coated with polymers, such as polyethylene glycol (EGn) that is considered to avoid proteins non-specific adsorption. Recently, many applications of surfaces covered by EGn (organized as polymer brushes) have been reported for medical devices used in diagnostic and therapy systems. The "grafting from" polymerization strategy [2] allows for better control over the efficiency, dispersity and functionalization.

The goal of this PhD thesis is to contribute to the knowledge of the "Nano-Bio" interface. We are attempting to solve problems related to the nature of the interactions between biological systems and nanomaterials, considering both structural aspects (such as the nature of the material, the chemistry of the protective layer and its structure) as well as the interactions between the nanomaterial surface and the biological systems (i.e., with the proteins which form the protein corona, and those between the different proteins within the corona). The advances obtained during the development of this work are aimed at establishing the biocompatibility of the different materials, both in the nanometric and macroscopic systems of the same nature and, with this, contribute to the general knowledge about their properties in order to make them applicable and safe in Bionanomedicine.

ADVISERS/MENTORS
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Acknowledgments
Ministerio de Economía y Competitividad (MINECO) (Proyectos CTQ2014-60227-R and CTQ-2015-71955-REDT Red de Excelencia Sensores y Biosensores Electroquímicos), Junta de Andalucía (P10-FQM-6408) y Universidad de Córdoba.