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seminar

Wednesday, 11th November, 9.30am, Online

Host: Prof. Luis M. Liz-Marzán

Inorganic-organic hybrid materials for biomedicine

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Every material presents characteristic properties, but by their rational combination we can take advantage of either individual components or the resulting multifunctional material. Such hybrid materials are often composed of inorganic particles and organic materials such as polymers. The nanoparticles (NPs) can provide the physical properties of interest, such as optical absorption, fluorescence, magnetic response or mechanical strength, while the polymeric matrix may provide stability, controlled porosity, or responsiveness toward external stimuli. Composite polymer colloids are one of these hybrid materials, composed in most of the cases of an inorganic NP core covered by a polymeric shell that provides colloidal stability and functionalization possibilities. Surface-enhanced Raman scattering (SERS) labelled nanoparticles which are efficient SERS imaging probes are a good example of such hybrid colloids.

Complex cell culture models are of increasing importance in medical research, given the need to create models that better represent real situations in humans. This is of high importance to understand complicate mechanisms of many problematic diseases such as cancer or respiratory diseases in order to design efficient treatments for them. These sophisticated models not only require improvements in cell engineering techniques, or the development of new materials, but also advanced imaging tools to accurately characterize them, hence providing fast and precise diagnostics, including their evolution over time. To image such systems, high penetration depth, no photobleaching and minimum signal overlap are all desired. Our hybrid SERS labelled systems can provide these characteristics. In line with the fabrication of cell models, 3D printing has revealed itself as a promising tool for their fabrication, however the availability of bioinks with printable properties and suitable behavior for realistic medical models is still poor. Here again, by combining inorganic and organic materials we can obtain hybrid smart bioinks for the fabrication of the aforementioned medical models.

In my talk I will highlight how our advanced hybrid materials could be used in biomedical applications and the advantages they offer of current materials and techniques.