SEMINAIRE ISMO

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"Magic bullet" science : from drug delivery to photocatalysis

Depending on their composition and structure, nanoparticles are used, or are being evaluated for use, in many fields. This talk will give an overview of several applications where nanoparticles play key roles.

ISAsomes are internally self-assembled particles composed of a structuring lipid, an oil and stabilized by a surfactant in excess of water. The internal structure of ISAsomes can be tailored by varying the temperature and the concentration of selected additives such as oil. This class of channel-forming liquid crystalline media of submicron size can be used to confine and control the release of drugs.

Magnetic nanoparticles are highly exciting nanomaterials from a fundamental and industrial research point of view, considering the dependence of the magnetic properties with size, shape, composition, surface and interaction, and also for their numerous potential applications in bio- and nano-technologies ranging from diagnosis and therapies in medical care to environmental applications.

TiO_2 nanoparticles have been widely used for photocatalysis. When TiO2 is irradiated with near-UV light, this semiconductor exhibits strong bactericidal activity. However, the major drawback of TiO_2 in photocatalysis is its relatively large band gap. By doping TiO_2 with non-metals (such as N and F) it is possible to tune and narrow the band gap, resulting in activation of TiO_2 under visible light. Thus, the generation of radical oxygen species at their surface under visible light can lead to bacterial inactivation.

The impacts of various parameters are illustrated in this presentation highlighting possible applications.

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