



PhD in CHEMISTRY – NANOMATERIALS FOR NANOMEDICINE

3 year-duration – Funding from October 1st, 2018

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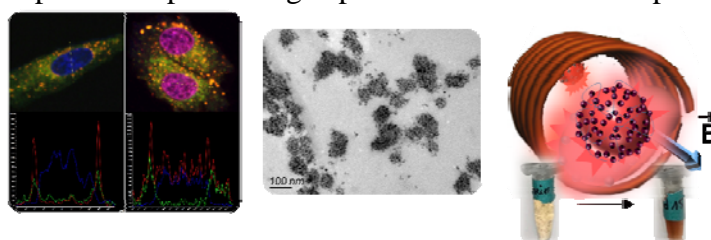
Laboratory : [CEISAM](#) – UMR CNRS 6230, Université de Nantes

Project title: **Multimodal nanoassemblies for on-command theranostics**

PhD supervision: Supervisor: ISHOW Eléna, elena.ishow@univ-nantes.fr, 02.51.12.53
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Research project: Nanomedicine nowadays represents a scientific field per se, at the interface of molecular chemistry, materials science, biology and medicine in order to offer novel approaches aiming at addressing therapeutic “dead ends”, providing early diagnosis and/or deciphering cellular mechanisms. In this context, we have been interested for several years in the fabrication of innovative biodegradable and non-cytotoxic nanoassemblies, comprising an all-organic thermosensitive core made of self-assembled small fluorescent molecules and an inorganic shell of iron oxide nanoparticles. The latter impart the nanostructures with strong MRI contrast and hyperthermia properties. The objectives of these PhD studies will be threefold: i- tuning the viscoelastic properties of nanomaterials via the synthesis of novel cores involving thermocleavable linkers to improve the control of drug delivery and cellular uptake; ii- grafting “home made” affinity proteins to target membrane receptors over-expressed at the surface of mesothelioma cells (to fight against asbestos cancer) or bacteria; iii- stimulating drug delivery at the vicinity of biological entities with simultaneous signaling thanks to the conversion of a fluorescence signal from an “off” to an “on” state. These studies will be extended to photoacoustics, a novel *in vivo* imaging technique, little explored despite its high spatial resolution and deep imaging potentialities.



This transdisciplinary project will provide the PhD candidate with strong knowledge and expertise in organic synthesis, nanomaterials chemistry, physico-chemical characterizations (structure at the nanoscale level, photophysics, magnetism), fluorescence and electron microscopy, with complements in molecular biology and cell biology. It will request high motivation, an open-minded spirit supported by a solid background in chemistry, and in particular synthetic chemistry and physical chemistry.

Application will first proceed by e-mail by sending a detailed CV, records of the master and bachelor degrees (or Engineer School), two letters of recommendation, or two names of possible referees.

E. Ishow et al. Patent US 14/218,368, 2014, **2014**. A. Faucon et al. *J. Mater. Chem. C* **2013**, *1*, 3879-3886. A. Faucon et al. *J. Mater. Chem. B* **2014**, *2*, 7747-7755. K. Snell et al. *ACS Appl. Mater. Int.* **2015**, *7*, 1932-1942. P. Girard et al. *ChemPhotoChem* **2017**, *1*, 6-11. A. Faucon et al. *J. Coll. Int. Sci.* **2016**, *479*, 139-149. A. Faucon et al. *Nanoscale* **2017**, *9*, 18094-18106. C. Linot et al. *ACS Appl. Mater. Interfaces* **2017**, *9*, 14242-14257.