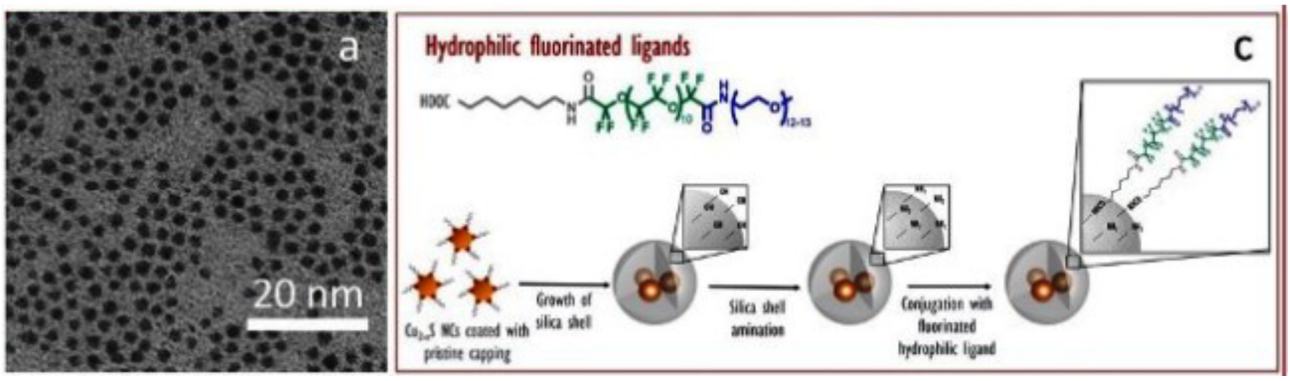
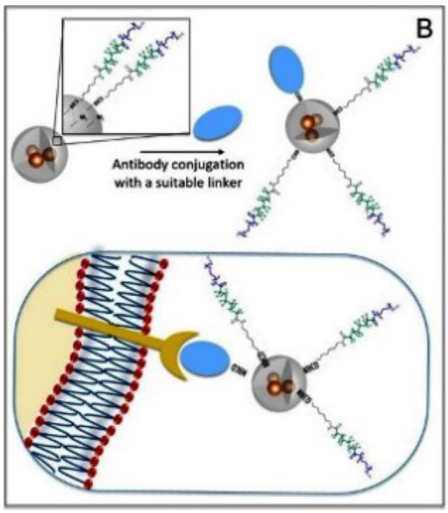
MD/8 — FLUORINATED NANOMATERIALS FOR ^{19}F-MRI AND BIOSENSING

The research activity foreseen for this position is related to the research project "New-Generation Nanostructured Fluorinated Materials for ^{19}F-MRI and their Biophysicochemical Interactions (NiFTy)" financed by the Italian Ministry of Education, University and Research that will be carried out in collaboration with other four Italian research groups for a multidisciplinary approach.

A pressing need in modern medicine is the development of targeted diagnostic tools to improve early diagnosis and allow personalized treatment of diseases. Nanotechnology has provided many new opportunities to design and produce multifunctional nanosystems working simultaneously as therapeutic and imaging agents, viz. theranostics [1]. Among available noninvasive imaging techniques, ^{19}F-Magnetic Resonance Imaging (^{19}F-MRI) is emerging as a powerful quantitative detection modality for clinical use, as it permits in-depth *in vivo* detection with high spatial resolution without the use of radioactive agents [2]. Moreover, the total absence of intrinsic ^{19}F organic signals in living tissues, i.e., dark background, allows unambiguous *in vivo* visualization of exogenous fluorinated tracers, with a signal-to-noise ratio close to that of ^{1}H-MRI, yielding colored "hot spots" complementary to the anatomical information obtained through standard ^{1}H-MRI

The aim of the project is to develop new generation of theranostic nanomaterials for ^{19}F Magnetic resonance Imaging (MRI) in order to overcome the limitations of previous reported fluorinated agents and to propose multifunctional fluorinated nanosystems to enhance the retention time and the specificity of the contrast agent and on the same time to enable quantitative analysis with the use of non-radioactive, stable, and versatile reporters. For the realization of the project we plan to design and synthesize new branched fluorinated ligands to be anchored to the surface of inorganic nanoparticles presenting hydrophilic end groups in order to favor the solubility in aqueous environment [3]. Fluorinated ligands will be also designed for developing fluorous platforms for sensing applications. The nanosystems will be completely characterized by a variety of methodologies from NMR to TEM, TGA and MRI, etc. A strong interactions with the others partners will enable to investigate the interaction of the fluorinated nanomaterials with biological environment and to model these systems computationally with multiscale approaches.





We are looking for highly talented and very motivated students with skills in organic synthesis and spectroscopy techniques.

Possible candidates are invited to contact Proff. Lucia Pasquato or Paolo Pengo for additional details.

Prof. Lucia Pasquato: lpasquato@units.it

or Prof. Paolo Pengo: ppengo@units.it

Refrences

1. Kunjachan S. et al., Chem. Rev. 2015, 115, 10907-10937.
2. Tirotta I. et al., Chem. Rev. 2015, 115, 1106-1129.
3. Boccalon M. et al., Chem. Commun. 2013, 49, 8794-8796.