



Internship proposal 2009-2010

<p>Laboratory : LIONS (Lab. Interdisciplinaire sur l'Organisation Nanométrique et Supramoléculaire) Address : CEA de Saclay, 91191 Gif-sur-Yvette cedex</p> <p>Laboratory director : Jean Daillant</p>	
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Synthesis and assembly of nanoparticles at oil/water interfaces

This project addresses two general challenges of the synthesis of nanoparticles: achieve a very high monodispersity in size, and control the organisation of the primary nanoparticles into more complex assemblies, e.g. 2D ordered arrays, rods, hollow shells, “Janus” nanoparticles etc.

The route we propose consists in preparing the nanoparticles at the oil/water interface by using non miscible reactants, one in each phase. In to this two-phase synthesis, the presence of the oil/water interface provides a large freedom of control over the growth of nanoparticles and their assembly. A large number of unusual chemical parameters (adsorption at the interface of surfactant molecules, of other nanoparticles...) but also physical parameters (dielectric jump, shear...) become accessible. Recently, we have shown that the reaction at the surface of highly monodisperse droplets generated by microfluidics allows a tremendous enhancement of the size distribution of nanoparticles.

Now, the project will deal with the elaboration of systems inaccessible by usual routes, and that show a higher complexity at two scales: at the level of the nanoparticle itself (mixed oxides, controlled morphology, controlled segregation in composite nanoparticles...), and at the level of their organization (simple or mixed 2D arrays of nanoparticles, assemblies into controlled shapes etc.)

See also:

<http://iramis.cea.fr/Pisp/68/david.carriere.html>

Techniques in use:

Small-angle X-ray scattering, microfluidics, UV-Vis spectroscopy, transmission and scanning microscopy.

Applicant skills :

Background in chemistry of nanomaterials recommended

Granted internship : yes ($\geq 800\text{€}/\text{month}$)

C'nano IdF laboratory (France only) : yes

Possibility for a thesis : yes (“CFR” grant) if accepted by CEA