



Internship proposal 2009-2010

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| <p>Laboratory : LIONS (Lab. Interdisciplinaire sur l'Organisation Nanométrique et Supramoléculaire) Address : CEA de Saclay, 91191 Gif-sur-Yvette cedex Laboratory director : Jean Daillant</p> |  |
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Towards "Solar Vesicles"

Under proper conditions, surfactant molecules self-assemble into vesicles: micro- or nano-containers with an aqueous core, closed by a molecular-thick film. This project aims at designing complex devices embedded in such vesicles, for instance solar cells which could then allow very localized energy inputs in miniaturized applications.

To achieve this goal, we propose to devise new approaches based on self-assembly. The first step is to design and study the original physical properties of surfactant vesicles decorated by organic or inorganic functions in very well defined areas, for instance on one single hemisphere ("Janus" vesicles), on diametrically opposed patches, as a "sandwich" structure on both sides of the vesicle wall etc. This control over localization prefigures the relative organization of the different layers, which is necessary in a device where all components (e.g. electrodes, semiconductor core, recognition sites) must be precisely distributed.

Here, the control will be provided by self-assembly principles, like dewetting at the submicron scale or segregation at the surface of the vesicles, which will be either spontaneous or assisted with microfluidics. The vesicles made from fatty acids studied in our laboratory, which show original and suitable physical properties (resistance, structure, permeability etc.), are a good starting point for this study.

See also:

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

Techniques in use :

Confocal laser scanning microscopy, steady-state and time-resolved fluorescence spectroscopy, Small and Wide Angle X-ray scattering, microfluidics.

Applicant skills :

Experimental subject

Background in soft matter physics or 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 application accepted by CEA