



Internship proposal 2009-2010

Laboratory : LIONS (Lab. Interdisciplinaire sur l'Organisation Nanométrique et Supramoléculaire) Address : CEA de Saclay, 91191 Gif-sur-Yvette cedex Laboratory director : Jean Daillant	
Internship supervisor : David Carrière Phone : +33 (0)1 69 08 54 89 e-mail: david.carriere@cea.fr	

Buckling of spherical vesicles into icosahedra

Under proper conditions, surfactant molecules self-assemble into vesicles, which are most commonly of spherical shape. However, in some special cases more exotic and intriguing shapes spontaneously appear. For instance, we have demonstrated that faceted vesicles with 5-fold symmetry around the vertices (icosahedral shapes) can be prepared from mixtures of simple, commercially available molecules.

This study will deal with the emergence of these particular shapes, which is important for the physical understanding of similar phenomena (e.g. maturation of viruses), but also for the design of stimulus-sensitive containers for biomedical and materials science applications.

The sphere-to-icosahedra “buckling” transition of these vesicles is probably determined by the mechanical properties of the (solid) surfactant film, i.e. the competition between the resistance to stretching and to bending. In addition, size effects are expected, due to the effect of “self-encapsulation” of the ions discovered in our laboratory. To achieve a complete understanding of the system, measurements of the mechanical properties of the vesicles will be performed by atomic force microscopy, will be completed by ion analysis by time-resolved fluorescence spectroscopy, and compared to the existing models.

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, atomic force microscopy.

Applicant skills :

Experimental project with some theoretical aspects. Work in collaboration with the University of Bayreuth (3 stays of one month, funded by a European program)

Granted internship : yes (≥ 800 €/month)
C'nano IdF laboratory (France only) : yes
Possibility for a thesis : yes (“CFR” grant) if accepted by CEA