Study of DNA containing nano-objects:

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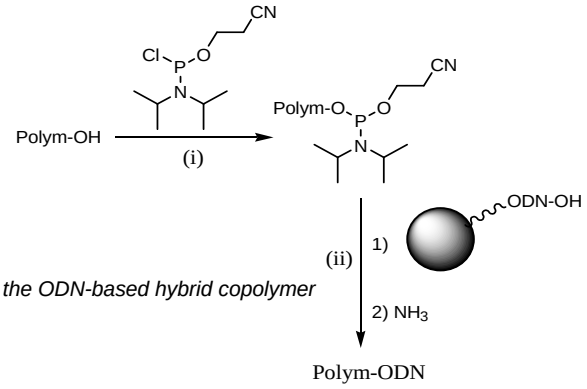
Aim

This project aims at the preparation of nano-objects containing short DNA strands for biological and therapeutic purposes. The molecular building blocks will be amphiphilic hybrid block copolymers obtained by the coupling of oligonucleotides with synthetic polymers. In this study, we will focus on the self-aggregation behaviour of those hybrid copolymers which could lead to the desired DNA containing nano-objects (micelles, vesicles, ODN-osomes).

Synthesis

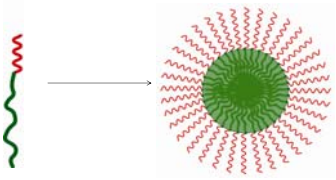
We use hydrophobic and commercial polymers (Polym-OH) functionalized with a hydroxy group at the end. The synthesis of the copolymer is realized thanks to a well established solid state strategy (phosphoramidite chemistry) to form the ODN-based hybrid copolymers.



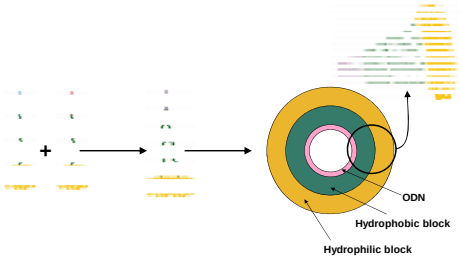
Synthesis of the ODN-based hybrid copolymer

Self Assembly

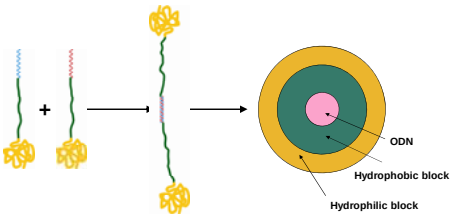
Amphiphilic diblock copolymers with an oligonucleotide as the hydrophilic part have already been prepared, the spontaneous formation of micelles has been reported and the micelles have been characterized[1]. The preparation of triblock copolymers could lead to the formation of vesicles in water. Even more challenging is the elaboration of ODN-osomes. This is of special interest because the ODN would be confined in the centre of the structure and thus protected against the environment yielding a potential carrier for the delivery of *as*-ODN.



Formation of a micelle



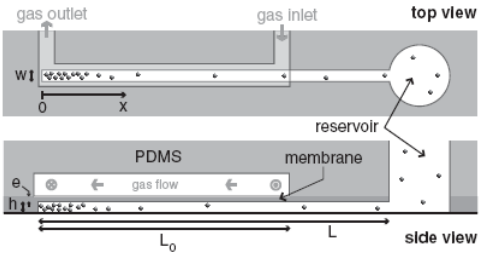
Formation of an asymmetric vesicle



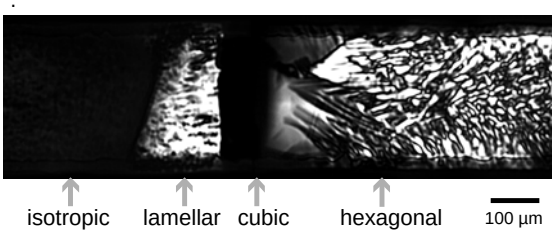
Formation of an ODN-Osome

Characterization

All the objects formed should be characterized by DLS and TEM. We will also use microevaporation, a new microfluidic technology[2] which should allow us to construct the phase diagram using a very limited amount of material. We also plan to carry out SAXS and SANS experiments to gain more insight into the structures obtained.



Top and side views of a microevaporator



Successive phases observed during the densification of a solution of docusate sodium salt AOT

1. Herrmann *et al., ACIE,* **2006**, *45,* 4206
2. Leng *et al.*, *Langmuir*, **2007**, *23*, 2315 *-4210*