FINAL MASTER PROJECT PROPOSAL

Title

Optimized nanocarriers from amphiphilic block copolymers by supramolecular chemistry

Supervisor(s)

Luis Oriol, Department of Organic Chemistry
Milagros Piñol, Department of Organic Chemistry

Summary of the project

Amphiphilic block copolymers with two chemically distinctive polymer segments are able to self-assemble in certain solvents forming objects of nanometric dimensions such as spherical micelles and vesicles that can be used as containers for small molecules. In particular, these polymeric nanoparticles can be used for delivery of bioactive molecules. The use of polymers is particularly appealing because their architecture can be modified to tune the type and size of these nanocarriers and therefore their bioperformance. For instance, the introduction of functional moieties provides of stimuli-response to the nanocarriers, which facilitates the controlled release of the encapsulated molecules or the incorporation of crosslinking might improve their stability under physiological conditions

This project aims the use of amphiphilic block copolymers with side-chain nucleobase or nucleobase-analogs that by post-polymerization functionalization through multiple H-bond molecular recognition might endow polymeric nanoparticles with response to light and/or dynamic crosslinking. Encapsulation of fluorescent probes of bioactive molecules will be studied in order to check the release ability of encapsulated cargo molecules.

Basic tasks are:
- Previous literature covering of the state of the art
- Synthesis, structural characterization by NMR/IR/SEC, optical characterization by UV-vis, and thermal characterization by DSC/TGA of block copolymers
- Preparation of polymeric nanoparticles, determination of size distribution by DLS and morphology by TEM
- Study of loading/stimulated release abilities of the nanoparticles

The work includes synthesis, characterization and self-assembly in water, together with characterization of loading/release abilities of the polymeric nanoparticles.