Dynamic Covalent Self-Assembly of Nanostructured Polymers

Post-doctoral researcher (18 months)

Project

Block copolymers are fundamental building blocks in material science, widely used for their ability to self-assemble into periodic nanostructures (spheres, cylinders, lamellae). However, synthesizing these architectures requires complex and costly living polymerization techniques. We aim to explore an alternative using dynamic covalent chemistry. By introducing exchangeable bonds into linear and branched polymers, we aim to allow the material to "find" its own optimal topology, effectively self-synthesizing ordered block-like structures from random precursors driven by thermodynamic forces.

As a Postdoctoral Researcher, you will study the self-assembly in solution of these dynamic covalent polymers. Your goal is to correlate the chemical dynamics of the exchangeable bonds with the physical self-assembly of the polymer chains. You will investigate how these dynamic polymers organize in selective solvents (micellization) and how they can be processed into nanostructured materials for energy-relevant applications.

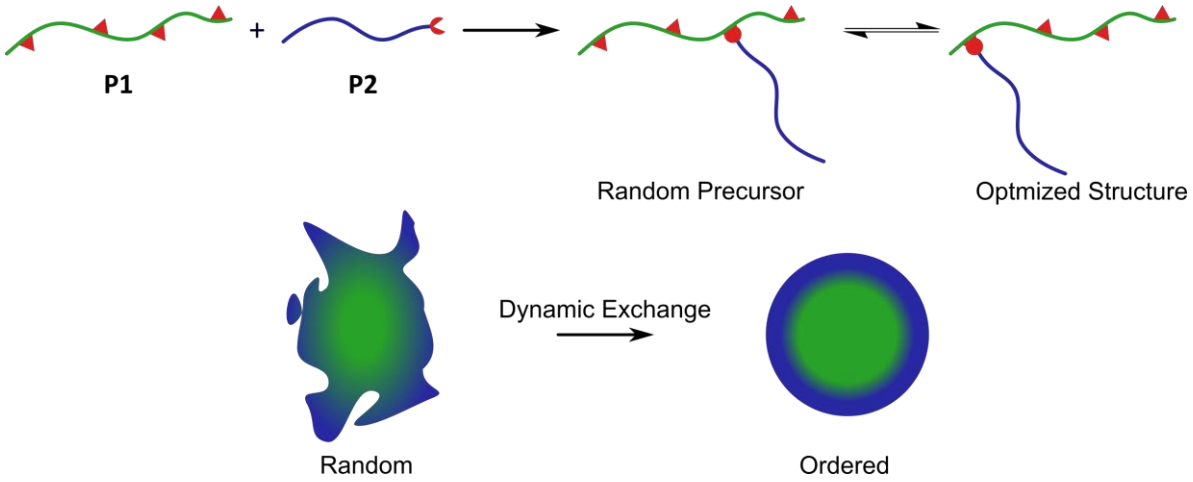

Figure: Concept of the project. Using dynamic covalent chemistry to allow random graft copolymers to reorganize their topology into ordered block-like sequences and well-defined nanostructures.

Key Responsibilities

- **Synthesis:** Prepare libraries of dynamic amphiphilic polymers.
- **Self-Assembly:** Investigate structure formation in solution and in the solid state using SAXS/SANS, Dynamic Light Scattering (DLS), and Electron Microscopy (SEM/TEM).
- **Mentoring:** Assist in the supervision of PhD and Master students in the group.

Candidate Profile

- PhD in Polymer Science, Chemistry, or relevant fields.
- Proven expertise in monomer and polymer synthesis and structural characterization of polymeric materials.
- Experience in the self-assembly of block copolymers is a plus.
- Interest in understanding new applications and concepts of dynamic polymers.
- Eager to learn, discuss new ideas, and integrate into a fast-paced new team.

Conditions

- **Start Date:** Flexible.
- **Duration:** 18 Months
- **Salary:** ~2100-2400 €/month (Net, depending on experience)
- **Location:** IMP Laboratory, Université Claude Bernard Lyon 1.
- **Contact:** georges.formon@unifr.ch

Position open until the vacancy is filled.