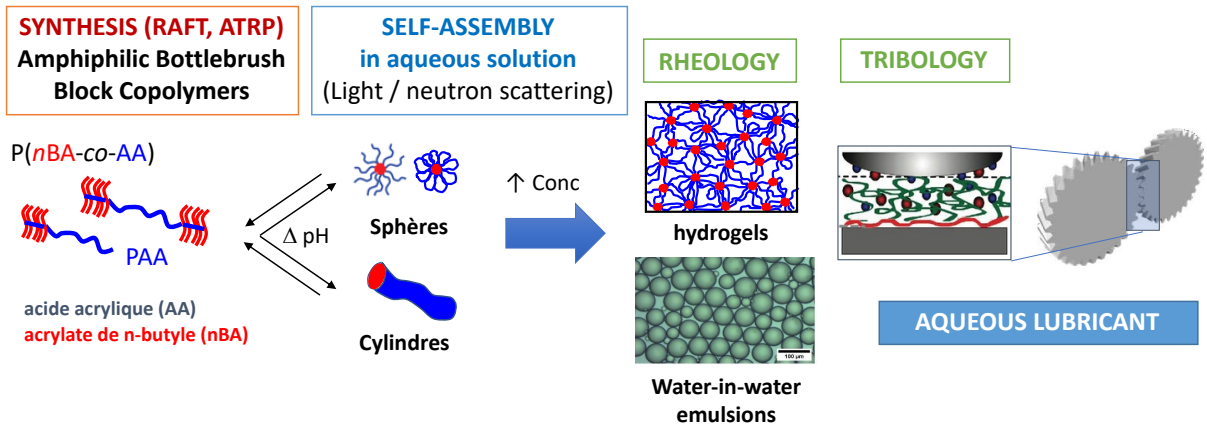
PhD Proposal: Self-assembly of bottlebrush amphiphilic block copolymers for the development of aqueous lubricants.

36 months, from 01/10/2025

Project description

The aim of this project is to formulate aqueous lubricants in order to reduce the environmental impact of current formulations using mineral oils derived mainly from petroleum refining. Polymers are of particular interest for the formulation of aqueous lubricants, especially polymers that are sensitive to external stimuli, making it possible to control the factors influencing friction. Polymer brushes are particularly promising for the creation of "intelligent" lubricants, thanks to their ability to generate strong repulsion under pressure and reduce shear resistance.

In this project, we propose to use pH-sensitive amphiphilic block copolymers with bottlebrush architecture to prepare aqueous lubricants whose tribological properties can be adjusted by pH variations. The aim of the PhD work will be to ***i)*** **synthesize a series of amphiphilic** diblock, but also triblock, copolymers containing a brush block, in order to ***ii)*** **study the influence of self-assembly** induced by pH variations on the **tribological properties** of aqueous solutions. A third objective will be ***iii)*** **to study water-in-water emulsions** stabilized by bottlebrush amphiphilic block copolymers as novel aqueous lubricant solutions.



Expected skills

The candidate must hold a Master's degree in Chemistry.
Experience in polymer chemistry and/or physical chemistry is desirable.
Knowledge of radiation scattering techniques and rheology is a plus.

Duration / Salary: 36 months from October 1, 2025**.** Gross monthly salary: 2100 euros

Location: Institut des Molécules et Matériaux du Mans, IMMM-UMR 6283, Le Mans Université, 72000 Le Mans, France.

Applications should be sent to **Elise Deniau** (elise.deniau@univ-lemans.fr) and **Lazhar Benyahia** (Lazhar.benyahia@univ-lemans.fr). They should include a **CV**, a **motivation letter** outlining your career plans, a **recommendation letter**, and transcripts with grades from **Bac+3 to Bac+5 or equivalent**.

Applications must be submitted **by 30/03/2025**.