Thesis offer

“elaboration of antimicrobial materials for medical device applications”

State of art and aim of the project

Infection remains the third leading cause of death in developed countries and the second worldwide. In the clinical practice, the continuing decline of effectiveness of existing antibiotics due to the ability of microbes to develop and disseminate mechanisms of resistance against traditional antimicrobials, raise international healthcare concerns as they are associated with increased morbidity and mortality and also higher hospital costs. Such resistance also increased drastically due to the widespread use of antibiotics in animals and humans, the increasing global population, and the rise of globalization.

To prevent bacterial infection and in particular in hospitals, an efficient method consists in using antimicrobial materials that are usually obtained either by **coatings, impregnation** or by **incorporation of additives** like chlorhexidine, silver ions, antibiotics or heparin. Even if these materials have proven their efficiency against bacterial infections, one of their main limitations is the leaching (release) of their active compounds with time that could impact their properties and worsens the phenomenon of antibiotic resistance**.** In addition, because of the release of the active compound, leaching antimicrobial materials cannot be used for a long indwelling time because of a loss of activity with time.

The aim of this work is to develop in collaboration with the Vygon company non-leaching antimicrobial organic materials with no toxicity, no resistance and no loss of activity with time that could find application as enteral probe. To reach this objective, the technology will use synthetic antimicrobial copolymers as additive in a co-extrusion process with common industrial polymeric matrices (Figure 1).

Figure 1. Elaboration of antimicrobial organic materials by co-extrusion with synthetic antimicrobial copolymer

This work will be performed in collaboration with Université Paris-Saclay (Paris), Université Claude Bernard (Lyon) and Vygon. The biological tests will be performed in Marseille (AMU, iSM2).

Work of the PhD student: **synthesis of the antimicrobial copolymers** according to an already published procedure (Benkhaled, B. T., et al., *Polym. Chem.* 2018, *9*, 3127), preparation of the **antimicrobial materias by extrusion** according to the patent (FR1756390 (2017)/PCT WO2019/008176 (2018)), **characterization of the materials** (mechanical properties and surface characterization).

Location: Institut de Chimie Radicalaire (UMR 7273, Aix-Marseille Université, Marseille, France) in the CROPS team (Chimie Radicalaire Organique et Polymères de Spécialité) (http://icr-amu.cnrs.fr)

Duration: 3 years

Funding: Cifre

Position available: from September 2021

Candidature profile: Engineer or master 2 student with a good knowledge in polymer synthesis and characterization of materials.

Contact: CV and motivation letter to send to Dr. Catherine Lefay (catherine.lefay@univ-amu.fr) and Dr. Yohann Guillaneuf (yohann.guillaneuf@univ-amu.fr)