MASTER 2 INTERNSHIP – 6 MONTHS

Chemical Functionalisation of Biomaterials to Improve Water Resistance for Sustainable Food Packaging

CONTEXT

The extensive use of petroleum-based plastics, particularly for single-use food packaging, represents a major environmental challenge. Their persistence in the environment and the increasing concern regarding micro- and nanoplastic contamination are driving the development of more sustainable packaging solutions. At the same time, European and French regulations are accelerating the transition towards more circular packaging systems. The European Packaging and Packaging Waste Regulation (PPWR) introduces new requirements concerning packaging waste reduction, recyclability and circularity, while the French AGEC law aims at the progressive reduction of single-use plastics.

In this context, biobased and biodegradable materials present promising alternatives to conventional plastics. However, their use in food packaging is often limited by their sensitivity to water and moisture, which can strongly affect their mechanical, structural, and barrier properties. Developing strategies to increase the water resistance of these materials is therefore a key challenge for the next generation of food packaging.

OBJECTIVES & RESEARCH WORK

The objective of this internship is to develop chemical functionalisation strategies for biomaterials to improve their water resistance while maintaining properties suitable for food packaging applications.

The intern will work at the interface between chemistry, physicochemistry and materials science. The research will include:

- Literature review and critical analysis of existing functionalisation strategies;
- Selection and development of suitable chemical modification approaches;
- Optimisation of reaction and processing conditions;
- Chemical and physicochemical characterisation of modified materials;
- Evaluation of surface properties and wettability;
- Characterisation of water uptake, moisture sensitivity and barrier properties;
- Investigation of the impact of functionalisation on material structure and performance;
- Establishment of structure–property relationships between chemical modification and water resistance.

RESEARCH ENVIRONMENT

The internship will be jointly conducted at ICMUB and UMR PAM in Dijon, France. ICMUB, expertise in chemistry and chemical functionalisation, providing the scientific environment for the development and understanding of modification strategies. UMR PAM, expertise in the physicochemistry and characterisation of materials, particularly in relation to food and packaging applications.

The internship is part of the NextFoodPack project dedicated to the development of innovative and sustainable solutions for next-generation food packaging. NextFoodPack brings together 21 partners: 11 research laboratories, 5 technical centres and 5 industrial partners, creating a multidisciplinary environment connecting fundamental research, technological development and industrial applications. The project is supported by approximately €3 million of French government funding.

CANDIDATE PROFILE

We are looking for a motivated Master 2 student or final-year engineering student with a background in: Chemistry / Physicochemistry / Polymer Science / Materials Science / Biomaterials or related fields

The ideal candidate should demonstrate:

- Good fundamental knowledge of chemistry and physicochemistry;
- Good bibliographical and scientific literature research skills;
- Critical thinking and ability to interpret experimental results;
- Scientific curiosity, rigour and responsibility;
- Autonomy and good organisational skills;

PRACTICAL INFORMATION & APPLICATION

Duration: 6 months
Preferred start date: January or February 2027, with some flexibility
Location: UMR PAM & ICMUB, Dijon, France
Level: Master 2 / final-year engineering student
Gratification: According to the French legal rate applicable to internships (approximately 680 euros per month)

Candidates should send a CV and a motivation letter to: truc.phung@institut-agro.fr and thomas.karbowiak@institut-agro.fr