Understanding the behaviour of bioactive food packaging based on bio-sourced electrospun nanofibers coatings

PhD Title

Starting date : 01/10/2024 Contrat doctoral

UNIVERSITY OF BURGUNDY & UNIVERSITY OF LILLE

Place of work
Mainly Dijon, University of Burgundy – France, and University of Lille (dual PhD)

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Understanding the behaviour of bioactive food packaging based on bio-sourced electrospun nanofibers coatings

Scientific domains

- Food analysis, food preservation
- Food Packaging
- Physical-chemistry, microbiology

Key-words
Electrospinning, coated PLA film packaging, active coating, food shelf life, release mechanisms

Description of the PhD project

Context and objectives

Innovations in food packaging are mainly focused on inhibition or prevention of microbial growth on foodstuff thanks to the development of antimicrobial active packaging. In particular, biodegradable and bio-sourced polymers as well as natural antimicrobial compounds ensure a sustainable approach for food packaging.
In this context, the goal of the PhD project is to highlight the potential of electrospinning process in the field of active food packaging, coupled with the use of cyclodextrins with the aim of improving and extending the diffusion of active molecules, in order to increase the shelf-life of food. The strategy will consist in developing an antioxidant and antimicrobial coating based on bio-sourced materials applied on a PLA film for the combined release of several natural bioactive compounds. The elaboration of biodegradable nanofibrous coatings with varying compositions will be optimized. Morphological, physicochemical and mechanical properties of the different systems will be studied through adequate characterization techniques. The study of release/transfer mechanisms of model active compounds and the preliminary evaluation of their in vitro antioxidant and antimicrobial activity will be correlated to elaboration parameters/film properties and carried out as proof of concept.

The project, funded by Agence Nationale de la Recherche (ANR), will be carried out with strong interactions between UMET (Université de Lille), PAM (Université de Bourgogne) and UCEIV (Université du Littoral – Côte d'Opale).

The specific objective of this PhD is to characterize the **developed active biobased coated films and coatings applied onto biodegradable packaging films**. Indeed, another PhD student will work mainly on the development of the formulation of the coating and on the set-up of the technology of application, based on the existing experiences. The **synergistic action of high oxygen barrier coatings and release control** of the **bioactive molecules** will be explored. The understanding of interactions involved between components of this complex system will be focused to better understand and optimize the active system. The data resulting from structure, physical-chemical and microbiological analyses will be useful for modelling of the release and the shelf-life of food that will be targeted.

Funding

3 year contract – net salary about minimum 1700€/month (minimum gross salary 2100 €/month according to French regulation for PHD).**Précisions sur le financement**
ANR (French national Agency for Research)

Presentation of the institution and lab

JOINT UNIT UMR PAM – UNIVERSITY OF BURGUNDY (INSTITUT AGRO-DIJON - INRAE)

Presentation of the hosting research unit and working environment.
The thesis will be mainly hosted in the research unit PAM – Food Processing and Microbiology (UMR A02.102, Université de Bourgogne, Institut AgroDijon, INRAé, France),
and partly in the UMET, University of Lille and UCEIV Université du Littoral Cote d'Opale).
University of Burgundy (UB) is a multidisciplinarity higher education institution for both education and research, and particularly well ranked for food sciences in the well-known ARWU or Leiden rankings. The Joint Unit "Food Processing and Microbiology" UMR PAM A02.102 (UB+ Institut Agro Dijon + INRAé) is a major player in scientific and technological progress in food and wine knowledge and technologies. The scientific approach shared by all members is to understand the physical, chemical and biological phenomena that determine the quality of food in order to develop new foods and new food processes. Physico-chemical group is highly involved in the development and characterization of biopackaging materials and their uses. UMR PAM will be involved and leading functional and bioactive properties of the new packaging system. The aims is to select, adapt, develop and test a variety of eco-friendly active bio-packaging products to extend the shelf-life of the food.

The project includes periods in the partners university

Website :
https://www.u-bourgogne.fr/universite/organisation/laboratoires-et-entites-de-recherche
https://www.umr-pam.fr/fr/

Expected profile

Skills and experience. Master or engineer degree in food chemistry and engineering and/or polymer/packaging sciences, mainly focused on physical chemistry. Knowledge and /or experience in migration or release mechanisms and calculations are of key elements for the PhD. Knowledge of characterization techniques of biopolymer materials (structure, surface, optical, transport and mechanical properties) as well as biochemical knowledge on food will be appreciated. Experience in mass transport modelling is a plus. Good written and spoken language skills in English are required, French or Italian or Spanish would be appreciated.

Application dates and contacts

From now to 27th 2024.

PhD starting in 1st October

Send CV and motivation letter to :

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