31st March 2025

PhD position

Start : September / October 2025

Corrosion inhibitors from agro-industrial by-products

General information

Workplace : Nancy
Contract type : Fixed-term contract Université de Lorraine
Contract duration : 36 months – Full time
Start : September / October 2025
Education level : Engineer's or master's degree

Missions / Activités

In order to address the current challenge of fitting the principles of Green Chemistry, especially "the use of renewable feedstocks", molecules extracted from natural resources appear as a valuable alternative to the widespread corrosion inhibitors whose production and use may have high environmental impacts. Although numerous natural extracts have been investigated in various media and substrates, only few have found their way in industrial applications due to a lack of fundamental knowledge about how the various chemical functions are involved in the protection of the metallic surfaces and about potential synergistic effects between different molecules/macromolecules.

The PhD work falls within a larger project dealing with the determination of the fundamental parameters involved in the corrosion protection mechanisms provided by biomolecules extracted from local and abundant agro-industrial by-products, using judiciously chosen extraction processes. The final goal is to get 100% vegetal carbon-based anticorrosion solutions for the formation of coatings on steel and to evaluate them in comparison with references in terms of efficiency, techno-economical aspects, as well as environmental impacts.

More specifically, the Phd work aims to understand the role of various chemical functions present in biomolecules of interest in the corrosion inhibition and the formation of protective films. Several antioxidant molecules (secondary metabolites) as well as various polysaccharides will be selected for this fundamental study in order to further guide the fractionation of the extracts that will be formulated in the surface treatment solutions.

The highlight of the involved mechanisms will rely on the combination of:
- Conventional and advanced electrochemical methods (stationary techniques, electrochemical impedance spectroscopy, quartz crystal microbalance)
- Advanced microscopic and spectroscopic characterisation of the surfaces (SEM, TEM, Raman, AFM).

Work context

The PhD work falls within a larger project funded by the French Agence Nationale de la Recherche (COBY project). The partnership will rely on the complementarity of four research teams whose specialities are, respectively, (i) the eco-processes related to the recovery of vegetal by-product (**URD-ABI / Reims**) with specific expertise in technico-economic data analysis and life cycle assessment (**LRGP / Nancy**); (ii) the corrosion protection of metallic materials (**IJL / Nancy**); and (iii) the advanced characterization of organo-metallic surfaces (**LRS / Paris**).

The PhD student will be located at the Institut Jean Lamour (Nancy) with numerous available means of investigation / characterization. The study will be carried out within the team "Surface and Interface : Chemical reactivity of Materials" and supervised by Dr Delphine Veys-Renaux.

The PhD sudent will work in close interaction with the researchers of the other laboratories and punctal stays in the Laboratoire de Réactivité des Surfaces (**LRS / Paris**) are planned.

Profil / Compétences

The candidates must have an Engineer's or a Master's degree in the field of chemistry and/or materials science with good skills in:

- chemistry
- physico-chemistry and materials characterization
- thoroughness / Analytical skills
- organization / initiative
- relationship / communication
- oral and written English.

Salary

2200 euros (gross) / month

How to apply

Send CV et letter to:
delphine.veys-renaux@univ-lorraine.fr