anr®	INSA	INSTITUT CARMeN	**Proposition de thèse 2025-2028**

Projet FULL-OIL : Comprehensive characterization of advanced bio-oils by a multi-technique approach combining column and planar chromatography with high resolution mass spectrometry

Laboratory : Institut de Chimie Analytique et Réactivité Moléculaire en Normandie (CARMeN, ex COBRA) UMR 6064, INSA Rouen Normandie, Université Rouen Normandie, CNRS
Research team : Analyse et modélisation, groupe spectrométrie de masse et sciences séparatives
Duration : october 2025 – october 2028

Context : Among the renewable energies (*i.e.* solar, wind), biomass has great potential. To produce biofuels, different processes are available and for one them, pyrolysis, leads to a liquid mixture called bio-oil. Contrary to heavy fuel oil, bio-oils contain high amount of oxygen species (*i.e.* carbonyl and acid species) that are responsible for corrosion, storage issue and catalyst poisoning. Moreover, this mixture is prone to condensation reactions such as polymerization so its composition is not stable over time. To orient the choice of upgrading treatment, it is necessary to have a deep knowledge of the bio-oil composition. Because of their complexity, their molecular composition is not yet fully-known and their actual physicochemical properties prevent them from being directly used. Therefore, to optimize both the conversion and upgrading processes, high performance techniques with cutting edge instruments must be developed and applied to achieve their most extensive molecular description.

Programm : Various analytical techniques will be developped through this project :

- Implementation of the first online SFC-FTICR MS 18 T (2ω) hyphenation (different types of column, solvent, ionisation source…) to take benefit of the isomer separation capacity of SFC and mass accuracy, resolution and dynamic range of the new FTICR 18 T.
- Synthesis of new HPTLC plates and achievement of offline HPTLC-LDI-FTICR MS using different home-made HPTLC plates to increase selectivity, reduce definitive adsorption and improve the class separation.
- Development of new achiral SFC columns (synthesis, characterization, packing, column performance tests) to expand the possibilities for complex sample analysis.

Profile :

- Master in analytical chemistry
- Knowledge in analytical techniques (both chromatography and mass spectrometry)
- Interest for method development and analytical sciences

A willingness to communicate and popularise scientific results is also desirable, as the person recruited will be able to take part in national dissemination days for the general public, such as the Fêtes de la science, FENO, Chimie & Terroir, among others.

Our institute is also classified as a ZRR (Zone à Régime Restrictif), so access is subject to authorisation from the Ministry of the Interior.

Contact : CV and motivation letter + master results to be sent at melanie.mignot@insa-rouen.fr until July, 10th