PFAS detection using electrochemistry at liquid/liquid immiscible interfaces

Stage Master 2, débutant en Février/Mars 2025 (6 mois)

Laboratoire : Institut des Nanotechnologies de Lyon – Campus de la Doua à Villeurbanne

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Mots-clés : électrochimie, miniaturisation, microfluidique, détection de polluants, alkyls perfluorés et polyfluorés (PFAS),

Application:

Please send your **CV**, **cover letter**, **bachelor and master transcripts** to: **rosaria.ferrigno@univ-lyon1.fr**

You can ask **references** to directly send their letter of recommendation to: **rosaria.ferrigno@univ-lyon1.fr**

Context*:* PFAS are manufactured chemical substances that contain the specific perfluoroalkyl chain (C_nF_{2n+1}) and polar/ionizable end groups. These substances are widely used in various industrial applications such as firefighting foams, food packaging, cookware, cosmetics and paints. Therefore, they have economical relevance worldwide that results in their widespread use and their release into the environment. It was uncovered that human exposure to PFAS is of high concern as these substances are connected with multiple toxicological issues such as cancer, diabetes, fertility and cardiovascular diseases. Hence, the sensitive detection of these substances is a major concern worldwide. The most widely used analytical technique is liquid chromatography-tandem mass spectrometry combined with solid phase extraction. However, it is unsuited for on-site analyses and requires highly-skilled users. Alternative analytical approaches are currently under investigation.

Project: Direct oxidation or reduction of PFAS is not feasible due to their chemical stability. An indirect detection, based on electrochemistry at interfaces between two immiscible electrolyte solutions (ITIES), will be investigated here. In this approach, the electrical polarization between two immiscible solutions drives the transfer of non-redox species from one phase to another, resulting in an electrical signal proportional to the concentration of the non-redox species. During the internship, we will investigate PFAS transfer at macro- and micro-interfaces. The experimental protocol will be assessed and the geometrical parameters of the interfaces will be optimized using numerical simulations. The implementation of this approach in microfluidic environment will also be investigated. The candidate will have the possibility to develop competencies in electroanalytical chemistry, microfluidics, micro-fabrication techniques and numerical modelling of mass transfer phenomena.

Who this project might be a good fit for, in terms of interests and/or goals: We are seeking highly motivated students with an interest in environment and electroanalytical methods and their implementation in microfluidic systems. Students interested in gaining research experience in a collaborative team environment.
This project can be continued with a PhD thesis.

Requirement: candidate should be currently following a master program in either: Analytical chemistry, Micro-technologies, or Physical-Chemistry.

If you have any questions, contact me: **rosaria.ferrigno@univ-lyon1.fr**