

## INTERNSHIP OFFERING – Master 2

### *Microdroplet cell: A tool for rapid screening of materials*

**Location & labs:** Laboratoire de Réactivité de Surface (LRS) at Sorbonne Université – Paris

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### **Research project**

Reducing the surface area of working electrodes for microelectrochemical measurements is crucial for microanalysis, a better understanding of the role of interface texture on electrochemical response, and for rapid screening of materials of different compositions. We recently showed that microdroplet techniques can be used to perform local impedance spectroscopy measurements<sup>1</sup> as well as in-situ wettability and electrochemistry characterization of corroding interfaces.<sup>2</sup> When aqueous solvents are used, the water evaporation limits the duration of the experiment. Known to have a negligible vapour pressure, ionic liquids provide an interesting alternative approach. These solvents are nowadays widely used in electrochemistry applications and can also be used in corrosion science as inhibitors.

The objective of this project is twofold: First, to utilize the microdroplet technique to statistically study the influence of surface texture on electrochemical reactivity of metals exposed to corrosion inhibiting ionic liquids. Two metals, Fe and Al, will be investigated in small droplets using different electrochemical techniques (current/potential curves, impedance spectroscopy), followed by post corrosion analysis of passive films and/or corrosion products using surface analysis techniques including SEM/EDX, XPS, and Raman spectroscopy. Second, the local reactivity of the protected material with respect to an aggressive environment such as chloride-containing solutions will be investigated.

**This project is a collaboration with Western University (Canada), with which we will have regular meeting to discuss the results.**

### **Applicant profile**

- Student in 2<sup>nd</sup> year of Master or 3<sup>rd</sup> year of engineering school with a good background in electrochemistry and/or material science
- Autonomous, meticulous, rigorous
- A good level of English is required

**Internship period:** Ideally from mid-January 2022 for 5 or 6 months

(1) Molena de Assis, C.; Ho, T. H.; de Melo, H. G.; Keddad, M.; Turmine, M.; Vivier, V. Electrochemical Impedance Spectroscopy in a Droplet of Solution for the Investigation of Liquid/Solid Interface. *Anal Chem* **2016**, *88* (24), 12108.

(2) Gateman, S. M.; Gharbi, O.; Turmine, M.; Vivier, V. Measuring changes in wettability and surface area during micro droplet corrosion measurements. *Electrochimica Acta* **2021**, *399*.