

ITI HiFunMat Master Internship Proposal

M 1

M 2

Title: Plasma polymerization: investigation of physico-chemical properties of novel thin films

Internship supervisor

Name, first name	Carneiro de Oliveira, Jamerson
E-mail, Telephone	jamerson.carneiro-de-oliveira@uha.fr , 03 89 60 88 30
Laboratory	Institute of Materials Science of Mulhouse
Collaboration with a HiFunMat member (<i>please indicate their name</i>)	<input checked="" type="checkbox"/> No <input type="checkbox"/> Yes :

Student profile looked for

Master program (<i>more than one box can be ticked</i>)	<input checked="" type="checkbox"/> Material science and engineering <input checked="" type="checkbox"/> Chemistry <input type="checkbox"/> Physics
Other indications if necessary	

Internship description

The research project:

Plasma polymer thin films are versatile coatings due to a broad range of factors. One important factor is the precursor used for the polymerization in the plasma reactor, as it influences the final chemical and physical properties of the thin film. The precursors are intrinsically linked to the formation and stability of the plasma film [1] as well as to the possible applications of the final coating [2]. The fact that the polymerization starts from species in the plasma state means that more varied chemical bonds can be created from the same precursors, when compared to other polymerization approaches. The tailoring of the polymer thin film properties can be performed by changing the operating parameters and the precursor chemistry. That makes plasma polymerization a flexible process, with potential applications from the textile to the pharmaceutical industries. In addition, plasma polymerization is performed in the absence of organic solvents, which appeals to its use as a greener process. The goal of the current offer is to **explore the plasma polymerization of original precursors and characterize the novel thin films**. The intern will have the opportunity to learn fundamental concepts of **surface functionalization and thin film characterization**, through the analysis of **physico-chemical and morphological properties** of the plasma polymers. The **3-month internship** will be carried in the **Institute of Materials Science of Mulhouse (IS2M, France)** and thus the intern will count with a set of available characterization techniques in the institute.

The missions of the intern:

The intern will carry out **plasma polymerization**. He/she will also perform **physico-chemical and morphological characterizations** of the surfaces using the available techniques at the IS2M (contact angle measurements, ellipsometry, infrared spectroscopy (FTIR), atomic force microscopy (AFM) ...).

Skills to be developed:

During the internship, the intern will develop disciplinary skills in materials chemistry, particularly in plasma treatments as well as in surface characterization. More generally, he/she will learn how to work within a research team, exploit data, use scientific databases, write a report and communicate on his/her results.

References:

- (1) Brioude, M. M. et al. Controlling the Morphogenesis of Needle-Like and Multibranched Structures in Maleic Anhydride Plasma Polymer Thin Films. *Plasma Process Polym* 2014, 11, 943–951.
- (2) Carneiro de Oliveira, J.; Meireles Brioude, M. de et al., Plasma polymerization in the design of new materials: looking through the lens of maleic anhydride plasma polymers. *Materials Today Chemistry* 2022, 23, 100646.

Candidate profile and application:

Master 1 student. Education in chemistry and/or materials science is required. The candidate is expected to show initiative and seriousness.

Applications including a CV and a cover letter should be sent electronically as soon as possible.