Plasma polymerization: novel thin films, their properties and possible impact of light on their formation

The research project:

Plasma polymers are commonly defined as thin films (nm to µm thickness) generated through the deposition of organic species from a plasma phase. Their formation process depends on several factors, such as: the precursor nature, the plasma operating conditions and the physico-chemical properties of the surface over which they are deposited [1]. The precursors are intrinsically linked to the formation and stability of the plasma film 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 **plasma polymerization** of **original precursors** and gather initial data about the **chemistry of the plasma phase.** The intern will further **characterize the novel plasma polymers**. The intern will thus have the opportunity to learn fundamental concepts of **plasma diagnostics, surface functionalization and thin film characterization**, through the analysis of physico-chemical and morphological properties of the plasma and of plasma polymers. The preparation of the surface exposed to the plasma will allow the intern to obtain an extra set of competences in **wet chemistry functionalization procedures**. The **6-month internship** will be carried in the **Institute of Materials Science of Mulhouse (IS2M, Mulhouse, France)** and thus the intern will count with a set of available characterization techniques in the institute.

The missions of the intern:

The will carry out **plasma polymerization** and perform **chemical, physico-chemical and morphological characterizations** of the **plasma** and/or **plasma polymers** using the available techniques at the IS2M (contact angle measurements, ellipsometry, infrared spectroscopy (FTIR), X-ray photoelectron spectroscopy (XPS), atomic force microscopy (AFM) ...).

Skills to be developed:

Thanks to this internship, the intern will develop disciplinary skills in **materials chemistry**, particularly in **surface functionalization** as well as in **plasma treatments**. More generally, she/he will learn how to work within a research team, exploit data, use scientific databases, write a report and communicate on her/his 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 2 student or student in last year of engineering school. Education in chemistry and/or materials science is required. The candidate is expected to show initiative and seriousness.

Applications including a CV, a cover letter and a copy of grades (last 2 years) should be sent electronically as soon as possible.

Contact:

Jamerson Oliveira, jamerson.carneiro-de-oliveira@uha.fr, +33 3 89 60 88 30. IS2M Website : ww.is2m.uha.fr