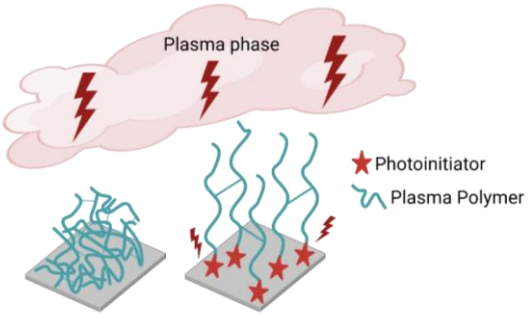
Photoreactive surfaces and their role on the structure of plasma polymers

DIRECTEUR DE THESE : VINCENT ROUCOULES
CO-ENCADRANT : JAMERSON CARNEIRO DE OLIVEIRA
INSTITUT DE SCIENCE DES MATERIAUX DE MULHOUSE, 15, RUE JEAN STARCKY, 68057 MULHOUSE CEDEX
TEL : 03 89 60 88 30 ; E-MAIL : JAMERSON.CARNEIRO-DE-OLIVEIRA@UHA.FR

Surface modification offers the possibility to physically or chemically change the surface of a material in order to provide a new property. Among the procedures for surface modification, plasma enhanced chemical vapor deposition (PECVD) of polymerizable precursors, commonly referred as plasma polymerization offers several advantages when compared to other strategies [1]. For instance, it is performed in the absence of solvents and catalysts, since excited species are generated from a vapor phase and can recombine on virtually any surface. The chemical functionalities of the surface are known to play a role in the good attachment of the plasma polymer to the substrate. However, there is an absence of studies and effort dedicated to understand the phenomena involved in the plasma polymer growth. It is that gap of knowledge that this thesis aims to assess. The idea is to evaluate the influence of photoinitiators, grafted on the surface of a substrate, in the mechanisms of formation of plasma polymers. It aims to identify how plasma polymers growth kinetics and structures are affected by the presence of a photoinitiator and select parameters that correlate the surface chemistry to the plasma phase. A surface containing a photoinitiator might allow drawing a correlation between the light emitted by the plasma and its impact on the thin film formation, especially in the early stages of growth. The activated photoinitiators will further influence the attachment of species of the plasma phase on the surface and the kinetics of growth of the polymer. A possible impact on the mechanism of formation of plasma polymers can be evaluated through the analysis of the structural and physico-chemical properties of the thin films. The project thus involves the understanding of fundamental aspects of the deposition and growth of plasma polymers that can be further directed to generate bottom-up processing strategies.



Scheme 1 : Graphical abstract

[1] Carneiro de Oliveira, J. 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. DOI: 10.1016/j.mtchem.2021.100646.