M2 Internship Offer – 4/6 months – Early 2026

Temperature probes based on polymer for thermoplasmonics

Context

Illuminated by a light wave, gold nanoparticles (NPs) generate localized surface plasmons inducing strong local field exaltation, electron/hole pairs and heat. Thanks to these 3 phenomena, NPs lead to numerous applications (biology, catalysis, optics, etc.). It is also possible to attach polymers around these NPs by photopolymerization, [1] thus creating hybrid NPs. Recently, the heat induced by gold NPs, known as thermoplasmonics, enabled us to generate millimetric polymer plots via laser illumination of an assembly of gold NPs. [2]

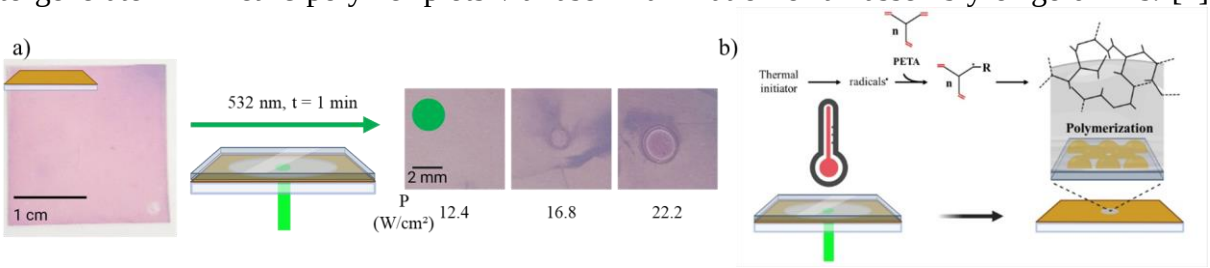

Figure 1: Thermally induced polymerization by thermoplasmonics a) and the associated chemical mechanism b)

Objectives & research project

The goal is to map the temperature of thermoplasmonics sample (assembly of gold NPs). To this end, we need temperature probes (i.e., thermopolymerizable formulations) for thermoplasmonics in order to address accurately a wide temperature range (80-250°C). The intern will vary the different chemical compounds inside the formulation (thermal initiator, monomer…) and characterize their temperature on a heating plate. Then, he/she will validate the new thermal probes in thermoplasmonics on assemblies of gold NPs using continuous wave laser illumination. Ultimately, the most effective thermal probes will be tested at the nanoscale on colloidal NPs.

[1] Kameche *et al.* 10.1016/j.mattod.2020.03.023 ; Khitous *et al.* 10.1021/acsanm.1c01377
[2] Molinaro *et al.* 10.1021/acsapm.4c00525

Application

Start date: early 2026 / Duration: 4 to 6 months
The internship will take place in the PHOTON team of the Institut de Science des Matériaux de Mulhouse (IS2M - CNRS UMR 7361).

The candidate will be in M2 or engineering school in the fields of physics or physical chemistry, with interest in interdisciplinary and experimental work. Skills/Knowledge in optics (laser) and nanoscience will be appreciated. This internship may be followed by a PhD.

Applications will include a cover letter and a CV, and should be sent to celine.molinaro@uha.fr (deadline: 1st December 2025).