

MASTER FRONTIERS IN CHEMISTRY

OFFRE DE STAGE DE MASTER / INTERNSHIP OFFER

M1 X ET M2 X

2021 - 2022

SUJET DU STAGE / INTERNSHIP SUBJECT:

Advanced hierarchical superstructures of nanoparticles in liquid crystal matrices

SUJET DU STAGE / INTERNSHIP DESCRIPTION (10-15 LIGNES) :

The main objective of this thesis is to build advanced hierarchical superstructures of nanoparticles (NPs) in liquid crystal (LC) matrices and investigate the new optical properties that can be obtained in relation with their structure. In our group at INSP, we pointed out how to create a thin LC film with a large array of oriented linear topological defects [1]. A self-assembly process for the NPs is induced in relation with the localization of the NPs in the topological defects of the LC film [2]. Depending on the size and the concentration of the NPs, a confinement of the NPs in the topological defects occurs leading to NP chains or hexagonal networks of NPs of different localization in the LC matrix. These NP organizations allow for a controlled modification of the individual properties of the NPs. For metallic NPs, for example, the Localized Surface Plasmon Resonance (LSPR) becomes shifted due to the electromagnetic coupling with the neighboring NPs [2]. For semi-conductor NPs, like single-photon emitters, a light emission of controlled polarization is observed [3]. In this internship, we will use gold and fluorescent NPs with different size, form and nature (spheres, dot-in-rods, perovskites...) to build hybrid structures of NPs where the interaction between the different kinds of NPs will be controlled by the LC matrix.

[1] D. Coursault et al., *Soft Matter* 12 (2016) 629

[2] S.-P. Do et al., *Nano Letters* 20 (2020) 1598 ; S.-P. Do, *Frontiers* 7 (2020) 234

[3] L. Pelliser et al., *Adv. Funct. Mat.* 25 (2015) 1719

MOTS-CLES / KEY WORDS: NANOPARTICLES, ASSEMBLY, OPTICAL PROPERTIES, CONFINEMENT, TOPOLOGICAL DEFECTS, LIQUID CRYSTALS

DATES ET DUREE DU STAGE / DATES AND DURATION : DE FEVRIER A FIN JUIN

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