# STUDY OF THE DEFORMATION OF CHIRAL MOLECULES UNDER MECHANICAL STRETCHING THROUGH POLARIZED LIGHT INTERACTION

**LABORATORY :** Institut Lumière Matière

**LEVEL :** M2
**TEAM(S) :** MNP

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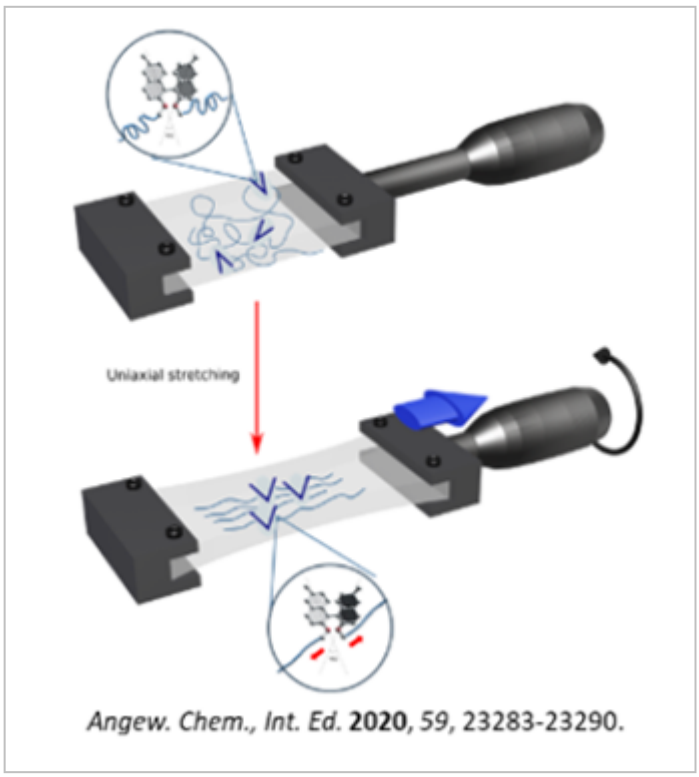
**KEYWORD(S) :** Spectroscopy / Polarimetry / Chiral molecule's conformational tuning

## SCIENTIFIC CONTEXT :

We have recently demonstrated the ability to tune reversibly the internal geometry (i.e. the conformation) of a chiral molecule by grafting it in an elastomer and simply stretching it, as illustrated on the left figure. This seminal work [1] open exciting perspectives because many molecular properties such as color, pH, catalyst reactivity, luminescence ... depend on their molecular conformation.

We want now to have a better understanding of the transmission between the macroscopic force applied on the elastomer and the molecular deformation by investigating different aspects : (i) at the molecular level (way of grafting the molecule to the elastomer, stiffness of the molecule,...) and (ii) at the elastomer level (reticulation, young modulus).

At ILM, we want to develop efficient spectroscopic setups based on the interaction of polarized light with matter, to follow in live, the geometrical deformation of these molecules under stretching of the guest polymer.



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By correlating the different material parameters, the applied stretching force and the deformability of the molecules, relationship will be established leading to the rational design of devices and smart materials development where by a simple mechanical action, different chemical processes can be obtained and tuned in a continuous and reversible way.

## MISSIONS :

The M2 student will be involved in the implementation of high performance optical measurement systems capable to control on-line the geometrical change of chiral probes linked to PDMS elastomers under stretching.

To do so, the first step will be to optimize the whole process by angular orientation automation and force measurement. Then, by using a full Stokes/Mueller analysis, the chiroptical tensor of the molecules as a function of the stretching ratio will be extracted.

SKILLS : The candidate should have a taste for experimental work, taste for computer coding (experimental automation and data analysis) and general knowledge in polarimetry and spectroscopy.

## OUTLOOKS :

PhD thesis financial support available through  ANR grant

## BIBLIOGRAPHY :

[1] Angew. Chem. Int. Ed. 2020, 132 (51), 23483-23490

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