Master *Matière Condensée et Nanophysique*

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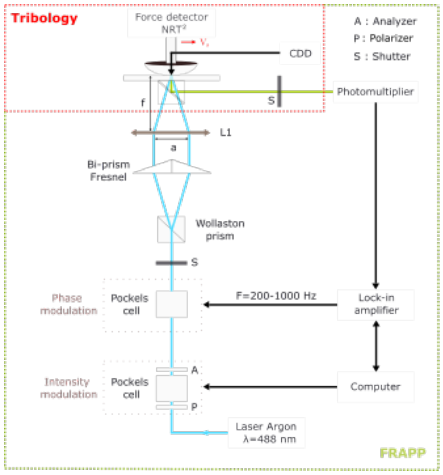
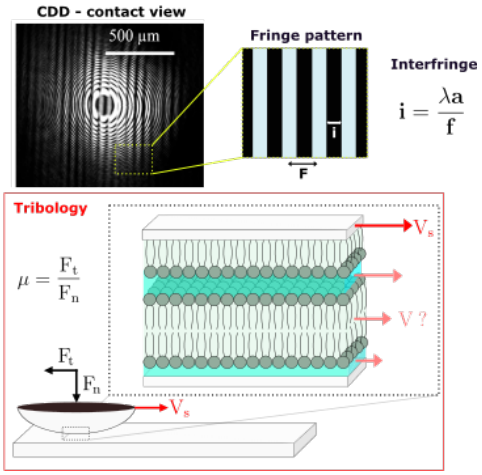
Title : Rheology of charged lipid layer: velocity profile characterization





Abstract: Nature has produced water-based lubricant systems that by far outclass the best man-made devices (Urbakh et al., 2004). Biological contacts such as the articulating cartilage surfaces in human hips or knees often operate under severe conditions (i.e., high load and low speed), which is related to a boundary lubrication regime. In this regime, actual contact between the surfaces can be prevented by boundary lubricant that attaches itself to the solid surfaces due to molecular forces, thereby modifying their tribological properties. This boundary regime is characterized by a very low friction coefficients (μ=0.005–0.02, for the human joint). Phospholipids, the main constituents of cell membranes are critical in these systems.

The present internship project aims to better understand the role of phospholipid layers in biolubrication by associating velocimetry and tribology experiments on well controlled model system. We have developed an original experimental setup, which couples the precise tribological characterization of the system, and the measurement of velocimetry by Fluorescence Recovery After Patterned Photobleaching. Using this setup, we want to address the question of the velocity profile and the localisation of sliding plane. We will focus on the case of charged phospholipids, involving complex electrostatic interactions, which are supposed to strongly modify the tribological properties.

The student will be first introduced to the preparation of supported layer methods available at the MCube group of the Charles Sadron Institute and to use the coupled experimental setup. The Master intern will be fully associated to the scientific activities of the team (seminar, scientific discussion, …) and discussion with partner groups.

Contacts: https://ics-mcube.cnrs.fr/