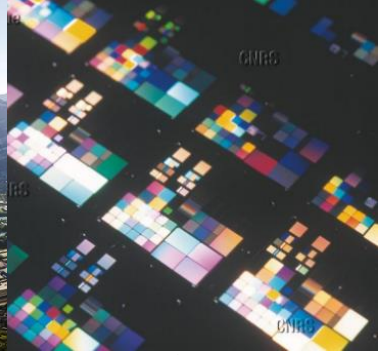


French Master 2 training

Hierarchical structures on micro-lenses

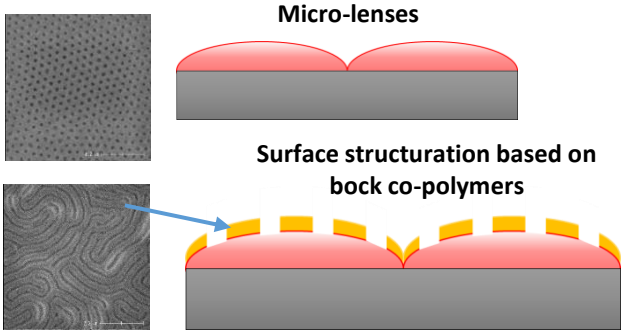
Key words: plasma etching process, micro-lens, copolymers, imagers applications

Context :

In this training, we propose a study on the fabrication of hierarchical micro surfaces, with the aim to mimic natural structures on butterfly eyes. Such kind of surfaces sub-structures can improve the properties of optical lenses. Micro lenses are currently used in the imagers technology to focalize photons on silicon photodiodes. Hierarchical surfaces are expected to increase photon flux transmittance with anti-reflective properties. Also such nanostructurations are known to show super-hydrophobicity, useful as anti-dust or self-cleaning surfaces.

Objective:

During the training, we will develop a new approach for nanostructuring microlenses (CEA patent pending) in an organized manner using deposition, plasma etching and block copolymer lithography techniques. The innovation lies in particular in the choice of deposition processes as well as in the nature of the films to be produced. This approach thus offers a new solution for surface texturing of microlenses, that can be industrialized in a standard clean room.



Starting from organic lenses fabrication using a standard process flow, our first objective is to deposit a stack at the lenses surface, followed by copolymer deposition. The bloc copolymers will serves as a hardmask to transfer a geometric structure on top of the lenses surface. Dots or lines copolymers will be smeared on the surface, and we will see how the geometric transfer is allowed.

The second objective of this internship is to develop appropriate etch recipe to transfer the pattern in the different layers. The stack required for transfer will be achieved on CEA/Leti deposition facilities.

Smearing of copolymers, as well as the etching experiments will be carried out in the LTM's inductive plasma reactor (ICP) located in the CEA/Leti clean room. Numerous characterization techniques will be used before and after transfer: ellipsometry to determine etching speeds as a function of the chosen parameters, scanning electron microscopy (SEM) to evaluate the damages and the quality of the copolymer transfer, and AFM to determine the surface roughness.

Laboratory:
Laboratoire des Technologies de la Microélectronique (LTM/CNRS)
17 avenue des martyrs
38054 GRENOBLE cedex 9

- ✓ Formation: M2
- ✓ 6 months
- ✓ Begining in march 2025
- ✓ Salary: 650 euros/months

How to apply?

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