leti
ceatech
TECHNOLOGY RESEARCH INSTITUTE

2019

Internship Offer

scan me

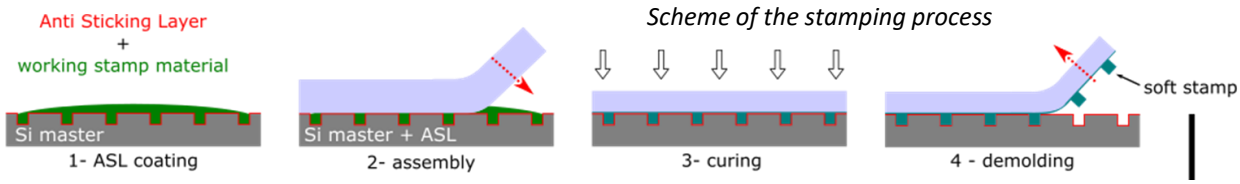
In Grenoble, capital of the french alps, LETI is an institute dedicated to applied research in micro- and nano-technologies, information technologies and technologies for healthcare. LETI is the privileged interface between industry and academia. Through research programs using world-leading technology platforms, it ensures the development and industrial transfer of innovative technologies in a wide range of sectors.

Study of mechanical properties of soft mold for nanoimpression

Keywords: microelectronic, advanced patterning for up to date devices, polymers, atomic force microscopy, nano mechanics

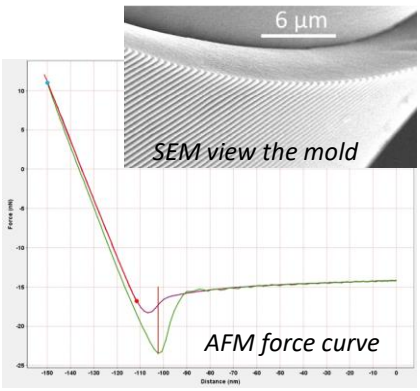
❑ Context

Toward advanced patterning technology, nanoimpression/stamping [1] has been identified as a key process for various devices fabrication like micro displays. It's based on printing a soft mold pattern by direct contact onto a resist.



[1] Menard E., Rogers J.A. (2010) Stamping Techniques for Micro- and Nanofabrication. Bhushan B. (eds) Springer Handbook of Nanotechnology.

Soft molds used in lithography for nanoimpression could reduce the impact of particles on defectivity on a patterning step: its softness could mimic the shape of defect without any impact on structures. Although, the mold pattern must be stiff enough to ensure a moving and flowing of the resist for creating the desired pattern. For instance, if the stiffness is too low, patterns of the soft molds may be deformed (buckling,…) under the stress induced by the contact printing, leading to a bad pattern replication. For optimizing the process, one should determine the dimensions (width vs. height) that could be replicated for a given couple of material (soft mold vs. resist). At now, this determination was performed empirically when the mechanical properties are unknown, or through simulation/computation in the other case. This mechanical characterization could be done on bulk materials or, better, on a material thickness closer to the one used in the real process. At this scale, mechanical analysis need highly spatially resolved tools, such as atomic force microscopy (AFM).



❑ Internship work

- Process soft molds, in the LETI clean room, using both state of art polymer and fabrication tools (toward a strong industrial agreement with a leading company). Candidate will be warmly encouraged to propose improvements on the establish process.
- Analyze mechanical properties of molds by AFM through force curve acquisition. Data will be treated via specific software to determine the elastic modulus, the surface adhesion, as well as the material deformation. The characterization protocol will be settled & optimized by the candidate (choice of AFM tip stiffness, sample preparation and storage, etc.). If needed, mechanical analysis could be completed by other characterizations such as DSC under UV, surface energy, XPS, Tof-SIMS at the devices and materials characterization Service (SCMC) from silicon technology Department (DTSI).

Laboratory : LETI/DTSI/SCMC
Contacts: Nicolas Chevalier / Hubert Teyssedre
nicolas.chevalier@cea.fr / Hubert.TEYSSEDRE@cea.fr

Formation Requise: M2 ou 3e année Ingénieur
Durée: 6 mois
Démarrage: March 2019