Light scattering in complex photonic surfaces

Surface patterning is known to add new physical properties to bulk material leading to numerous applications (self-cleaning surfaces [1], haptics, and friction). But it also changes the macroscopic appearance of the surface, which nowadays becomes relevant parameter in science and industry [2]. There are numerous examples of natural objects with stunning appearance, provided by fine variation of optical properties (several at once: reflection, transparency and color) under the change in lightning. These remarkable properties originate from light interaction with complex multi-scale photonic structures. In order to reach such “natural aesthetics” in artificial objects, complex patterning with several degrees of freedom must be applied.

SVI lab is specialized in surface coatings and surface patterning. Apart the facilities for thin films fabrication (magnetron sputtering, liquid-based approaches), we have also developed in the lab a flexible fabrication process to make controlled engineered surfaces based on patterning at the nanometric to micrometric scales (nano-impression) (Fig 1) [1]. Moreover, we have recently expanded our patterning techniques towards controlled deposition of organized metallic objects through solid-state dewetting (Fig 2) [2].

The PhD will consist in combining various elaboration techniques (Fig 1, 2) developed in our laboratory to make complex multi-scale photonic structures and study the light scattering and other their optical properties [3]. The quality and physical dimensions of our complex systems will be examined with Near-Field Microscopies (STM/AFM) and optical interference microscopy. The results will be brought in relation with existing models and numerical simulations.

The student will benefit from an in depth experience in surface modification technologies and optical phenomena in a mixed academic industrial environment.


Contact: Jérémie TEISSEIRE, Iryna GOZHYK, Emmanuelle GOUILLART
Phone: +33 1 48 39 55 09 (J. Teisseire), +33 1 48 39 55 57 (I. Gozhyk)
e-mail: jeremie.teisseire@saint-gobain.com, iryna.Gozhyk@saint-gobain.com