Laboratoire PPSM – UMR CNRS 8531

Photochimie et Photophysique Supramoléculaires et Macromoléculaires

Séminaire PPSM

Mardi 9 janvier 2018 - 11h00

Auditorium D. Chemla - Bâtiment IDA

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«Functional materials for astronomical instrumentation»

Both telescopes and their instrumentation are featuring a strong increase in their complexity due to the larger sizes and demanding performances required by the new exciting scientific cases to be faced. The development of innovative materials and processes is a key strategy to reduce the complexity while keeping or improving the performances. In this framework, we are developing functional organic materials to be used in different kinds of optical elements, namely diffractive, refractive and reflective.

Photochromic materials, thanks to the light-triggered reversible change of optical properties, have been studied for making an adaptable and rewritable platform for computer generated holograms (CGHs). The CGHs are useful for the metrology of complex optical system through interferometry. The change in the refractive index that accompanies the change in color can be also exploited for making rewritable phase modulating elements and optical waveguides. With a similar approach, focal plane masks for astronomical multiobject spectroscopy have been developed.

Materials showing a modulation of the refractive index, in particular photopolymers, have been developed to produce Volume Phase Holographic Gratings, which are dispersing elements characterized by a very large diffraction efficiency. Thanks to the tunable properties of the photopolymers, non-conventional grating structures have been implemented.

Photoconductive materials can be applied in the development of innovative deformable mirrors used to improve the optical performances of imaging devices (microscopes and telescopes). Indeed, the photoconductor, by means of a suitable illumination, behaves as a multiactuator deformable mirror (usually piezoelectric or electromagnetic) without “real” actuators. Following such approach, it is possible to simplify the structure of deformable mirrors and to tailor the size, shape and number of virtual actuator according to the final application.

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