Photo-Patterning of Optically Active Nano-Fibers on Surfaces with Control of Orientation and Position or Color

Leire Gartzia-Rivero, Philip Schäfer, Christiaan de Vet, Guillaume Raffy, André Del Guerzo

[1] *Université de Bordeaux, Institut des Sciences Moléculaires UMR5255 CNRS, 351 cours de la Libération, 33400, Talence, France*

E-mail: andre.del-guerzo@u-bordeaux.fr

The organization and patterning of optically active nanostructures on transparent surfaces is proposed using a photo-synthetic approach based on light-triggered self-assembly. Using focussed laser irradiation, the self-assembly of a small molecule gelator (DDOA, 2,3-didecyloxyanthracene) into fluorescent nanofibers can be spatially and temporally controlled at the surface. The photocleavage of a soluble precursor can be triggered by visible light at 473 nm or two-photon excitation. A confocal microscope set-up is used to write spatially defined nanostructures and image the occurring processes (Figure 1a). Patterning lines and rectangles occurs with a separate control of the nucleation and the growth by laser-scanning and successive wide-field illumination. The patterned nanofibers emit linearly polarized emission. The technique provides also the unique possibility to pattern juxtaposed anisotropic micrometric patches of aligned nanofibers on an isotropic surface. In addition, the orientations of each pattern can be individually controlled by the irradiation scheme.

Furthermore, we propose FRET-assisted photo-patterning as a strategy for a sub-micrometer scale color-tuning in self-assembled fluorescent nanoribbons formed by 2,3-dihexadecyloxy-9,10-diphenylanthracene. The effective incorporation of guest-molecules that function as FRET-acceptors allows high energy transfer efficiencies, giving rise to a macroscopic modification of the emission color. Based on the same principle a simultaneous negative and positive laser-writing is feasible upon photo-oxidation of the acceptor molecules. This allows individual ribbons to be color-tuned locally at the microscopic level (Figure 1b).

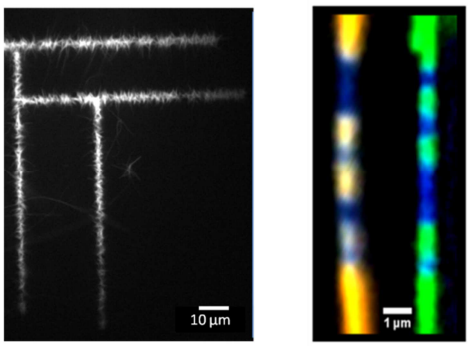

Figure 1: a) Lines of DDOA fibers obtained by repetitive line scans in xy and yx direction with a focused laser. Scale bar is 10 µm. b) Hyperspectral maps of an orange and a green ribbon patterned in presence of ambient oxyen.

Funding: EC Marie Curie ITN project SMARTNET