Functional polymer nanofibers for photonics, nanoelectronics and biotechnology

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Functional polymer micro- and nanofibers are novel structures, exhibiting smart physico-chemical properties, with applications ranging from liquid and air filtration, tissue engineering, regenerative medicine, sensing, photonics, nanoelectronics. Technologies for producing polymer fibers are rapidly evolving from the production of inert nanofibers materials to more specialized, functional and multi-functional nanofibers. The nanostructure capabilities range from conduction properties to light-sensing, from promoted cellular differentiation to enhanced mechanical, thermal and anisotropy properties. Here results and perspectives of our research on functional fibers are presented, focusing on hybrid fabrication approaches (electrospinning, nanoimprinting, soft lithography, two-photon lithography and together with novel perspectives opened by biomineralization) and complementary applications of polymeric and biological fibers. Demonstrators include field-effect transistors, polarized light-emitters, lasers, smart controllable surfaces, waveguides and bioactive systems.

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