Flexible optoelectronic and information processing devices

Imagine world where electronic device surround us in a way you cannot even see them – they are integrated processing units, LED displays into ordinary objects. If you think that is far future, think again. Necessary technological advancement can be done in just under several years from now. In our opinion, the main task should be to investigate and apply large area spatial (2D and 3D) organization with sub-micrometer resolution on flexible polymeric substrates.

In proposed project Principal Investigator (PI), alongside with scientific team is going to develop cutting-edge methods towards nanodevice design and assembly. We will investigate different force field gradients that should improve construction of electronic devices on predefined shapes (by the means of lithography). Among directed assembly strategies PI is going to explore more specific interactions between functionalized polymeric (flexible) surfaces and nanostructures (nanoparticles, nanorods, etc). We also plan to investigate contact electrification phenomenon on different insulating materials and its ability to induce material directed arrangement. Assembly of nanostructures will take place due to chemical reduction, electrostatic attraction, magnetic field gradients or by combination of all these factors. To set an example – polymer stamped set of lines on dielectric flexible surface, when inserted into metal ion solutions will generate conductive layer of metallic nanoparticles. These can next act as electrode layer for optoelectronic device – such as quantum dot based displays.

The outcomes of the project will unite set of materials and methods that will allow for design both architecture and function of electronic devices. Joint of all of these factors will allow to produce nanostructured devices with very good quality by even unskilled users.