# Light manipulation of nanoparticles arrays designed by topological defects

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Manipulation of nanoparticles (NPs) is of increasing interest in fields such as biotechnology, nanophotonics and material sciences. It enables several lab-on-a-chip solutions for sensing, imaging, drug delivering, etc. [1,2]. Different approaches [3,4] have been proposed to assemble NPs in a variety of environments that are able to control their interaction (electrostatic, magnetic, etc.). Actual applications for NPs manipulation mainly involve optical tweezers [5], that able to control single NP with a range typically restricted to the micro-scale. However, the capability to assemble and to manipulate NPs at large range remains challenging. Here we report a strategic approach based on using topological defects (TDs), i.e. disclination lines created in anisotropic chiral soft matter. We demonstrate that TDs can efficiently trap NPs thus forming a chain of NPs and one can move NP chains in a wide range of distances (up to centimeters) by manipulating TDs with low power incoherent light (see Figure). The chirality of anisotropic medium is introduced both by the boundary architecture and by a photosensitive chiral dopant. The first one permits to design the TD templates, the second to move NPs-charged TD lines without disrupting them. Large angle rotation, translation and deformation of light-emitting chains of quantum dots are demonstrated using LED illumination. Full reconfigurability and time stability make this strategy attractive for future developments and practical applications.

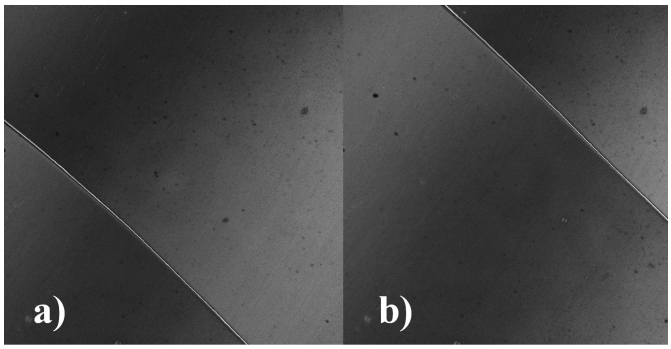


Figure. LED controlled movement of single NPs stripe. The figures display a QDs-rich TD line made in confocal fluorescent microscope. Image a) corresponds to initial position of QDs chain, when image b) shows the its shift while LED irradiation.

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