Organized planar nanostructures via interfacial self-assembly and DNA templating

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The objectives of nanotechnology are development of new materials and nanofabrication techniques with efficient control of composition and organization of functional nanocomponents and with ability to make products inexpensively, in a parallel fashion, and, preferably, at ambient or ecologically-friendly conditions. Due to the unique structure and physical-bio-chemical properties DNA (deoxyribosenucleic acid) molecules are promising building blocks and nano-templates for controllable fabrication of various nanostructures. Recently, we have obtained new interfacially-assembled DNA/amphiphilic polycation complexes which were used to form new planar nanoscale-organized polymeric and composite nanostructures [1]. In this contribution we report on the formation of novel nanoscale-organized DNA complexes with highly-luminescent CdSe nanorods (about 3 nm in diameter and 25 nm in lenght) by interaction of predeposited planar DNA/amphiphilic polycation complexes with bulk phase colloidal cationic CdSe nanorods via interfacial ligand exchange and self-organization processes. The obtained planar DNA/CdSe nanorod complexes represent a new class of highly-organized bio-inorganic nanostructures in which nanorods are organized as oriented collinear monorod strings and filamentary structures of about micrometer lenght and tens nanometer in diameter. Unidirectional linear orientation of nanorods in the filamentary complexes resulted in their interesting optical and electronic properties including strong linearly-polarized photoluminescence.

[1] G.B. Khomutov, M.N. Antipina, A.N. Sergeev-Cherenkov, T.V. Yurova, A.A. Rakhnyanskaya, V.V. Kislov, R.V. Gainutdinov, A.L. Tolstikhina, Mat. Sci. Eng. C., 23 (2003) 903.

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