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Surface Modified Quantum Dots for Nanophotonics, Stereolithography and Hybrid Systems for Biomedical Studies

Authors : Redouane Krini, Lutz Nuhn, Hicham El Mard Cheol Woo Ha, Yoondeok Han, Kwang-Sup Lee, Dong-Yol Yang, Jinsoo Joo, Rudolf Zentel

Abstract : To use Quantum Dots (QDs) in the two photon initiated polymerization technique (TPIP) for 3D patternings, QDs were modified on the surface with photosensitive end groups which are able to undergo a photopolymerization. We were able to fabricate fluorescent 3D lattice structures using photopatternable QDs by TPIP for photonic devices such as photonic crystals and metamaterials. The QDs in different diameter have different emission colors and through mixing of RGB QDs white light fluorescent from the polymeric structures has been created. Metamaterials are capable for unique interaction with the electrical and magnetic components of the electromagnetic radiation and for manipulating light it is crucial to have a negative refractive index. In combination with QDs via TPIP technique polymeric structures can be designed with properties which cannot be found in nature. This makes these artificial materials gaining a huge importance for real-life applications in photonic and optoelectronic. Understanding of interactions between nanoparticles and biological systems is of a huge interest in the biomedical research field. We developed a synthetic strategy of polymer functionalized nanoparticles for biomedical studies to obtain hybrid systems of QDs and copolymers with a strong binding network in an inner shell and which can be modified in the end through their poly(ethylene glycol) functionalized outer shell. These hybrid systems can be used as models for investigation of cell penetration and drug delivery by using measurements combination between CryoTEM and fluorescence studies.

Keywords : biomedical study models, lithography, photo induced polymerization, quantum dots
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