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ABSTRACTS

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- Organic Devices, Molecular Electronics
- Fabrication Technique and Characterization
- Liquid Crystals, Polymers, and Other Soft-Materials
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Organic-based hybrid nanostructures and their bio/optical applications

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Functional hybrid nanotubes (NTs), nanowires (NWs), and nanoparticles (NPs) of light emitting polythiophene (PTh) derivatives and MEH-PPV, with inorganic materials, were fabricated. The hybrid nanostructures were visualized and confirmed through SEM, TEM, and HR-TEM. The enhanced photoluminescence (PL) efficiency in nanoscale was determined through laser confocal microscope (LCM) PL measurements with a high spatial resolution. The LCM PL intensity of a single strand of the PTh/metal hybrid NTs increased up to ~100 [1]. We found that the nanoscale LCM PL intensities of poly (3-methylthiophene) (P3MT) based-hybrid NTs remarkably increased up to ~350 times as the doping levels of the P3MT NTs increased [2]. For MEH-PPV NPs, the increase of the LCM PL efficiency after the adsorption of the Au NTs was also observed. We analyze that the huge enhancement of LCM PL of the light-emitting polymer based-hybrid nanostructures might originate from energy transfer and/or charge transfer in a surface plasmon resonance (SPR) coupling, supported by ultraviolet and visible absorption spectra. By using the light-emitting polymer nanostructures, we directly detected the variation of luminescence color and intensity through the attachment of the probe and target DNAs on the light-emitting polymer nanostructures. We fabricated light-emitting bar-code NWs through a sequentially electrochemical synthesis of polymers' nano-compartments. The color CCD images and LCM PL spectra of the light-emitting bar-code NWs are presented and discussed.

[1] J. Joo, D. H. Park, *et al.*, Advanced Materials 19, 2824 (2007).
[2] D. H. Park, J. Joo, *et al.*, Advanced Functional Materials 18, 2526 (2008).