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ABSTRACTS

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Luminescence Characteristics and Modulation of Multi-Dimensional Organic Rubrene Nanostructures

Jin Woo Lee[1], Jin Sun Jung[1], Seong Gi Jo[1], Hyun Soo Lee[2], Jeongyong Kim[2], Jinsoo Joo*[1]

[1] *Department of Physics, Korea University, Seoul 136-713, Korea*

[2] *Department of Physics, University of Incheon, Incheon 406-772, Korea, jjoo@korea.ac.kr*

Multi-dimensional rubrene nanostructures such as nanoparticles (NPs), nanorods (NRs), nanoribbons (NBs), and nanosheets (NSs) were fabricated by using organic vapor deposition method. We compared the nanoscale luminescence properties of multi-dimensional rubrene nanostructures by using high-resolution laser confocal microscope photoluminescence (PL) measurements. The luminescence characteristics of two-dimensional rubrene NS varied with the crystalline domain direction, indicating intrinsic PL anisotropy, which was distinguishable from other low-dimensional rubrene nanostructures. The PL anisotropy was strongly correlated to the anisotropic charge mobility in the rubrene NS-based field-effect transistors (FETs). The optical waveguiding properties of rubrene nanostructures were also dependent on the dimensionality of rubrene nanostructures. Also, the modulation of luminescence characteristics by electric field was observed through the control of source-drain and gate voltages using a rubrene single NS-based FETs patterns. We observed that PL intensity of rubrene NS was enhanced on the Au electrode due to the surface plasmon resonance (SPR) coupling.