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Electronic Properties of Carbon Based Materials

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## Comparison of Rubrene Nanowires and Single crystals

Jin Woo Lee, Kihyun Kim, Jin Sun Jung, Seong Gi Jo, and Jinsoo Joo\*

Hybrid Nanostructure Research Lab, Department of Physics, Korea University,  
Seoul 136-701, Korea

jjoo@korea.ac.kr

We report on the growth of light emitting rubrene nanowires array with diameters of  $200 \pm 10$  nm by using organic vapor transport. Photoluminescence (PL) spectra including laser confocal microscope (LCM) PL spectra in nanometer scale and crystalline structures of the rubrene nanowires were compared with those of rubrene single crystals prepared in the same experimental conditions without the template. We observed that LCM PL spectra and intensity of rubrene nanowire and its single crystal varied with the detecting positions in the nanometer scale, because of crystal growth characteristics of the rubrene molecules. A single rubrene nanowire had the wider PL band width than that of rubrene single crystal, which might have originated from the light emission of the mixed polarized bands due to the additional new crystallinity in the form of nanowires. From the current-voltage ( $I$ - $V$ ) characteristic curves, semiconducting nature of both the rubrene nanowires and its single crystals was observed. The optical properties of the hybrid rubrene nanowire attached Au nanoparticles were also compared with those of the rubrene nanowire through LCM PL spectra.