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Nanometer-scale Light Emission Characteristics of Poly (3-alkylthiophene) (P3AT) Nanowires

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Polythiophene (PTh) and its derivatives such as Poly (3-methylthiophene) (P3MT) and Poly (3-alkylthiophene) (P3AT) nanowires were synthesized through electrochemical polymerization method by using anodic aluminum oxide (Al₂O₃) nanoporous template.¹ Among the P3AT, poly (3-butylthiophene) (P3BT) and poly (3-hexylthiophene) (P3HT) were selected due to excellent optical and electrical property. From a scanning electron microscope and a transmission electron microscope photographs, the formation of P3AT nanowires were observed with diameters and length of ~200 nm and 20 µm, respectively. To discern the structural and optical properties, FT-IR, micro Raman, and UV/Vis absorbance spectra were measured. From the home made laser confocal microscope (LCM) photoluminescence (PL) experiments of the single strand the P3AT nanowires,²⁻³ the nanometer-scale PL characteristics of the P3AT nanowires were investigated. In the color charged coupled devices (CCD) image results, the luminescence colors of the single strand of the PTh and P3AT nanowires were observed from green light emission (PTh and P3MT) to yellow light emission (P3BT and P3HT), as shown in Fig 1. From the LCM PL experiment, the P3BT single nanowire was observed relatively brighter light emission than other nanowires.

![Figure 1. Luminescence color images of (a) PTh and (b) P3HT single nanowire](image)

References