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Structural and Optoelectronic Characteristics of the Copper Phthalocyanine Rectangular Nanotubes

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We present for the structural transformation of organic copper phthalocyanine (CuPc) nanowires to hollowed rectangular nanotubes through the use of a hydrothermal process. Through reaction with trifluoroacetic acid in chloroform solution, the CuPc molecules have been chemically self-assembled into a form of nanowires. The mechanism of the chemical self-assembly for the CuPc nanowires is studied through analyzing the Fourier transform infrared spectra. After the hydrothermal process, it is observed that the α-phase CuPc nanowires are transformed to β-phase CuPc rectangular nanotubes. The crystalline of the CuPc nanowires is enhanced by annealing. Above these results are confirmed from the X-ray diffraction patterns. The optical and electrical characteristics of the β-phase crystalline CuPc rectangular nanotubes are compared with those of α-phase CuPc nanowires, using ultraviolet and visible absorption spectra and current-voltage (*I-V*) characteristics. Because of the relatively strong π-π interaction between the CuPc molecules, the higher charge carrier mobility have been observed in the β-phase CuPc crystalline rectangular nanotube transistor, compared with the self-assembled α-phase CuPc nanowire transistor.