The International Symposium on Carbon Electronics (ISCE) 2010

May 03 (Mon) – 04 (Tue)

2010

Seoul National University

Seoul, Korea

[P-19]

Direct DNA detection using a poly (3-methylthiophene) single nanowire

Dong Hyuk Park[1,2], Chunzhi Cui[2], Woo Jeong Kim[2], Young Ki Hong[1], Dae-Chul Kim[3], Jeongyong Kim[3], Dong June Ahn[2]*, and Jinsoo Joo[1]*

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

[2] *Department of Chemical and Biological Engineering, Korea University, Seoul 136-713, Korea.*

[3] *Department of Physics, University of Incheon, Incheon 402-749, Korea.*

* e-mail: jjoo@korea.ac.kr (J. Joo) and ahn@korea.ac.kr (D. Ahn)

Direct DNA detection is presented using a light-emitting poly (3-methylthiophene) (P3MT) single nanowire (NW). The probe DNAs (*p*-DNAs) were easily attached to the P3MT NWs through electrostatic interaction between the negative counter-ions and the terminal amine (NH^{3+}) group attached at the end of the *p*-DNA. After the functionalization *p*-DNA and their label–free recognition of target DNAs (*t*-DNAs) onto the surface of P3MT NWs, the light-emitting color and intensity of a P3MT single NW were dramatically changed due to the conformational changes of the P3MT main chains and fluorescence resonance energy transfer. We observed color change of a P3MT single NW from green to red after attaching the *p*-DNA, and then luminescence intensity of a single P3MT/*p*-DNA NW was dramatically enhanced by hybridizing *t*-DNA. The conformational changes of the P3MT main chains due to attaching *p*-DNA were investigated ultraviolet-visible absorption and confocal Raman spectra. The enhanced PL of the P3MT/*p*-DNA+*t*-DNA can be explained in terms of the dopant-mediated fluorescence resonance energy transfer effect.