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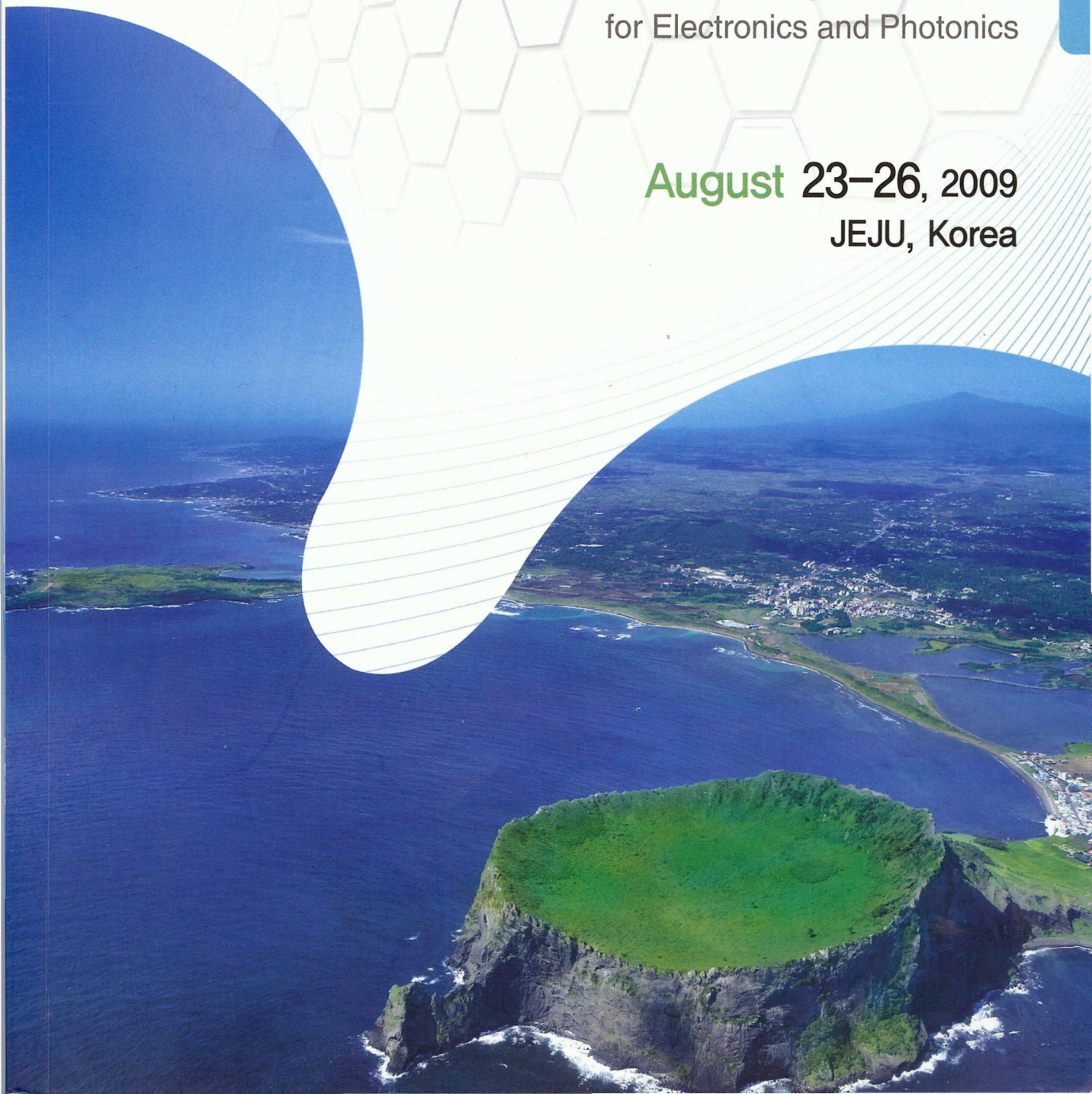


Photo-responsive electrical characteristics of a single strand of hybrid multi-walled carbon nanotube coated with poly (3-hexylthiophene)

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We fabricated hybrid coaxial nanotubes consisting of multi-walled carbon nanotube (MWCNT) coated with light-emitting poly (3-hexylthiophene) (P3HT). MWCNTs were grown by thermal chemical vapor deposition on a SiO₂/n-Si substrate, and *p*-type P3HT material was electrochemically deposited with thickness of ~20 nm onto the MWCNT surface. The hybrid coaxial nanotubes of the P3HT/MWCNT were visualized through the transmission electron microscope. The UV/Vis absorption and Raman spectra for the P3HT/MWCNT nanotubes clearly showed characteristic peaks of the MWCNT and the P3HT material. The photoluminescence (PL) intensity of the P3HT/MWCNT nanotubes was quenched as compared with that of the P3HT because of charge transfer effect between the MWCNT and the P3HT. For electrical characterization of the single strand of P3HT/MWCNT nanotube, three types of 2-probe electrodes were selectively fabricated between outer P3HTs, between inner MWCNTs, and between outer P3HT and inner MWCNT, through the electron beam lithography and etching technique as shown in Fig. 1. The current-voltage (*I-V*) characteristics showed the semiconducting behavior between outer P3HTs, and the ohmic behavior between inner MWCNTs, respectively. The *I-V* characteristics between the P3HT and the MWCNT showed the diode behavior, and it was clearly increased when the UV light was irradiated onto a single strand of the P3HT/MWCNT nanotube. From these results, we discuss photo-responsive electrical characteristics for a single strand of the hybrid coaxial nanotube.

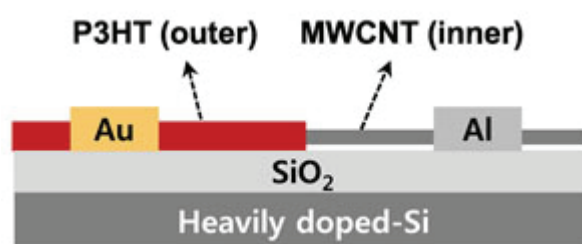


Figure 1. Schematic diagram for electrical characterization of the single strand of P3HT/MWCNT nanotube.

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