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Fine control of physical properties of light-emitting polymer nanomaterials through focused electron-beam

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We report on the effects of focused electron (E)-beam irradiation on the optical properties of π-conjugated polymer nanomaterials. π-Conjugated, and light emitting poly (3-methylthiopnehe) (P3MT) nanotubes and nanowires were synthesized through the electrochemical polymerization method. Focused E-beam generated from E-beam lithography instrument was irradiated on the partial and intended area of single strand of P3MT nanomaterial. To discern conformational changes due to the E-beam irradiation, Raman spectra of the pristine and E-beam treated P3MT nanomaterials were compared in the conditions of E-beam irradiation. From the laser confocal microscope (LCM) photoluminescence (PL) images and spectra for the single strands of P3MT nanotubes, we observed the significant red-shift of LCM PL peaks and enhancements in the LCM PL intensity of P3MT nanotubes through relatively high energy E-beam irradiation. We suggest that the variation of physical and optical properties of light-emitting polymer nanomaterials might have originated from conformational change and dedoping effect, produced by the E-beam irradiation.