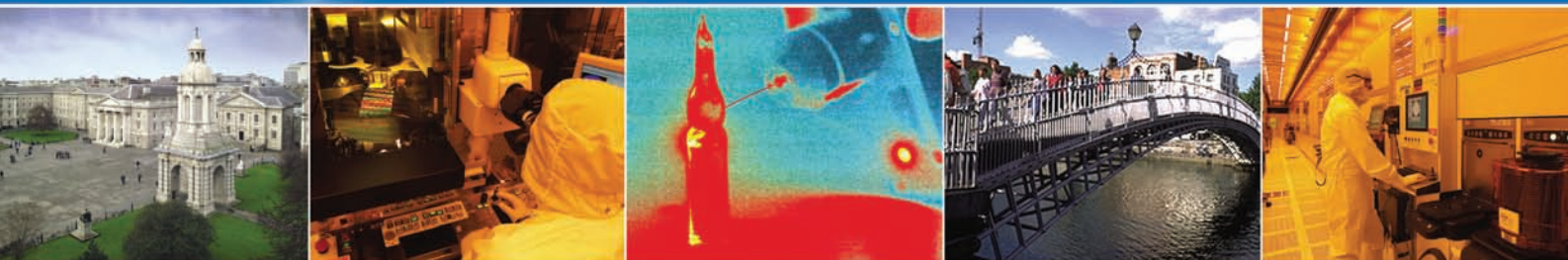


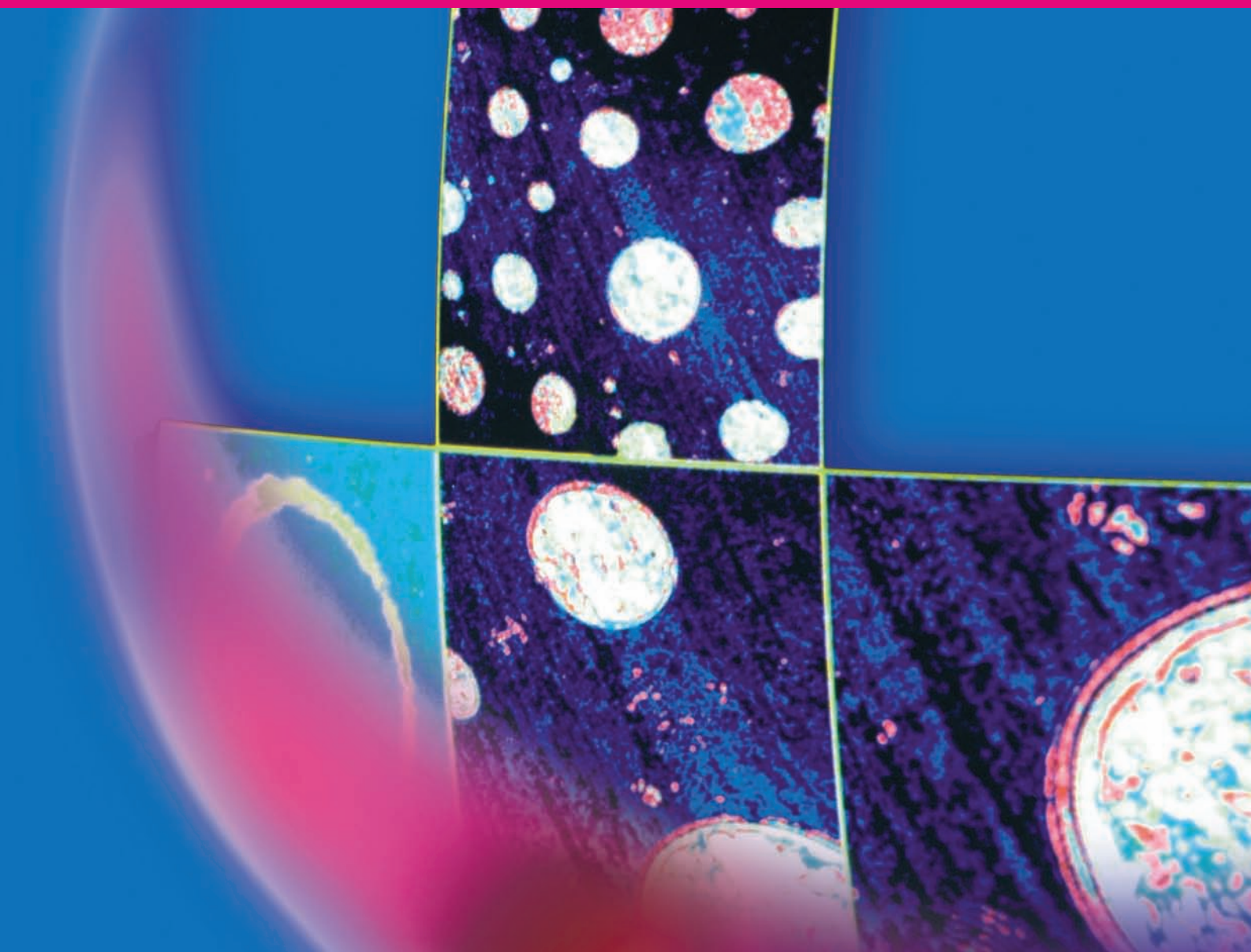
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Hybrid Nanotubes, Nanowires, And Nanojunctions Using π -Conjugated Polymers: Characteristics And Applications

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Hybrid double-walled nanotubes (HDWNTs) of light emitting polythiophene (PT) or poly (3-methylthiophene) (P3MT), and conducting polypyrrole (PPy), enveloped by ferromagnetic nickel (Ni) or metallic copper (Cu) nanotubes were synthesized through electrochemical method by using nanoporous anodic aluminum oxide (Al_2O_3) template. From experiments of high-resolution transmission electron microscope (HR-TEM), scanning electron microscope (SEM), and X-ray diffraction (XRD), we observed the formation of the HDWNTs of the (semi) conducting polymers and Ni or Cu. The thickness of Ni and the PT layers of the PT/Ni HDWNTs was both ~ 10 nm. The variations of photoluminescence (PL) characteristics including UV/Vis absorption spectra and of the anisotropic remanent magnetization for the PT/Ni and P3MT/Ni HDWNTs due to the hybrid-junction between the π -conjugated polymers and the ferromagnetic Ni were observed. Using confocal microscope, the PL of single strand of P3MT/Ni and P3MT nanotube are compared. The nanotubes of light emitting poly (3-hexylthiophene) (P3HT) were also synthesized through the same method. The optical and structural properties of the P3HT nanowires are presented. We present the applications of the HDWNTs based on PT and its derivatives to electrical and optical devices. The hetero-nanojunction of π -conjugated polymers using poly(3,4-ethylenedioxythiophene) (PEDOT)-PPy and PEDOT-PT were fabricated through sequential electrochemical polymerization method based on the Al_2O_3 template. To discern the formation, structure, and optical properties of the hetero-nanojunctions of the systems, we used SEM, TEM, FT-IR, and UV/Vis spectra. From the I - V characteristic curves, hetero-nanojunctions π -conjugated polymer nanowires shows a rectification effect.

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