Thienoisoindigo -Based Semiconductor Nanowires Assembled with 2-Bromobenzaldehyde via Both Halogen and Chalcogen Bondings and Their Application to Organic Field-Effect Transistors

노주란, 정성우[1], 구동건, 김경식[1], 신태주[1],
최경순[2], 양창덕[1], 박주현†
중앙대학교; [1]UNIST; [2]KBSI
(jpark@cau.ac.kr†)

We fabricated nanowires of a conjugated oligomer and applied them to organic field-effect transistors (OFETs). The supramolecular assemblies of a thienoisoindigo-based small molecular organic semiconductor (TIIG-Bz) were prepared by co-crystallization with 2-bromobenzaldehyde (2-BBA) via a combination of halogen bonding (XB) between bromide in 2-BBA and electron-donor groups in TIIG and chalcogen bonding (CB) between aldehyde in 2BBA and sulfur in TIIG-Bz. It was found that 2-BBA could be incorporated into the conjugated planes of TIIG-Bz through XB and CB pairs, thereby enlarging π-π stacking area between the conjugated planes. As a result, the driving force for one dimensional growth of the supramolecular assemblies was significantly enhanced. TIIG-Bz/2-BBA nanowires could be applied to fabricate OFETs that presented significantly enhanced charge transfer mobility in comparison to OFETs based on TIIG-Bz thin films and TIIG-Bz-only nanowires, suggesting the usefulness of nanowire fabrications simultaneously employing both XB and CB.