Development of Air-Stable *n*-Type Polymers Based on Naphthalenediimide and Their Application in Organic Field-Effect Transistors

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Many scientists have developed high-performance semiconducting polymers since organic materials were applied as an active layer in organic field-effect transistors (OFETs). However, development of *n*-type polymers has been difficult compared to *p*-type polymers because of vulnerable air stability. Air stability of *n*-type polymers can be enhanced by substituting fluorine atoms in polymer backbone to lower lowest unoccupied molecular orbital (LUMO) energy level. Poly{*N*,*N*-bis(2-octyldodecyl)-1,4,5,8-naphthalenedicarboximide-2,6-diyl]-*alt*-5,5′-(2,2′-bithiophene)} (P(NDIOD-T2)) has been reported as high-performance n-type polymer. In our work, P(NDIOD-T2F*y*)s, where part of bithiophene was fluorinated, were synthesized and estimated their electrical performance and air stability (y = 0, 30, 50, 70, 100). The OFETs based on the polymers with higher ratio of fluorinated bithiophene exhibited remarkable lifetime compared to those based the polymers with lower ratio.