Oligo(Ethylene Glycol)-Based n-Type Polymers For High-Performance And Eco-Friendly Organic Electrolyte-Gated Transistors

정다현, 김민제[1], 이승진, 이진우, 김영웅, 조정호[1], 김범준†
한국과학기술원; [1]연세대학교
(bumjoonkim@kaist.ac.kr†)

Replacing toxic processing solvents with greener ones is one of the most pressing challenges for commercialization of electronic devices beyond industrial regulations. However, even green solvents such as toluene, xylene, and THF show definite harmfulness to both environment and human body. Herein, we fabricated water/ethanol-processed n-type organic electrolyte-gated transistors (OEGTs), utilizing naphthalene diimide-thiophene (NDI-T)-based polymers with the different side chains. To impart the ease of processability in the mixture of ethanol and water, branched oligo ethylene glycol (OEG) side chains were attached to the NDI backbone. Depending on the length of side chains, aggregation behaviors and crystalline characteristics of the polymers could be systematically controlled. As a result, the highest electron mobility of 0.1 $cm^2 V^{-1} s^{-1}$ was obtained in P(NDITEG-T)-based OEGTs, which is among the best performances of n-type aqueous-processed organic transistors reported before. These results obviously demonstrate the applicability of aqueous-soluble polymers in the eco-friendly manufacture of electronics