TF-P023

Fluorescence Switching of Conjugated Polyelectrolyte based on Polydiphenylacetylene

W. E. Lee[1], J. H. Kim[1], T. Sakaguchi[2], G. Kwak[3], C. L. Lee[1]

[1]Advanced Photonics Research Institute (APRI), Gwangju Institute of Science and Technology (GIST), Gwangju 500-712, Korea, [2]Department of Materials Science and Engineering, Graduate School of Engineering, University of Fukui, Bunkyo, Fukui 910-8507, Japan, [3]Department of Polymer Science, Kyungpook National University, Daegu 702-701, Korea

Polydiphenylacetylene (PDPA) derivatives are a class of conjugated polymer that contain intramolecular excimer emission originating the intramolecular stack structure. In contrast with conventional conjugated polymer, the fluorescence property of PDPA significantly depends on the intramolecular stack structure. In this regard, herein, we investigated new fluorescence switching mechanism of conjugated polyelectrolyte (CPE) based on PDPA. The developed CPE showed relatively weak fluorescence emission in water, while the polymer exhibited a great fluorescence amplification behavior by electrostatic complex with proteins. In addition, the CPE is highly sensitive to binding with a little protein despite of turn-on type fluorescence response. We found that the fluorescence switching of the CPE closely relate to a perturbation of the intramolecular stack structure. The new fluorescence switching mechanism of the CPE is very useful for protein assays and discrimination and it also would be provide new sensing approaches as basic sensing mechanism.

TF-P024

Isoindigo Based Small Molecules for High-Performance Solution-Processed Organic Photovoltaic Devices

W. Elsawy[1,2,5], C.-L. Lee[3], S. Cho[4], S. H. Oh[5], S. H. Moon[6], A. Elbarbary[7], Jae-Suk Lee[1,2]

[1]Department of Nanobio Materials and Electronics and School of Material Science and Engineering, [2]Research Institute for Solar and Sustainable Energies (RISE), [3]Advanced Photonics Research Institute (APRI), [6]School of Environmental Science and Engineering, Gwangju Institute of Science and Technology (GIST), Gwangju 500-712, [4]Departments of Physics and EHSRC, University of Ulsan, Ulsan 680-749, [5]Radiation Research Division for Industry & Environment, Korea Atomic Energy Research Institute (KAERI), 580-185, Korea, [7]Department of Chemistry, Faculty of Science, Tanta University, Tanta 31527, Egypt

Solution processed organic photovoltaic devices have relatively less attention compared to polymer photovoltaic devices even though they have high possibility to be developed because they have both advantages of polymer and organic, such as solution processable, no synthetic batch dependence of photovoltaic performance, high purity and high charge carrier mobility as well as relatively high efficiency (~7%). In addition, solution processed organic photovoltaic devices have an advantage of easiness to study the relationship between the molecular structure and photovoltaic performance due to its simple structure. In this work, five isoindigo based low band gap donor-acceptor-donor (D-A-D) small molecules with different electron donating strength were synthesized for investigating the relationship between the molecular structure and photovoltaic performance, especially, investigating the effects of different electron donating effect of donor group in isoindigo backbone to photovoltaic device performance. The variation of electron donating strength of donor group strongly affected the optical, thermal, electrochemical and photovoltaic device performances of isoindigo organic materials. The highest power conversion efficiency of ~3.2% was realized in bulk heterojuction photovoltaic device consisted of the ID3T as donor and PC70BM as acceptor. This work demonstrates the great potential of isoindigo moieties as electron deficient units as well as guideline for synthesis of donor-acceptor-donor (D-A-D) small molecules for realizing highly efficient solution processed organic photovoltaic devices.