Pepptide/Graphene Hybrid Assembly into Core/Shell Nanowires

Hybrid assembly of peptides and graphene into core/shell nanowires is presented here. Electroconductive nanowires comprised of multilayered graphene shells wrapped around peptide nanowire cores were readily assembled upon dipping peptide solution into an aqueous reduced graphene dispersion. Calculation of peptide cores generated a hollow graphene-shell network with large surface area and high thermal/chemical stability.

Ladder-Type Heterocyclic Polymers Bearing Carbazole and Thiophene Ring Units and Their Use in Field-Effect Transistors and Photovoltaic Cells

A ladder-type x-excessive conjugated monomer (diocyclopetanethiencarbozole) integrating the structural components of carbazole and thiophene into a single molecular entity is synthesized and polymerized by oxidative coupling to yield poly(diocyclopetane-thiencarbozole) (PDPCTC2). Moreover, through the careful selection of 2,1,3-benzothiazoliodiazole as a x-deficient building block, the diocyclopetane-thiencarbozole-based copolymer poly(diocyclopetane-thiencarbozole-alt-2,1,3-benzothiazoliodiazole) (PDPCTC2-BT) is prepared by Suzuki polycondensation. The optical, electrochemical, and field-effect charge transport properties of the resulting polymers (PDPCTC2 and PDPCTC2-BT) are not only characterized in detail but also their bulk-heterojunction (BHJ) solar cell in combination with PC61BM are evaluated.

Synthesis and characterization of a new copolymer for use in high-performance solar cells

New copolymer, P1, was synthesized and characterized. P1 consisted of alternating 2,7-(9,9-dioctylfluorenyl) and 2,7-(2,5-bis(2-thienyl)pyrrole). As introducing withdrawing groups in backbone chain, the energy levels, absorption spectra, and band gaps of the resulting polymers were effectively tuned. P1 was blended with [60]PCBM. The highest occupied molecular orbital (HOMO) and lowest unoccupied molecular orbital (LUMO) levels of P1 is well aligned with those of PCBM acceptor.

Bulk heterojunction solar cells with these polymers as electron donor and (6,6)-phenyl-C61-butyric acid methyl ester (PCBM) as electron acceptor exhibits high Voc and power conversion efficiency (PCE).

Syntheses of Triphenylenne-based Organic Dyes and Effects of Molecular Structure on the Photovoltaic Performances of Dye-sensitized Solar Cells

Organic dyes have many advantages as dyes for DSSCs, such as higher molar absorption coefficients, the wide variety of the structures. Thus, we synthesized three organic dyes (N-TPA, F-TPA, and F-TPA-T) based on the triphenylenne (TPE) moiety as an electron donor and cyanuronic acid moiety as an electron acceptor to study the effect of molecular structure on the performance of the resulting dye-sensitized solar cells devices. The electron donor group was modified with the 9-tetrafluorenyl substituent and the triphenylenne bridge as a x-conjugated bridge. The F-TPA-T sensitized cell showed the highest overall conversion efficiency of 4.25% (Jsc: 10.5 mA/cm², Voc: 0.70 V, FF: 0.58), while the N-TPA sensitized cell showed the lowest value of 3.26% (Jsc: 6.55 mA/cm², Voc: 0.77 V, FF: 0.64) among the cells based on the three organic dyes, as compared to 5.12% for the cell based on the N-TPE dye (Jsc: 13.0 mA/cm², Voc: 0.69 V, FF: 0.57) under AM 1.5 illumination.

Investigation of Impedance Spectroscopy Based on PSHT:PCBM Bulk Heterojunction Polymer Solar Cells

The charge transfers of each interface layer in polymer solar cells such as between blend of poly (3-hexylthiophene) (PSHT) and [6,6]-phenyl-C61-butyric acid methyl ester (PCBM) as an active layer, Poly(3,4-ethylenedioxythiophene) polystyrene-sulphonate acid (PEDOT-PSS) as an anode side buffer layer, indium-tin-oxide (ITO) as an anode electrode, and aluminum as a cathode electrode have been analyzed under the dark condition and illumination (100 mW/cm²) by means of impedance spectroscopy. Impedance measurements show that charge transfer at the interface between PEDOT-PSS and ITO have been observed at high frequency and, several