

with addition zinc oxide nanoparticles in active layer

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 here is now known as 3.5 to 4% with a power conversion efficiency of bulk hetero-junction
 organic solar cell device structure of an ITO / PEDOT: PSS / P3HT: PCBM / LiF / Al
 mes. Active layers in the structure of nano-sized particles increases the range of
 absorption, or by adding a good electron mobility or the mobility of holes and looked
 forward to. In this study, resulting in a higher power conversion efficiency of organic
 solar cells, organic solar cells to get the existing substance of the donor poly (3 -
 hexylthiophene) (P3HT) and acceptor material PCBM active layer of the proper ratio
 of the pyramid by the addition of zinc oxide absorption area and saw the changes
 in mobility.

2PS-142 배승환

Synthesis and Characterization of Low Bandgap Polymers Containing Fluorinated Benzothiadiazole for Efficient Organic Solar Cells

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Low bandgap polymers containing fluorinated electron-accepting building blocks have recently been studied. Substitution of highly electronegative fluorine atom lowers the energy levels of the polymer. Although it is well known that electron-rich unit in alternating conjugated copolymer mainly affects the LUMO energy level of the copolymer, fluorinated electron-deficient unit in the copolymer lowers both HOMO and LUMO energy levels. Therefore, substitution of fluorine atom into the copolymer affords high V_{OC} of device. In this report, we synthesized low bandgap polymers based on benzo[1,2-b:4,5-b']dithiophene (BDT) as an electron-rich unit and 2,1,3-benzothiadiazole (BT) or 5,6-dihydro-2,1,3-benzothiadiazole (HBT) as an electron-deficient unit. Both of polymers show a similar optical bandgap of ~ 1.7 eV, while PBDT/HBT shows deeper HOMO energy level (-5.43 eV) than that of PBDBT (-5.17 eV), implying that the solar cell device with PBDT/HBT exhibits higher V_{OC} than PBDBT.

2PS-143 배준휘

Synthesis and characterization of low band gap polymers based on 3,6-bis(5-bromothiophen-2-yl)-2,5-bis(2-ethynyl)pyrrole[3,4-c]pyrrole-1,4(2H,5H)-dione and 4,7-dithiophen-2,1,3-benzo thiadiazole as acceptor in polymer photovoltaic cells

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Polymer solar cells (PSCs) are one of promising technology due to their versatile advantages of easy process and potential application in many field. Diketopyrrolopyrrole (DPP) or Benzo[1,2,5]thiadiazole (BT) as acceptor unit are known as a promising material in organic electronic devices because polymers based on DPP or BT have good hole mobility and narrow band gap. And poly(2,7-carbazole) derivatives with low-lying HOMO energy level and phenanthrene derivatives with planar structure are used as electron donor. Herein, we synthesis polymers with donor-acceptor (D-A) concept based on 4,7-di-carbazol (CD) or alkyl-9,10-phenanthren (PN) with 2,5-Dioctyl-3,6-di-thiophen-2-yl-2,5-dihydro-pyrrole[3,4-c]pyrrole-1,4-dione (DPP) or 4,7-Di-thiophen-2,1,3-benzo[1,2,5]thiadiazole (TBT) by Suzuki coupling. In this presentation, we will report the synthesis, optical properties and photovoltaic properties of the polymers.

2PS-144 배진영

A novel metal-free panchromatic TiO₂ sensitizer based on a phenothiazine unit and squaraine derivatives for highly efficient dye-sensitized solar cells

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 We have designed and synthesized novel unsymmetrical squaraine near-IR sensitizers that have D- π -A system based on squaraine derivatives with a phenothiazine unit as electron-donating group and a carboxyl indolium group as electron-accepting group. The squaraine dyes which are assembled using both thiophenyl and pyrrolyl groups, could enhance panchromatic light harvesting by extending π -conjugated bridge system. A successful approach has been attempted by incorporating the nonplanar phenothiazine structure into the organic framework, which is being investigated through the study of their photophysical and photoelectrochemical properties.

2PS-145 서강득

Dual-Channel Anchorable Organic Dyes with Well-defined Structure for Highly Efficient DSSC

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 Dual-channel anchorable organic dyes with a diphenylamine unit as electron donor and acrylic acid unit as electron acceptor were synthesized and used as sensitizers in dye-sensitized solar cells (DSSCs). Two dual-channel anchorable organic dyes which showed two separate light-harvesting units in one molecule. In addition, the corresponding single D-A dye was synthesized for a comparison. Their chemical structures were characterized by ¹H-NMR, FT-IR, UV-vis absorption, and MALDI-TOF mass spectrometry. Their electrochemical properties were studied by cyclic voltammetric measurement. The ground state geometries of the dyes have been optimized by DFT. In synthesis and characterization of dual-channel anchorable organic dyes with well-defined structure for dye-sensitized solar cells will be presented.

2PS-146 송호성

Low band bulk heterojunction organic photovoltaics using various shape of zinc oxide nanoparticles

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Low power conversion efficiency of poly(3-hexylthiophene)(P3HT) and (6,6)-phenyl C₆₁ butyric acid methyl ester(PCBM)-based conventional bulk heterojunction(BHJ) solar cells has reached 4~5%. Conventional organic solar cells(OSCs) has limitation in to

become a marketable technology due to air sensitive low work function electrode such as Al. Furthermore, the degradation of indium tin oxide(ITO)/poly(3,4-ethylene dioxythiophene): (polystyrene sulfonic acid) (PEDOT:PSS) interface occurred due to the strong acidic nature of PEDOT:PSS. Therefore we use of the inverted structure overcomes their disadvantages. In this study our inverted device structure, ITO / zinc oxide (ZnO) / P3HT:PCBM / PEDOT:PSS / Ag are used. And for the more light trapping we employ various shape of zinc oxide nanoparticles(ZnO NPs) between photoactive layer and sol-gel derived ZnO layer.

2PS-147 신지수

Synthesis of Polymer Based on Naphthodithiophene and Organic Thin Film Transistor Characteristics

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Considerable research efforts with increased interests in both academic and industrial institutions for organic semiconductor have been devoted to the improvement of polymer-based organic thin film transistors (OTFTs) and polymer solar cells (PSCs) by solution processes. In this study, a series of p-type polymers with enforced coplanar structure for effective π -electron delocalization, naphtho[2,1-b:3,4-b']dithiophene and thiophenes as main core units, PNBT-T, PNBT-TT and PNBT-TTT, were successfully synthesized by stille coupling reaction. Naphtho[2,1-b:3,4-b']dithiophene unit of the polymers main chain enhances charge carrier mobility by extending π -conjugation length and rigidly enforced coplanar structure.

2PS-148 심주영

Efficient Solar Cells Based on Cyclopenta[de]phenanthrene and Phenanthrothiadiazole Moiety

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These donor-acceptor conjugated polymers, PCPDTPp and PCPDTPm, were synthesized by palladium catalyzed Stille coupling reaction of cyclopenta[de]phenanthrene and phenanthro[9,10-c][1,2,5]thiadiazole. The spectra of the solid films show absorption bands with maximum peaks at 450, 550nm, respectively. Under white light illumination (AM1.5G, 100mW/cm²), polymer:PCBM layers showed PCE of 1.80, 1.00%, respectively.

2PS-149 안성광

Synthesis and Characterization of Single Chain Polyfluorene Copolymers Containing Iridium (III) Complex for White Polymer Light-Emitting Diodes

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We report the synthesis and characterization of white light-emitting polymer based on fluorene with 2,1,3-benzothiadiazole and (phenylquinoline-carbazole)2 iridium(III) 2,5-bis(4-bromophenyl)-1,3,4-oxadiazole complex. This polymer contains blue-light-emitting 9,9-dioctyl-fluorene and green-light-emitting 2,1,3-benzothiadiazole and red-light-emitting iridium(III) complex, feed ratio of monomer has been tuned within 0.4~0.15mol% of Iridium(III) complex and 0.3~0.6mol% of 2,1,3-benzothiadiazole. The copolymer was via palladium-catalyzed Suzuki-polycondensation. The resulting copolymers were found to be thermally stable and soluble in common organic solvent.

2PS-150 안연선

새로운 녹색 발광물질(phBBPP)을 이용한 OLED구조 최적화에 관한 연구

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Electron-donating group인 phenothiazine과 electron-accepting group인 benzimidazole을 갖는 새로운 녹색 유기 발광소재 3,7-bis(1-(biphenyl-4-yl)-1H-benzo[d]imidazole-2-yl)-10-phenyl-10H-phenothiazine (phBBPP)를 사용하여 녹색전기발광 소자를 구현하였다. 소자의 특성을 극대화하기 위하여 다양한 구조의 발광소자들을 만들고 이에 따른 발광 특성을 평가하여 구조를 최적화 하였다. [ITO/NPB (40 nm)/phBBPP (30 nm)/BCP (30 nm)/LiF (1 nm)/Al (100 nm)]의 구조를 가진 OLED 소자의 경우, 발광 효율은 5.59 cd/A, 외부양자효율은 1.42%, 최대 휘도는 19951 cd/m²으로 여러 구조의 소자 중 가장 우수한 특성을 나타내었다. 소자는 (0.21, 0.51)의 녹색 색좌표에 잘 부합하는 특성을 보였다.

2PS-151 안효진

A Highly Efficient DSSC with the Photon Trapping Effects

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We have fabricated two-dimensionally patterned TiO₂ nanowires prepared via interference lithography (IL) followed by hydrothermal growth for highly efficient back side scattering layer. Compared with reference DSSC with nanocrystalline TiO₂, the DSSC in a hybrid nanostructure with additional scattering layer showed the increased efficiency due to the enhanced light trapping effect. This hybrid nanostructure has great potential for application in solar energy conversion, light emitting diodes and photodetectors.

2PS-152 양다슬

Pyrene-Based Donor-Acceptor Alternating Copolymers and their Semiconducting Properties

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Pyrene is a completely planar moiety and has a strong propensity for π - π stacking in a molecular level. Its derivatives are often used for conjugated semiconductors, since the flat pyrene moiety is also believed to aid strong π - π interactions in solid state such as crystalline films and single crystals. Thereby, well-defined π -stacked molecular arrangement can facilitate the charge transport. In the study, we designed and synthesized new low bandgap alternating copolymers containing diketopyrrolopyrrole (DPP) and pyrene-based monomers and characterized their physical and photophysical properties.