**2PS-130** 문병준

Synthesis, Photophysical and Electrooptical Properties of *bis*-Carbazolyl Methane Based Derivatives for Organic Light-Emitting Diode

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최근 높은 양자효율을 구현할 수 있는 인광 OLED (Phosphorescent Organic Light-Emitting Diodes; PHOLED) 에 관한 많은 관심과 연구가 진행되고 있다. 특히, 청색 PHOLED 소자의 양자효율을 높이기 위한 다양한 시도가 이루어지고 있으며 양자효율을 높이기 위한 많은 호스트 물질들이 제안되었다. PHOLED 소자의 양자효율을 높이기 위해서는 호스트 물질이 높은 삼중항 에너지를 가져야 한다. 본 연구에서는 정공수송 능력이 뛰어나고 높은 삼중항 에너지를 가지며 청색발광을 하는 carbazole 기반의 신규 유도체, 9-(4-(*bis*(9-ehtyl-9H-carbazol-3-yl) methyl)phenyl)-9H-carbazole (*bis*-CMPC)와 4-(*bis*(9-ehtyl-9H-carbazol-3-yl)methyl)-triphenylamine (*bis*-CMTA)를 합성하였다. 합성된 물질의 화학구조는 NMR과 mass를 통해 확인하였으며, UV/Vis, PL 그리고 CV를 통해 그들의 광학적 및 전기적 특성을 확인하였다. 또한 진공증착 공정을 통해 제작된 소자의 광전특성을 고찰하였다.

**2PS-131** 미쓰라

Partially ladder-type molecule-based donor-acceptor conjugated oligomer: synthesis and properties

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A new class of donor acceptor alternating cooligomer, where the acceptor is based on the ladder-type planar molecule and the alkylated thiophene is used as a donor, has been introduced. The optoelectronic properties of the prepared oligomer were investigated by UV-Vis spectroscopy and CV. Having a planar and rigid structure, it showed thermal and environmental stabilities, and a narrow band gap was discolsed due to the D-A structure. The synthesis, propeties and application of this material will be detailed.

**2PS-132** 박성민

Synthesis and Photovoltaic Properties of Donor-Acceptor Copolymers Based on Benzotriazole Derivatives

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The generally adapted strategy in designing low-band gap conjugated polymers is to alternate the electron-rich and electron-deficient units on the polymer backbone. Several low-band gap polymers have been utilized for organic photovoltaics (OPVs) with power conversion efficiency over 5%. In order to increase the efficiency of OPV devices, many aspects should be taken into account, such as the absorption coefficients of the materials, the exciton dissociation rates, and the charge-carrier mobilities. A series of new benzotriazole-containing low band gap polymers were synthesized by replacing conjugated electron-donating units, carbazole (PBTZ-C), fluorene (PBTZ-F), and benzodithiophene (PBTZ-B). The results indicate that their bandgaps as well as their molecular energy levels are readily tuned by copolymerizing with different electron-donating units.

**2PS-133** 박소민

Synthesis and Characterization of a Novel Polymer Based on Benzodithiophene Moiety for Organic Photovoltaic Cells

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BDT-NN and BDTS-NN were prepared by Stille cross-coupling polymerization. The obtained polymers have very good Solubility in organic solvents such as tetrahydrofuran, toluene, chloroform, chlorobenzene. BDT-NN Mn is 42000, Mw 104000 and PDI is 2.47. BDTS-NN Mn 33500, Mw 70800, PDI is 2.10. The photophysical properties for the polymer was investigated by UV absorption. UV absorption peaks was found at 440nm for BDT-NN and 446nm for BDTS-NN in solution and also found at 446nm for BDT-NN, 455nm for BDTS-NN in the film state. Thermal properties of BDT-NN was investigated 5 w% loss at 338oC and 384oC for BDTS-NN, it weren t appeared glass transition temperature. HOMO energy level of BDT-NN is 5.44 eV LUMO is 3.67eV. Bandgap is 2.35. In case of BDTS-NN HOMO is 5.56eV and LUMO is 3.73. Bandgap is 2.27 for BDTS-NN.

**2PS-134** 박정진

Enhanced Out-Coupling of OLEDs Using Microlens arrays Fabricated with Irregular 3D Colloidal Arrays

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Recently, for the benefit of high luminescence, microlens arrays for organic light-emitting diodes (OLEDs) have been studied in solid-state lighting field. However, microlens arrays have been generally fabricated with an ordered structure leading to an optical interference effect, which causes that a spectrum of devices with microlens arrays is different from that of standard devices. In this study, in order to overcome the unexpected problem, templates for the fabrication of microlens arrays were prepared with irregular colloidal arrays which are bimodal mixture of polystyrene particles. It was shown that the irregular microlens arrays greatly minimize the optical interference and maintain the original spectrum.

**2PS-135** 박정하

Fine Tuning of Molecular Energy Level of Low Band Gap Polymer by Introduction of Fluorine for High Performance Organic Photovoltaics

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Band gap and molecular energy level of alternating conjugated copolymers are the most important parameters to achieve high efficient organic photovoltaics. Lowering the HOMO energy level of donor polymer is beneficial for achieving high open circuit voltage ($V_{OC}$). One of the easy and simple methods to lower the HOMO energy level of alternating conjugated copolymer is to introduce the electron-withdrawing group onto the polymer backbone. For this purpose, fluorinated phenyl group is alternatively copolymerized with diketopyrrolo[3,4-*c*]pyrrole (DPP) which is one of promising building blocks for low band gap alternating copolymer. In this work, we have systematically synthesized low band gap copolymers composed of difluoro or tetrafluorophenylene and DPP. The effect of the number of fluorine substitution of the polymer on their electrochemical and photovoltaic properties will be demonstrated.

**2PS-136** 박종광

Synthesis and Characterization of Novel p-type Polymers Containing Thiophene and Fluorene Derivatives for Organic Thin Film Transistor (OTFTs)

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This article describes the synthesis and OTFT characteristics of novel p-type polymers containing thiophene and fluorine derivatives. The polymeric materials were efficiently synthesized through a Suzuki coupling reaction. In spite of high molecular weight, the obtained polymers have good solubility in common organic solvents such as toluene, THF, chloroform, chlorobenzene and dichlorobenzene. The weight average molecular weight (Mw) was measured to be 41,484. The thermal properties were performed by thermogravimety analysis (TGA) and differential scanning calorimeter (DSC).

**2PS-137** 박주현

Red Phosphorescent Iridium(III) complexes containing Phenylquinoline-thiophene Main Ligand for Organic Light-Emitting Diodes

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The synthesis, photophysics, electrochemistry and electrophosphorescent properties of novel red phosphorescent cyclometalated iridium(III) complexes, [4-phenyl-2-(thiophen-2-yl)quinoline]2 Iridium acetylacetonate (ThPhQ)2Ir(acac), [4-phenyl-2-(thiophen-2-yl)quinoline]2 Iridium picolinic acid (ThPhQ)2Ir(pic), [4-phenyl-2-(thiophen-2-yl)quinoline]2 Iridium picolinic acid N-oxide (ThPhQ)2Ir(picN-O) were synthesized. The phosphorescence organic light-emitting diodes (PhOLEDs) based on these complexes with the configuration of ITO/PEDOT:PSS (40nm)/CBP : TPD : PBD : Ir(III) complexes (70nm)/Bphen (20nm)/LiF (0.7nm)/ Al (100nm) were fabricated. The solution-processed PhOLEDs based on small molecule CBP:TPD:PBD (60:12:28) as the host and (ThPhQ) 2Ir(picN-O) as the guest exhibited a maximum quantum efficiency of 6.22 % and luminance efficiency 5.97 cd/A with CIE coordinate of (0.663, 0.323).

**2PS-138** 박지훈

Post-annealing temperature effect of n-type organic semiconductor/polymer interface on its stability: Bias stress and interfacial-trap density of state

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Recently *n*-type small molecule material, N,N'-ditridecyl-3,4,9,10-perylenetetracarboxylic diimide (PTCDI-$C_{13}$), has attracted attentions due to its air-stability and high-performance. We fabricated *n*-type organic TFT on glass substrate (top-contact, bottom-gate structure) comprising CYTOP™ (~10 nm)-treated $Al_2O_{3-x}$ dielectric operating at 7 V. Post-annealing of PCTDI-$C_{13}$ deposition was carried out at temperature of 80, 110, and 140 °C, respectively. We discuss the evolution of threshold voltage ($V_{th}$) of the TFTs undergone positive gate bias stress (PBS). Under PBS test, the TFTs reveal $V_{th}$ shift described by the empirical stretched exponential equation at all temperature. In order to understand the distribution of interfacial trap with respect to post-annealing temperature, we performed photo-excited charge collection spectroscopy (PECCS) measurement resulting into increased interfacial trap charge density of state below LUMO according to post-annealing temperature.

**2PS-139** 박형일

Enhanced Charge Transport of Organic Light Emitting Diodes Using ZnO/N-CNT Nanocomposites

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Currently used wide-bandgap metal oxides have limitations in the charge transport enhancement due to low electrical conductivities. We present the notable electrical conductivity enhancement of ZnO charge transport layers by dispersing a small amount of doped CNTs and the improved device performance of OLEDs. Among various undoped or doped CNTs, Nitrogen-doped CNTs showed a lowered work function which is well-matched with the conduction band of ZnO. Consequently, ZnO/N-CNT(0.08 wt%) nanocomposites transport layer showed a five-fold enhancement of electron mobility, while maintaining the other properties of pure ZnO. The inverted OLEDs employing ZnO/N-CNT electron transport layer could facilitate balanced electron/hole injection and, thus, more than two-fold enhancement of maximum luminance and efficiency. This enhancement of charge mobility enabled by work function tunable, chemically doped CNTs would be adaptable for various charge transport materials with different energy levels.

**2PS-140** 박혜지

Phenanthrothiadiazole Based Novel Alternating Polymers for Efficient OPVs

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we reported novel conjugated donor/acceptor conjugated polymers containing phenanthro[9,10-c][1,2,5]thiadiazole. The polymerization to generate PCPDTPT, PCPDTDTPT and PCDTPT were performed by using Stille conditions with Pd catalysis. All of polymers have good solubility in common types of organic solvents. PCPDTDTPT has the lowest band gap of these polymers. Optical and electrochemical characterizations reveal that polymers have proper energy diagram. The power conversion efficiencies of these polymers show 0.77 ~ 1.24 %.

**2PS-141** 반태원

Improved power conversion efficiency in bulk heterojunction organic solar cells