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removed at high temperature (500 °C) for 3D TiO<sub>2</sub> structures. 3D structures with a specific geometry offer many advantages, such as high surface-to-volume ratio, good mechanical strength yet low density, as well as superior properties in photonic and phononic devices. These properties have a great potential in light conversion efficiency and light-trapping effect of 3D DSSC.

**양승보** 2PS-332  
**Doping Effect of Pristine and Defective Transparent Single-Walled Carbon Nanotube Network Films**

양승보, 공병선<sup>1</sup>, 김대우<sup>2</sup>, 백연경<sup>2</sup>, 조혜미<sup>2</sup>, 정희태<sup>†</sup> *한국과학기술원 생명화학공학과; <sup>1</sup>KCC 중앙연구소; <sup>2</sup>한국과학기술원*

We investigated the relationship between electrical conductivity and transmittance of five different types of single-walled carbon nanotube (SWNT) network films for their potential uses as transparent conductive films. They were prepared by controlling SWNT concentration systematically under mediation of defects, positions of their percolation thresholds were slightly shifted depending on the types of the nanotube networks. C-SWNTs have lower conductivity than AP-SWNTs before post-treatment, but C-Au SWNTs show similar electrical conductivity to AP-Au SWNTs, implying larger enhancement of electrical conductivity by hybridization of SWNT networks with gold nanoparticles. These results provide important references to fabricate required optoelectronic devices using transparent conducting SWNT films.

**양승호** 2PS-333  
**Photoresponsive Ambipolar Transport Characteristics of Organic Thin Film Transistors Using Soluble HB-ant-THT and PCBM Composites**

양승호, 정기화<sup>1</sup>, 최동훈<sup>1</sup>, 주진수<sup>†</sup> *고려대학교 물리학과; <sup>1</sup>고려대학교 화학과*  
 용해 가능한 X 형태 유기공액 분자인 HB-ant-THT와 C<sub>60</sub>의 유도체인 PCBM의 복합체를 이용하여 유기박막 트랜지스터(OTFT)를 제작하였고, ambipolar(양극성) 전자 전달 광반응 특성을 연구하였다. 도핑된 p-type Si과 SiO<sub>2</sub> 층을 각각 게이트 전극과 절연막으로 사용하였고, 그 위에 photolithography 공정을 통해 길이 5 μm, 폭 1.9 mm의 소스와 드레인 전극을 형성하였다. 유기 활성층의 결정도를 증가시키기 위해, octadecyl-trichlorosilane(OTS)를 사용하여 SiO<sub>2</sub> 표면을 개질한 후, 다양한 비율의 HB-ant-THT:PCBM 용액을 스프레이코팅하여 각각의 OTFT 소자를 제작하였다. 트랜지스터 특성 곡선으로부터 HB-ant-THT:PCBM 혼합 비율에 따른 n-type과 p-type의 전하이동도 및 문턱전압을 측정하였고, 어두운 상태와 빛을 준 상태에서의 ambipolar 전하전달 특성을 비교하였다. 또한, HB-ant-THT:PCBM 복합체를 이용한 유기태양전지 효율과 ambipolar 트랜지스터에서의 n-type과 p-type의 전하이동도 간의 상관관계를 연구하였다.

**오대환** 2PS-334  
**Synthesis and Characterization of Donor-Acceptor Conjugated Polymer**

오대환, 배만훈, 황문찬, 권순기, 김윤희<sup>†</sup> *경상대학교*  
 Recently organic semiconductors have been developed for solar cell application because of their advantages such as light weight, low cost, flexibility and easy processing and manipulation. In this work, a new donor-acceptor conjugated copolymer containing dialkoxinaphthalene was synthesized via Suzuki coupling reaction. Donor-acceptor copolymer improve the visible absorption and decrease HOMO energy level of the conjugated polymer. The copolymer was characterized by elemental analysis, <sup>1</sup>H NMR, <sup>13</sup>C NMR, FT-IR, UV absorption, photoluminescence (PL), and cyclicvoltammetry (CV). The thermal property of this material was confirmed by using the thermogravimetric analysis (TGA) and differential scanning calorimeter (DSC).

**오창호** 2PS-335  
**Blood-Compatible Graphene/Heparin Conjugate**

오창호, 정성민, 윤세영, 이용규<sup>1</sup>, 인인식<sup>†</sup> *충주대학교 나노고분자공학과; <sup>1</sup>충주대학교 화학공생물공학과*  
 Blood-compatible graphene/heparin conjugate is formulated through noncovalent interaction. The heparinized graphene shows excellent blood-compatibility which is essential for bio-application of carbon nanomaterials such as graphene.

**왕 정** 2PS-336  
**Coordination polymer-based fluorescent system for colorimetric "turn-on" detection of fluoride**

왕 정, 하창식<sup>1,†</sup> *부산대학교 고분자공학과; <sup>1</sup>부산대학교*  
 Metal-organic framework created by the association of metal ions and multitopic organic ligands are a very promising type of materials because of their broad compositional and structural diversity, low cost, and facile production. Their wide range of potential properties and applications include gas sorption, catalysis, ion exchange, sensing, drug-delivery, magnetism, fluorescence, and non-linear optics. Fluoride ions are biologically important anions because of their important role in dental care and the treatment of osteoporosis, etc. In this regard, the ability to sense

fluoride ions has attracted increasing attention. Herein, a new thiazoline-containing cobalt(II) coordination polymer displayed colorimetric and fluorescent "turn-on" selectivity and sensitivity toward fluoride anions compared to the other anions investigated through color changes from pink to blue and changes in the emission spectra at approximately 570 nm when excited at 520 nm.

**유제정** 2PS-337  
**A Study of Hard-Mask using Organic-inorganic Hybrid Materials**

유제정, 송재동, 이성구, 이경균, 황석호<sup>1</sup>, 김상범<sup>†</sup> *한국생산기술연구원; <sup>1</sup>단국대학교*  
 For the next technological generations of integrated circuits, the traditional challenges faced by etch plasmas become more and more difficult. Metallic hard masks can help thanks to their high selectivity toward materials. In this work we discuss the interesting hard mask material and choosing the optimum dry etch using the hybrid hard-mask which contains organic and inorganic materials. The inorganic group was much easier to the hard mask than photo resist and the organic group was the etching to the substrate in organic-inorganic hybrid form. After etching process, we characterized the optical and morphological properties to the hard mask. In conclusion, the organic-inorganic hybrid polymer will become useful material to single-layered hard mask film for high integrated circuit.

**유해욱** 2PS-338  
**Highly Ordered and Stable Silver Nanodot Pattern: From Fabrication to LSPR Applications**

유해욱, 정진미<sup>1</sup>, 이수경<sup>2</sup>, 정희태<sup>†</sup> *한국과학기술원; <sup>1</sup>Massachusetts Institute of Technology; <sup>2</sup>Cheil Industry, Samsung*  
 Silver has been explosively used for optical sensing and imaging applications which benefit from localized surface plasmon resonance (LSPR) in nanoscale configuration. Many attempts have been made to fabricate and control the silver nanostructure but, fatal mechanical weakness of silver have interrupted the manufacturing of reproducible and high-throughput nanostructures using the top-down lithography approach. In this study, we suggest a steady fabrication strategy to obtain highly ordered silver nanopatterns that is able to provide tunable LSPR characteristic and high performance in optical sensing system. By using protecting layer of platinum on silver surface for dry lithographic etching process, we successfully obtained large-area silver nanopatterns with high reproducibility. The large-area silver nanopatterned structures were capable of enhancing Cy3 fluorophore labeled DNA signal with four order of magnitude of detection limit (~10<sup>-10</sup>M).

**윤명희** 2PS-339  
**The Effect of Donor-Acceptor Rod-Coil Diblock-Copolymer as Compatibilizer on the P3HT:PCBM Polymer Solar Cells**

윤명희, 김종기, 양창덕, 김진영<sup>†</sup> *울산과학기술대학교*  
 We find a substantial improvement in device performance by introducing 10% of diblock-copolymer P3HT-*b*-P(St<sub>66</sub>BAZ<sub>11</sub>)-C<sub>60</sub>(P3HT=poly(3-hexylthiophene), St=styrene, BAZ=benzyl azide) is introduced into the P3HT:PCBM blend system. The morphology of active layer is observed by an atomic force microscopy and the performance of solar cell devices are measured, resulting in ca. 15% improved efficiency relative to the P3HT:PCBM solar cell fabricated without the "P3HT-*b*-P(St<sub>66</sub>BAZ<sub>11</sub>)-C<sub>60</sub>". In addition, the diblock-copolymer additives employed as a compatibilizer to stabilize device the morphology of active layer against thermal phase segregation, which may also indicate a feasible strategy to improve the stability of the device.

**윤미경** 2PS-340  
**Synthesis and characterization of red phosphorescent materials for organic light-emitting diode applications**

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 We have designed the efficient new red phosphorescent material for solution processable phosphorescent organic light-emitting diodes. Carbazole derivative as a main ligand and a β-diketone unit as an ancillary ligand were introduced to the Iridium(III) complexes. Photophysical, electrochemical, and electroluminescent (EL) properties indicate Ir(III) complexes have excellent thermal and morphological stability and emit an intense red light with high color purity.

**윤세영** 2PS-341  
**Antimicrobial Activity of Noncovalent Graphene/Polymer Conjugates**

윤세영, 이다영, 문기성<sup>1</sup>, 인인식<sup>†</sup> *충주대학교 나노고분자공학과; <sup>1</sup>충주대학교 바이오산업학과*  
 Stable aqueous dispersions of reduced graphene are simply obtained by reducing GO solution in the presence of poly(2-vinyl pyrrolidone) (PVP) or chitosan. Prepared aqueous graphene solution are optically clear and stable for several months without