

KJF 2010

KJF International Conference on Organic Materials for Electronics and Photonics

August 22–25, 2010

Kitakyushu International Conference Center
Kitakyushu, Fukuoka, Japan



KJF2010

**KJF International Conference on Organic Materials
for Electronics and Photonics**

Program & Abstracts

August 22-25, 2010

**Kitakyushu
International Conference Center,
Fukuoka, Japan**

Conference Scope

Organic electronics and photonics are on forefront of materials science and technology and are expected as most promising in information- and energy-related applications due to many superior properties such as flexible, light-weight, printable, easy to fabricate. The activities in Japan and Korea are remarkable and are leading in both science and technologies. This forum will provide excellent opportunities for scientists, engineers, and students to exchange and share information about most recent advances in many related fields. Lectures and posters will provide a motivation for deep discussion about the topics of the conference. We are fully confident that all participants will benefit a great deal from this opportunity of scientific exchange provided by KJF 2010.

The representative technical sessions are as follows:

Organic Transistors, Memories and Photovoltaics

Molecular Photonics

Organic Electroluminescence Materials and Devices

Nonlinear Optical Materials and Devices

Electrochromic Materials and Devices

Fabrication and Characterization

Molecular Recognition

Sensors and Bioelectronics

Other Related Topics

Supported by

TOKUYAMA SCIENCE FOUNDATION

The Society of Polymer Science, Japan

The Japan Society of Applied Physics
(Division of Molecular Electronics and Bioelectronics)

US Army International Technology Center-Pacific

West Japan Industry and Trade Convention Association

Greeting

It is my great pleasure and honor to host the 2010 KJF International Conference on Organic Materials for Electronics and Photonics (KJF2010) in Japan and cordially invite all of you to Kitakyushu, Fukuoka on August 22-25, 2010.

For the present and near future electronic and photonic devices, it will be essential to take into accounts of the energy needed to fabricate and environmental impacts in addition to their high performance. Organic materials are expected to satisfy almost all requirements because of the freedom in molecular design, flexibility, light weight, and processibility at ambient conditions. Many efforts have been made to realize printed electronics, roll-to-roll fabrication of solar cells, and electronic papers just as a few examples. Since research and developments on organic materials and devices are interdisciplinary, they require broad experiences and collaborations of people in chemistry, physics, photochemistry, materials science, biology, electrical and electronic engineering, and others.

Distinguished scholars, researchers and engineers will attend this symposium to exchange and develop information, to make hot yet friendly discussions about broad range of topics related to synthesis of advanced materials and their applications in information, display, energy, or environments. Another very important role of KJF symposium is to contribute to mutual understanding at a personal level especially for young scientists and students. The success of the symposium will be judged by how many ideas are exchanged and developed in scientific parts and how many people get acquainted in social parts.

The KJF2010 is the continuation and expansion of Korea-Japan Joint Forum on Organic Materials for Electronics and Photonics which celebrated the 20th anniversary two years ago.

Please join the KJF2010 to refresh your ideas, to strengthen personal and scientific networks, and also to make great memories in Fukuoka, Japan.

Toshihiko Nagamura

Chairman of KJF2010

History of KJF

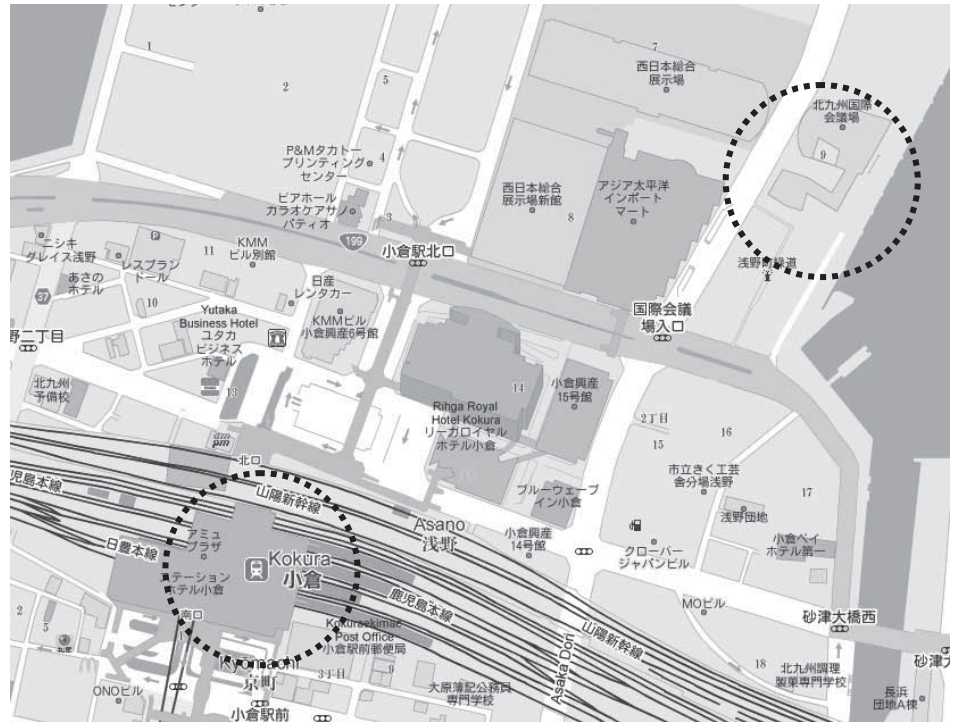
Year	Meeting	Place (City)	Participants	Papers
			(Korea/Japan/others)	
1989	KJF'89	KIST (Seoul)	10/20	20
1990	KJF'90	RIKEN (Wako)	15/30	20
1991	KJF'91	KIST (Seoul)	40/15	20
1992	KJF'92	RIKEN (Wako)	25/50	42
1993	KJF'93	KRICT (Daejeon)	70/25	60
1994	KJF'94	NIMC (Tsukuba)	40/60	80
1995	KJF'95	Korea Univ. (Seoul)	120/30	85
1996	KJF'96	AIST (Tsukuba)	40/120	150
1997	KJF'97	K-JIST (Gwangju)	140/44	117
1998	KJF'98	Hokkaido Univ. (Sapporo)	48/63	89
1999	KJF'99	Kyeongju TEMF Hotel (Kyeongju)	126/44	170
2000	KJF2000	Kyoto Research Park (Kyoto)	72/80	126
2001	KJF2001	Seoul National Univ. (Seoul)	173/46	159
2002	KJF2002	TG Hall (Sendai)	92/97	174
2003	KJF2003	Pusan National Univ. (Pusan)	200/45	220
2004	KJF2004	Okinawaken Seinenkaikan (Naha)	150/70	220
2005	KJF2005	Yousung Hotel (Daejeon)	180/70	212
2006	KJF2006	Toki Messe (Niigata)	128/146	217
2007	KJF2007	Korea Univ. (Seoul)	232/69	243
2008	KJF2008	CIST (Chitose)	140/190	247
2009	KJF2009	KAL Hotel (Jeju)	313/80/10	283
2010	KJF2010	Kitakyushu International Conference Center (Kitakyushu)	159/168/7	246

Meeting Venue

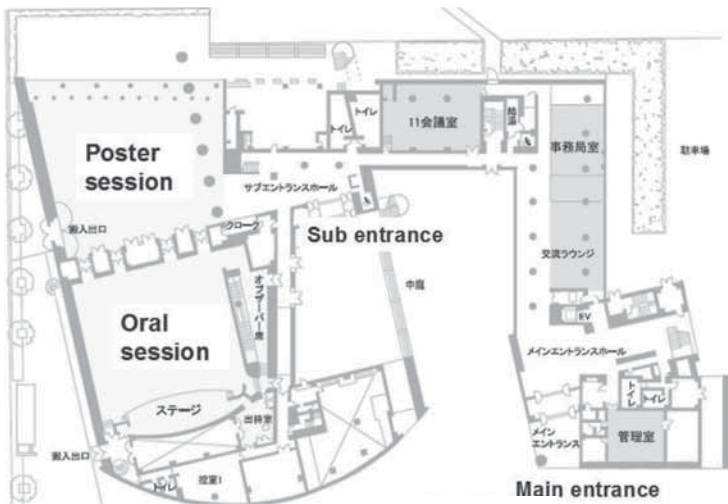
Kitakyushu International Conference Center (<http://www.convention-a.jp/language/english.html>)

3-8-1 Asano, Kokurakita-ku, Kitakyushu-shi, Fukuoka 802-0001

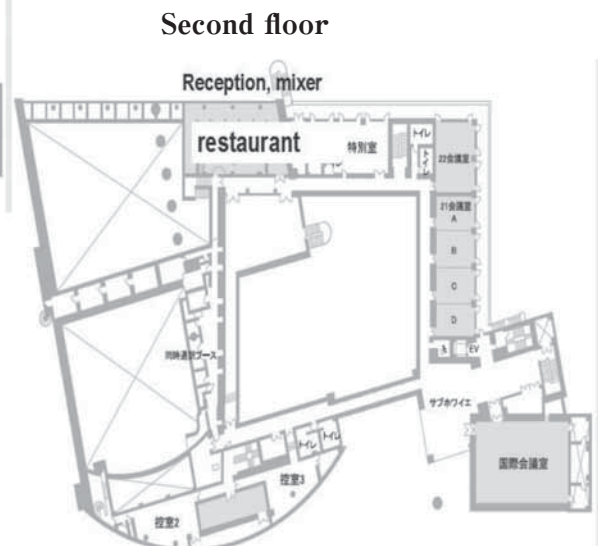
10 minutes walk from JR Kokura station's North Exit



Floor Plan



First floor



Second floor

Organization

KJF International Committee

- Honorary Chair : Hiroyuki Sasabe (Chitose Inst. Tech.)
Nakjoong Kim (Hanyang Univ.)
- Chair : Kwang Sup Lee (Hannam Univ.)
Kiyoshi Yase (National Inst. Adv. Indust. Sci. Tech.)
- Members : Yun Chi (National Tsing Hua Univ.)
Xuan-Ming Duan (Chinese Academy of Sci.)
Futao Kaneko (Niigata Univ.)
Olaf Karthaus (Chitose Inst. Tech.)
Jang-Joo Kim (Seoul National Univ.)
Changjin Lee (Korea Res. Inst. Chem. Tech.)
Jun Young Lee (Sungkyunkwan Univ.)
Kazumi Matsushige (Kyoto Univ.)
Tokuji Miyashita (Tohoku Univ.)
Toshihiko Nagamura (Kyushu Univ.)
Hachiro Nakanishi (Tohoku Univ.)
Soo Young Park (Seoul National Univ.)
Masatsugu Shimomura (Tohoku Univ.)
Tetsuo Tsutsui (Kyushu Univ.)
Jeong Won Wu (Ehwa Woman's Univ.)

Advisory Committee

- Jung-Il Jin (Korea Univ.)
Lyong Sun Pu (Sungkyunkwan Univ.)

KJF2010 Organizing Committee

- Conference Chair : Toshihiko Nagamura (Kyushu Univ.)
- Co-Chair : Chan Eon Park (POSTECH)
- Secretary General : Keiji Tanaka (Kyushu Univ.)
- Members : Chihaya Adachi (Kyushu Univ.)
Isamu Akiba (Kitakyushu City Univ.)
Katsuhiko Fujita (Kyushu Univ.)
Reiji Hattori (Kyushu Univ.)
Masahiro Hiramoto (Inst. Mol. Sci.)
Yoshio Hisaeda (Kyushu Univ.)
Kenji Ishida (Kobe Univ.)
Keizo Kato (Niigata Univ.)
Hirotsugu Kikuchi (Kyushu Univ.)
Ken Kojio (Nagasaki Univ.)
Yutaka Majima (Tokyo Inst. Tech.)
Yumi Mizutani (Kyushu Univ.)
Naotoshi Nakashima (Kyushu Univ.)
Ryusuke Nishitani (Kyushu Inst. Tech.)
Teruhisa Ohno (Kyushu Inst. Tech.)
Shuji Okada (Yamagata Univ.)
Yuji Oki (Kyushu Univ.)
Hideyuki Otsuka (Kyushu Univ.)
Kazuo Sakurai (Kitakyushu City Univ.)
Atsushi Takahara (Kyushu Univ.)
Kohji Yoshinaga (Kyushu Inst. Tech.)

Time Table

Start time	Aug. 22 (Sun)	Aug. 23 (Mon)	Aug. 24 (Tue)	Aug. 25 (Wed)
8:50		Opening ceremony		
9:00		I01 Yun Chi (National Tsing Hua University)	I07 Hiroaki Misawa (Hokkaido University)	O18 Naoki Matsuda (National Institute of Advanced Industrial Science and Technology)
9:20				O19 Yuji Oki (Kyushu University)
9:30		I02 Chan Eon Park (Pohang University of Science and Technology)	I08 Doseok Kim (Sogang University)	
9:40				O20 Yuna Kim (Yonsei University)
10:00		O01 Kensuke Takechi (Toyota Central R&D Labs., Inc.)	O11 Sunao Yamada (Kyushu University)	I12 Dong-Yu Kim (Gwangju Institute of Science and Technology)
10:20		O02 Kwang.-Sup Lee (Hannam University)	O12 Katsuhiro Ajito (NTT Corporation)	
10:30				coffee
10:40		coffee	coffee	
10:50				I13 Takeshi Yamada (Sumitomo Chemical Co. Ltd.)
11:00		I03 Yoshinori Nishikitani (ENEOS)	I09 Paul Mulvaney (University of Melbourne)	
11:20				O21 Wonsik Yoon (Seoul National University)
11:30		O03 Viruntachar Krurefu (Chiang Mai University)	O13 Hiroaki Usui (Tokyo University of Agriculture and Technology)	
11:40				O22 Chihaya Adachi (Kyushu University)
11:50		O04 Masayuki Kanehara (University of Tsukuba)	O14 Ngo Trinh Tung (Hanyang University)	
12:00				Closing ceremony
12:10		O05 Yongju Park (Seoul National University)	O15 Masatsugu Shimomura (Tohoku University)	
12:30		Lunch	Lunch	Excursion
14:00		I04 Yasuhiro Koike (Keio University)	Poster PB001-PB106 (14:00-15:30)	
14:30		I05 Hwan Kyu Kim (Seoul National University)		
15:00		O06 Jin Cheol Kim (Seoul National University)		
15:20		O07 Keunsoo Jeong (Korea Institute of Science and Technology)		
15:40		coffee	I10 Jinsoo Joo (Korea University)	
16:00		O08 M. Delower H. BHUIYAN (Industrial Research Ltd.)		
16:10			I11 Mikio Ihama (FUJIFILM Corporation)	
16:20		I06 Cheolmin Park (Yonsei University)		
16:40			O16 Masaya Mitsuishi (Tohoku University)	
16:50		O09 Takanori Ohinata (Nagoya University)		
17:00			O17 Tae-Dong Kim (Hannam University)	
17:30		Poster PA001-PA105 (17:30-19:00)	(poster award committee)	
18:00	Regist-ration			
19:00	Welcome party		Banquet, Mixer	

Oral Session

Monday, August 23

Session chair: Kohji Yoshinaga (Kyushu Institute of Technology)

- 9:00 **I01** Pyridyl Azolate Coupled Ru (II) Sensitizers for DSSC Applications
Yun Chi
National Tsing Hua University, Taiwan
- 9:30 **I02** Photo-curable Polymer Blend Dielectrics for Advancing Organic Field-Effect Transistor Applications
Chan Eon Park, Se Hyun Kim, Jaeyoung Jang
Pohang University of Science and Technology, Korea
- 10:00 **O01** An influence of monomeric porphyrin structure on the electropolymerized photoactive electrode for polymer solar cell
Kensuke Takechi^{1,2)}, Naoko Takahashi³⁾, Tohru Shiga¹⁾, Tsuyoshi Akiyama⁴⁾, Sunao Yamada⁴⁾
¹⁾Toyota Central R & D Labs., Inc., Japan, ²⁾Department of Material Physics and Chemistry, Graduate School, Kyushu University, ³⁾Nano-Analysis Lab., Toyota Central R & D Labs., Inc., ⁴⁾Department of Applied Chemistry, Faculty of Engineering, Kyushu University
- 10:20 **O02** Photopatternable Quantum Dots for Hybrid Organic-Inorganic Photovoltaics
Kwang-Sup Lee¹⁾, Kyung Kook Jang¹⁾, Prem Prabhakaran¹⁾, Won Jin Kim^{1,2)}, Sung Jin Kim²⁾, Marek Samoc²⁾, Alex N. Cartwright²⁾, Paras N. Prasad²⁾
¹⁾Hannam University, Korea, ²⁾Institute for Lasers, Photonics, and Biophotonics, The State University of New York
- Session chair: Soo Young Park** (Seoul National University)
- 11:00 **I03** Development of Efficient Organic Solar Cells based on New Structures
Yoshinori Nishikitani¹⁾, Hideki Masuda²⁾
¹⁾Central Technical Research Laboratory, Research & Development Division, JX Nippon Oil & Energy Corporation, Japan, ²⁾Department of Applied Chemistry, Graduate School of Engineering, Nagoya Institute of Technology
- 11:30 **O03** Enhancement of the Efficiency of Polymer Solar Cells by Blending Nb/ZnO Nanoparticles into Poly (3-hexylthiophene) : [6,6] -phenyl C61-butyric Acid Methyl Ester
Viruntachar Kruefu¹⁾, Chanitpa Khantha²⁾, Eric Peterson³⁾, Sukon Phanichphant^{1,2)}, David L. Carroll³⁾
¹⁾Chiang Mai University, Thailand, ²⁾Department of Chemistry, Faculty of Science, Chiang Mai University, ³⁾Center for Nanotechnology and Molecular Materials, Department of Physics, Wake Forest University
- 11:50 **O04** Electron conductive π -junction Au nanoparticles
Masayuki Kanehara, Toshiharu Teranishi
University of Tsukuba, Japan

12 : 10 **O05** Polymer photovoltaic devices with the solution-processible Cs carbonate inter layer

Yongju Park, Seunguk Noh, Donggu Lee, Junyoung Kim , Changhee Lee*
Seoul National University, Korea

Session chair: Naotoshi Nakashima (Kyushu University)

14 : 00 **I04** Status of Photonics Polymers toward Face-to-Face Communication

Yasuhiro Koike^{1,2)}

¹⁾Keio University, Japan, ²⁾ERATO-SORST Koike Photonics Polymer Project, JST

14 : 30 **I05** New Materials Paradigm for Highly Efficient Solid-State Dye-Sensitized Solar Cells

Kang Duk Seo, Dong Hyun Lee, Hae Min Song, Myung Jong Ju, Myung Jun Lee, Bok Joo Song, In Tack Choi, Min Soo Kang, Hwan Kyu Kim*

Korea University, Korea

15 : 00 **O06** Bistable Photoswitching in Highly Luminescent Infinite Coordination Polymer

Jin Cheol Kim, Seong-Jun Yoon, Soo Young Park*

Seoul National University, Korea

15 : 20 **O07** Conjugated Polymer/Photochromic Dye Integrated Binary Nanoparticles : Stable and Reversible Fluorescence Photoswitching for Bioimaging

Keunsoo Jeong^{1,2)}, Yong-Deok Lee¹⁾, Chang-Keun Lim¹⁾, Sehoon Kim^{1)*}, Chong Rae Park²⁾

¹⁾Korea Institute of Science and Technology, Korea, ²⁾Carbon Nanomaterials Design Laboratory, Global Research Laboratory and Department of Materials Science and Engineering, Seoul National University, Korea

Session chair: Kwang-Sup Lee (Hannam University)

16 : 00 **O08** Synthesis and NLO properties of 2- (3-Cyano-4- {5- [1- (2-hydroxy-ethyl) -3,3-dimethyl-1,3-dihydro-indol-2-ylidene] -penta-1,3-dienyl } -5,5-dimethyl-5H-furan-2-ylidene) -malononitrile

Mohammed Delower Hossain Bhuiyan¹⁾, Graeme J. Gainsford¹⁾, Yaser Kutuvantavida^{1,2)}, James W. Quilty¹⁾, Grant V. Williams¹⁾, Mark R. Waterland²⁾, Andrew J. Kay^{1)*}

¹⁾Industrial Research Ltd., New Zealand, ²⁾Institute of Fundamental Sciences, Massey University

16 : 20 **I06** Self Assembled Polymer Nanostructures for Printed Organic Electronics

Cheolmin Park, Youn Jung Park, June Huh, Hee June Jeong

Yonsei University, Korea

16 : 50 **O09** Effects of conducting polymer to quasi-solid-state dye-sensitized solar cells

Takanori Ohinata, Tatsuo Mori

Nagoya University, Japan

17 : 10 **O10** cancelled

Oral session

Pyridyl Azolate Coupled Ru(II) Sensitizers for DSSC Applications

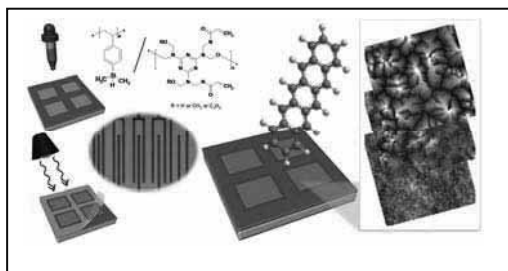
Yun Chi, Department of Chemistry, National Tsing Hua University, 101, Section 2, Kung Fu Road, Hsinchu, 30013, Taiwan, ychi@mx.nthu.edu.tw

Dye-sensitized solar cells (DSSCs) have practically considered as a feasible alternative to conventional amorphous silicon solar cells. From chemistry viewpoint, numerous organometallic sensitizers have been designed and synthesized, among which the most common sensitizers should be ascribed to *cis*-dithiocyanato *bis*(4,4'-dicarboxy-2,2'-bipyridine) ruthenium(II) and *tri*-thiocyanato-4,4',4''-tricarboxy-2,2':6',2''-terpyridine ruthenium(II) complexes, known as N3 and black dye, respectively. Recently, we reported a new family of ruthenium(II) complexes suited for DSSC applications. The core design lies in the introduction of a novel tridentate bipyridine pyrazolate chelate (or a functionalized bidentate pyridyl pyrazolate) ligand, while the *bis*(4,4'-dicarboxy-2,2'-bipyridine) or even 4,4',4''-tricarboxy-2,2':6',2''-terpyridine chelate is retained to ensure the same electron ejection site as that of e.g. N3 or black dye, respectively. These series of pyridyl azolate coupled Ru(II) sensitizers and relevant reference samples were strategically synthesized and characterized using photophysical methods and spectroscopic means, including single-crystal X-ray diffraction studies. In comparison to N3 and black dye, our modification allowed achievement of increased absorptivity and spectral range from visible to nearly 900 nm of NIR. These advantages allow us to reduce the thickness of TiO₂ photoelectrode, resulting in great suppress of dark current and hence increase of open circuit voltage V_{oc} . Upon optimization, some of our Ru(II)-based sensitizers could produce an efficiency of ~10%, even in the absence of thiocyanate ancillary, the results of which are superior to that of N719 and black dye reference solar cells prepared in our studies.

Photo-curable Polymer Blend Dielectrics for Advancing Organic Field-Effect Transistor Applications

Chan Eon Park, Se Hyun Kim and Jaeyoung Jang, Polymer Research Institute, Department of Chemical Engineering, Pohang University of Science and Technology, Pohang, 790-784 (Korea), cep@postech.ac.kr

For all-round organic field-effect transistor (OFET) applications, we introduced photocurable polymer blend dielectrics, in which the dielectric properties could be simply controlled via solution blending of two discernible polymers with a photo-initiator, subsequently spin-casting, and UV crosslinking. Optimized polymer blends tended to form smooth and hydrophobic films surface via vertical phase separation, as well as providing good electrical stability. On 400-nm-thick cast films of the polymer blends as bottom gate-dielectrics, pentacene and *N,N*-ditridecyl-3,4,9,10-perylene-tetracarboxylic diimide grew into highly ordered film structures, and the corresponding OFETs showed high field-effect mobilities up to 0.93 cm²/V⁻¹s⁻¹ (hole) and 0.2 cm²/V⁻¹s⁻¹ (electron), respectively. In addition, both the p- and n-type OFETs exhibited high on/off current ratio (more than 10⁵), but negligible hysteresis during device operation.



Development of Efficient Organic Solar Cells based on New Structures

Yoshinori Nishikitani¹ and Hideki Masuda²

¹Central Technical Research Laboratory, Research & Development Division, JX Nippon Oil & Energy Corporation, 8 Chidori-cho, Naka-ku, Yokohama 231-0815, Japan,

²Department of Applied Chemistry, Graduate School of Engineering, Nagoya Institute of Technology, Gokiso-cho, Showa-ku, Nagoya 466-8555, Japan

Organic solar cells such as dye-sensitized solar cells (DSCs) and organic thin-film solar cells (OPVs) have attracted much attention due to their great potential for low-cost, flexible and light-weight photovoltaic devices. Although great progress has been made in increasing the conversion efficiencies of these solar cells, more effort will be required to increase conversion efficiency and durability further before they can be used outdoors. In this presentation, discussed are various strategies for achieving high photon-to-electricity conversion efficiency in these solar cells, focusing on solar cell structures as shown in Fig. 1. In the case of DSCs, unlike TiO₂ nanoparticles, TiO₂ nanotubes with suitable dimensions are expected to function as efficient light scatterers as well as to give large surface areas for charge separation. Furthermore, OPVs based on donor/acceptor (D/A) block copolymers are discussed, focusing on the phase separation of donor and acceptor segments and their domain sizes.

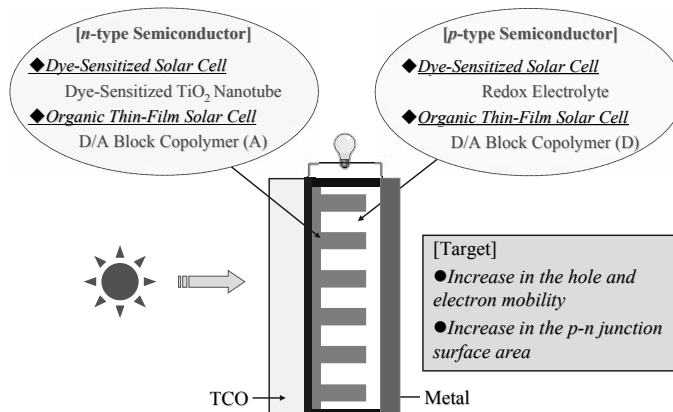


Figure 1. Targeting structure of organic solar cells

Status of Photonics Polymers toward Face-to-Face Communication

Y. Koike, Faculty of Science and Technology, Keio University*

ERATO-SORST Koike Photonics Polymer Project, JST**

3-14-1 Hiyoshi, Kohoku-ku, Hiyoshi, Yokohama, Japan 223-8522* koike@appi.keio.ac.jp

Internet has built a new information media society where billions of people are connected with one another instantaneously. However, it still greatly relies on a past electronic technology. We cannot deny that we still experience considerable time downloading large volume data files or animation with awkward movements and rough images. Why can we not exchange large sized files quickly? Why can we not communicate face to face through clear large-sized displays without distortion? To make these demands satisfied, we are proposing and promoting a concept of "Fiber-To-The-Display" that the high-speed data transmission from the main backbone is directly connected to displays and the terminal equipments inside home. It realizes lively face-to-face communication through high-quality large-sized displays at homes and offices as shown in Fig. 1 supported by photonics polymer materials such as the graded-index plastic optical fiber, zero-birefringence polymer and highly scattered optical transmission polymers. Details of such novel photonics polymers will be described in my presentation.

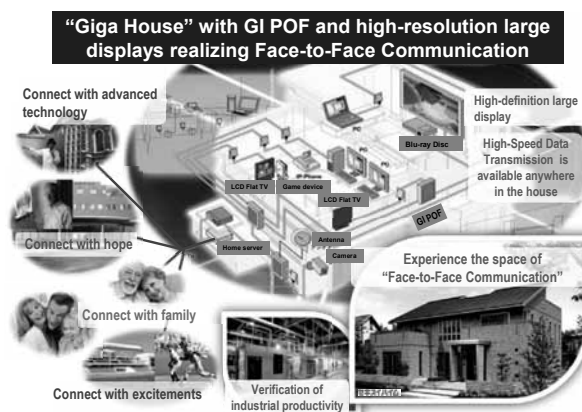


Figure 1 Concept of "Fiber-to-the-Display"

Poster session

Formation of Cylindrical Shaped Organic Light Emitting Diode Etched by Damage Free Neutral Beam

Junji Adachi^{1,2}, Tomohiro Kubota^{3,4}, Masayuki Yahiro^{1,5}, Seiji Samukawa^{3,6} and Chihaya Adachi^{1,2}

¹Life BEANS Center Kyushu, BEANS Laboratory, 744 Motoooka, Nishi, Fukuoka 819-0395, Japan, ²Center for Organic Photonics and Electronics Research(OPERA), Kyushu University, 744 Motoooka, Nishi, Fukuoka 819-0395, Japan, ³3D BEANS Center, BEANS Laboratory, 4-6-1 Komaba, Meguro-ku, Tokyo 153-8505, Japan, ⁴Institute of Industrial Science, The University of Tokyo, 4-6-1 Komaba, Meguro-ku, Tokyo 153-8505, Japan, ⁵Institute of Systems, Information Technologies and Nanotechnologies, 2-1-22, Momochihama, Sawara, Fukuoka, 814-0111, Japan, ⁶Institute of Fluid Science, Tohoku University, 2-1-1 Katahira, Aoba-ku, Sendai, Miyagi 980-8577 Japan, jadac@cstf.kyushu-u.ac.jp

Neutral Beam etching is an atomic layer level damage free etching technology¹⁾ of silicon semiconductor devices. Neutral Beams are free from charge damage and UV irradiation damage because a holey carbon plate named aperture, which is set between a plasma chamber and a substrate, cut UV light and radicals, and exchange minus ion beams to neutral beams.

Ordinary plasma beams consist of charged ion particles radicals and UV light with high energy and cause severe damage to organic layers of organic devices. We irradiated Nitrogen Neutral Beams on to organic emitting diodes (OLEDs) which have cylindrical metal electrodes (MgAg(150nm)/Ag(10nm)). Organic layers of α -NPD(50nm) and Alq₃(50nm) were etched and cylindrical OLEDs were obtained. Metal electrodes acted as masks of organic layers. Diameters of metal electrodes are 200 μ m, 500 μ m and 1,000 μ m. Organic layers were sharply and vertically etched along with the edges of electrodes. EL of etched and non-etched cylindrical OLEDs were observed. Optical and electrical characteristics were measured and confirmed that both etched and non-etched OLEDs showed similar characteristics.

1) S. Samukawa, Jpn. J. Appl. Phys., 45, 2395 (2006)

Color Purity Improvement of White OLED using Blue and Yellow Emitting Material

Dong-Eun Kim¹, Jun-Woo Park¹, Byoung-Sang Kim¹, Burm-Jong Lee², Young-Soo Kwon^{1,*}

¹Department of Electrical Engineering & NTRC, Dong-A University, Busan 604-714, Korea,

²Department of Chemistry & BPRC, Inje University, Gimhae 621-749, Korea

We synthesized new emissive materials, namely Zn(HPB)₂ and Zn(HPQ)₂. We fabricated white OLED using Zn(HPB)₂ and Zn(HPQ)₂ as blue and yellow emitting material. The fundamental structures of the white OLED were ITO / NPB (40 nm) / Zn(HPB)₂ (40 nm) / Zn(HPQ)₂ (20 nm) / LiAl (120 nm).

Figure 1 shows the EL spectra and the change of the CIE chromaticity diagram at different applied voltages for the white OLED. As the applied voltage increases from 8 to 10V, the CIE coordinates change from (0.261, 0.372) to (0.319, 0.338). At low voltages, the luminance of Zn(HPB)₂ has less of an effect on the EL of the device. At high voltages, the luminance of Zn(HPB)₂ has an effect on the EL of the device.

The emission changed from bluish green to white with an increasing applied voltage. In this case, we consider that the main exciton recombination zone in the device shifts gradually from the Zn(HPB)₂ side to the Zn(HPQ)₂ side as the voltage increases.

We obtained a maximum luminance of 15171 cd/m² at a current density of 955 mA/cm². The maximum external quantum efficiency and luminous efficiency are 0.7 % and 1.65 cd/A, respectively. The CIE coordinates are (0.3.19, 0.338) at an applied voltage of 10V.

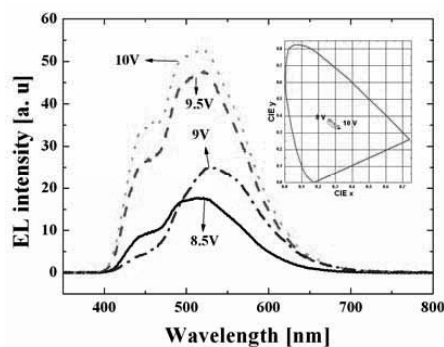
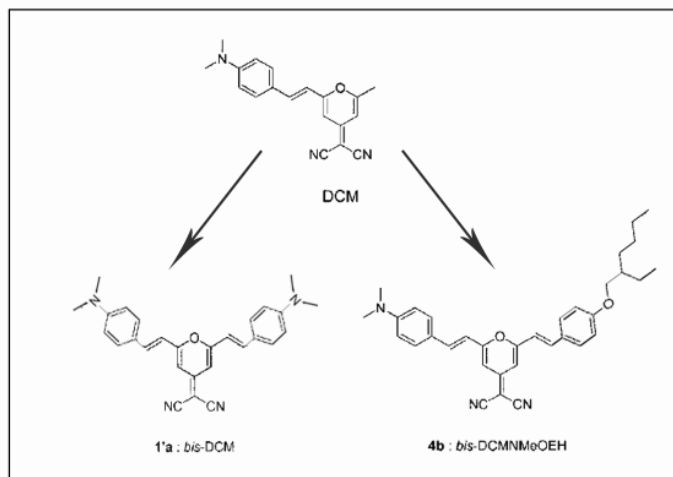


Fig. 1 The EL spectra and the change of the CIE chromaticity

Theoretical Studies of DCM Derivatives with dual Heteroleptic Electron Donating Group

Kyung Yoon Jung¹, Joo Young Kim² and Young Sik Kim^{2,*}, ¹International Design School for Advanced Studies, ²Department of Information Display, Hongik University, Seoul 121-791, Korea, youngkim@hongik.ac.kr

In this work, novel red emitting DCM derivatives with dual heteroleptic electron donating group (EDG), bis-DCMNMMeOEh and bis-DCMNDcJ, were designed and their photonic properties were studied theoretically in order to tune the emission wavelength of the deep red region and to enhance the luminescence efficiencies. To gain insight into the factors responsible for the emission color change and the enhanced luminescence efficiencies, we perform the density functional theory (DFT) and time-dependent density functional theory (TD-DFT) calculations of these DCM derivatives. It showed that the DCM derivatives with dual heteroleptic EDG gave more red-shifted emission than the DCM derivatives with homoleptic EDG due to the intramolecular energy transfer between the heteroleptic EDG and the luminescence efficiency of the dual heteroleptic DCM derivatives increased as the electron-donating ability of the EDG increased.



It showed that the DCM derivatives with dual heteroleptic EDG gave more red-shifted emission than the DCM derivatives with homoleptic EDG due to the intramolecular energy transfer between the heteroleptic EDG and the luminescence efficiency of the dual heteroleptic DCM derivatives increased as the electron-donating ability of the EDG increased.

Improvement of Emitting Properties in Organic Light Emitting Diode having liquid emitting layer

Heo Hyo Jung, Shuzo Hirata, Korefumi Kubota, Osamu Hirata, Kenichi Goushi, Masayuki Yahiro and Chihaya Adachi, Center for Organic Photonics and Electronics Research (OPERA), Kyushu University, 744 Motooka, Nishi-ku, Fukuoka 819-0395, Japan, adachi@cstf.kyushu-u.ac.jp

Recently, we reported a unique organic light emitting diode (OLED) based on a neat liquid emitting layer which will open novel possibilities of OLED applications.¹⁾ However, liquid OLEDs have serious problems such as low maximum luminance, low efficiency, and high applied voltage. Here we report improvement of external EL quantum efficiency and maximum luminance in OLEDs having a liquid emitting layer composed of a 9-(2-ethylhexyl)carbazole (EHCz) host with additives. A fabricated OLED structure is ITO/PEDOT:PSS (40 nm)/0.1 wt%-Organic salt, 16.7 wt%-guest compound, EHCz (1100 nm)/TiO₂ (10 nm)/ITO. Figure 1 shows that doping of organic salt into the liquid emitting layer and the insertion of a TiO₂ layer as a hole blocking layer between the liquid emitting layer and an ITO cathode can decrease driving voltage and improve external EL quantum efficiency and maximum luminance of the OLEDs drastically. Consequently, this newly designed OLEDs led to external EL quantum efficiency of 0.4 % and the maximum luminance of 100 cd/m².

1) D. Xu and C. Adachi, Appl. Phys. Lett. **95**, 053304 (2009).

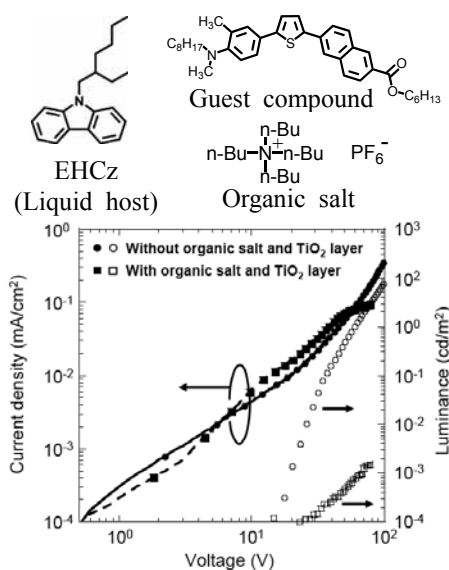


Fig. 1 Chemical structures of compounds used in this study and comparison of J-L-V properties in two kind of OLEDs having a liquid emitting layer.



Book of abstracts KJF 2010

Date of issue: August 21, 2010

Publisher : KJF2010 Organizing Committee

Printer : Secand, Co. Ltd.

(Kumamoto, Japan, <http://www.secand.jp>)