

学术报告

题目：100% electroluminescence efficiency through unlimited molecular design

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地点：丰盛堂芙兰学术中心 A402

时间：2016年7月1日下午4:00

主持人：池振国教授

欢迎参加！

报告摘要：Molecules are a carbon based material that enables unlimited molecular architecture, leading to unexpected and amazing functions. Recently, through sophisticated molecular design, Kyushu University, the OPERA research team, pioneered a novel conceptual luminescent molecule, thermally activated delayed fluorescence (TADF), that can harvest both electrically generated singlet and triplet excitons and realize 100% electron-photon conversion efficiency. Now, we established the third generation emitter in organic light-emitting diodes (OLEDs). I would like to look back and outlook the TADF science and technology.



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Education

1988: M. Eng. Materials Science and Technology, Kyushu University

1991: D. Eng. Materials Science and Technology, Kyushu University

Professional Appointments (Research)

1991-1996: Ricoh Co., Chemical Products R&D Center, Research Chemist and Physicist

1996-1999: Shinshu University, Department of Functional Polymer Science, Research Associate

1999-2001: Princeton University, Department of Electrical Engineering, Research Staff

2001-2004: Chitose Institute of Science and Technology, Associate Professor

2004-2006: Chitose Institute of Science and Technology, Professor

2006- : Kyushu University, Center for Future Chemistry, Professor

2010- : Kyushu University, Center for Organic Photonics and Electronics Research (OPERA), Distinguished Professor

Member of a scholarly academy in a major country

Materials Research Society (MRS) (USA)

The Institute of Electrical and Electronics Engineers (IEEE) (USA)

Society for Information Display (SID) (USA)

SPIE (USA)

Recipient of an international award(s)

1989: The 9th International Display Research Conference (SID), Oct.16-18, Kyoto, Outstanding paper award & presentation award

2003: FFIT Award, Funai Foundation for Information Technology

2004: Distinguished paper award on Organic electroluminescence, Div.of Molecular Electronics and Bioelectronics, The Japan Society of Applied Physics, Japan

2004: Nano-tech 2004, International Nanotechnology Exhibition and Conference, Nano-tech award, IT&Electronics division

2005: The Commendation for Science and Technology by the Minister of Education, Culture, Sports, Science and Technology, Science and Technology Promotion Category, Studies on Organic Electroluminescence

2014: 2014 SID Fellow Awards

Editor of an influential journal

Editor of "Organic Electronics" (Elsevier)

Selected papers:

1. "Organic light-emitting diodes employing efficient reverse intersystem crossing for triplet-to-singlet state conversion", K.i Goushi, K. Yoshida, K. Sato, C. Adachi, *Nat. Photon.*, **6**, 253 - 258, 2012
2. "Design of Efficient Thermally Activated Delayed Fluorescence Materials for Pure Blue Organic Light Emitting Diodes", Q. Zhang, J. Li, K. Shizu, S. Huang, S. Hirata, H. Miyazaki, C. Adachi, *J Am. Chem. Soc.*, **134**, 14706 - 14709, 2012
3. "Enhanced Electroluminescence Efficiency in a Spiro-Acridine Derivative through Thermally Activated Delayed Fluorescence", G. Mehes, H. Nomura, Q. Zhang, T. Nakagawa, C. Adachi, *Angewandte Chemie*, **51**, 11311 - 11315, 2012
4. "Highly efficient organic light-emitting diodes from delayed fluorescence", H. Uoyama, K. Goushi, K. Shizu, H. Nomura, C. Adachi, *Nature*, **492**, 234 - 238, 2012
5. "Bifunctional Star-Burst Amorphous Molecular Materials for OLEDs: Achieving Highly Efficient Solid-State Luminescence and Carrier Transport Induced by Spontaneous Molecular Orientation", J. Y. Kim, T. Yasuda, Y. S. Yang, C. Adachi, *Adv. Mater.*, **25**, 2666 - 2671, 2013
6. "Highly Efficient Organic Light-Emitting Diode Based on a Hidden Thermally Activated Delayed Fluorescence Channel in a Heptazine Derivative", J. Li, T. Nakagawa, J. MacDonald, Q. Zhang, H. Nomura, H. Miyazaki, C. Adachi, *Adv. Mat.*, **25**, 3319 - 3323, 2013
7. "Organic luminescent molecule with energetically equivalent singlet and triplet excited states for organic light-emitting diodes", K. Sato, K. Shizu, K. Yoshimura, A. Kawada, H. Miyazaki, C. Adachi, *Phys. Rev. Lett.*, **110**, 247401, 2013
8. "Efficient blue organic light-emitting diodes employing thermally activated delayed fluorescence", Q. Zhang, B. Li, S. Huang, H. Nomura, H. Tanaka, C. Adachi, *Nat. Photonics.*, **8**, 326 - 332, 2014
9. "Luminous Butterflies: Efficient Exciton Harvesting by Benzophenone Derivatives for Full-Color Delayed Fluorescence OLEDs", S. Y. Lee, T. Yasuda,

- Y. S. Yang, Q. Zhang, C. Adachi, *Angew. Chem. Int. Ed.*, **126**, 25, 6520 - 6524, 2014
10. "Donor-acceptor-structured 1,4-diazatriphenylene derivatives exhibiting thermally activated delayed fluorescence: design and synthesis, photophysical properties and OLED characteristics", T. Takahashi, Ka. Shizu, T. Yasuda, K. Togashi, C. Adachi, *Sci. Technol. Adv. Mater.*, **15**, 3, 034202, 2014
 11. "Electrogenerated Chemiluminescence of Donor–Acceptor Molecules with Thermally Activated Delayed Fluorescence", R. Ishimatsu, S. Matsunami, T. Kasahara, J. Mizuno, T. Edura, C. Adachi, K. Nakano, T. Imato, *Angew. Chem.*, **126**, 27, 7113 - 7116, 2014
 12. "High-efficiency organic light-emitting diodes with fluorescent emitters", H. Nakanotani, T. Higuchi, T. Furukawa, K. Masui, K. Morimoto, M. Numata, H. Tanaka, Y. Sagara, T. Yasuda, C. Adachi, *Nat. Commun.*, **5**, 4016, 2014
 13. "Large reverse saturable absorption under weak continuous incoherent light", Shuzo Hirata, Kenro Totani, Takashi Yamashita, Chihaya Adachi, Martin Vacha, *Nat. Mater.*, **13**, 938 - 946, 2014