

LECTURE 15



Dr. Chihaya Adachi

- **Distinguished professor, Kyushu University**
- **Director of Kyushu University's Center for Organic Photonics and Electronics Research (OPERA)**
- **Program coordinator of Kyushu University's Advanced Graduate da Vinci Course on Molecular Systems for Devices and director of the Fukuoka i³ center for Organic Photonics and Electronics Research.**

Date: 2019.11.06

淡江大學熊貓講座
Tamking Clement and Carrier Chair

**Challenge for next generation
organic optoelectronics with finely
designed organic molecules**

2019 11/06(三) 10:00~12:00
守謙國際會議中心
有蓮國際廳

Dr. Chihaya Adachi
Kyushu University, Japan

Position
Professor of National University Corporation Kyushu University, Applied Chemistry.
Director of Kyushu University's Center for Organic Photonics and Electronics Research.
Program coordinator of Kyushu University's Advanced Graduate da Vinci Course on
Molecular Systems for Devices.
Director of the Fukuoka F center for Organic Photonics and Electronics Research.
Co-founded and serves as scientific advisor for Kyulux Inc.
Editors-in-Chief, Organic Electronics, Elsevier.

理學院 化學系 敬邀

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INTRODUCTION

- Chihaya Adachi obtained his doctorate in Materials Science and Technology in 1991 from Kyushu University and held positions as at the Chemical Products R&D Center at Ricoh Co., the Department of Functional Polymer Science at Shinshu University, the Department of Electrical Engineering at Princeton University, and Chitose Institute of Science and Technology before returning to Kyushu University as a professor.
- Adachi's research combines the areas of chemistry, physics, and electronics to advance the field of organic light-emitting materials and devices from both the materials and device perspectives through the design of new molecules with novel properties, the study of processes occurring in individual materials and complete devices, and the exploration of new device structures, and he has co-authored over 500 research papers.
- He co-founded and serves as scientific advisor for Kyulux Inc, which is commercializing OLED emitters based on thermally activated delayed fluorescence. In 2019, he co-founded KOALA Tech Inc to further develop and eventually commercialize the organic laser diodes. Recent awards he has received include a 2017

Nishina Memorial Prize and a 2016 Thomson Reuters Research Front Award, and he was named a 2018 Highly Cited Researcher for the Cross-Field category.

- Adachi is recognized as an innovator in the development of materials for organic light-emitting diodes (OLED). He has pioneered a new technology known as thermally activated

delayed fluorescence (TADF).

- In the 2007 Adachi received the Commendation for Science and Technology by the Japanese Minister of Education, Culture, Sports, Science and Technology. In 2016 Adachi was awarded with the Japan Society of Applied Physics Fellow Award.

Topic : Challenge for next generation organic optoelectronics with finely designed organic molecules



ABSTRACT

After the fruitful success of thermally activated delayed fluorescence (TADF) technology, the importance of charge transfer (CT) states has been widely recognized in organic luminescence materials¹. In fact, finely controlled donor-acceptor strength in TADF molecules could realize nearly 100% quantum efficiency of electron-photon conversion in OLEDs by tuning the singlet-triplet energy gaps, upconversion rates from T_1 to S_1 states and radiative decay rates from S_1 states. Recently, further sophisticated control of CT interaction led to the new directions such as long persistent luminescence (LPL)² and organic lasers². In this talk, I will introduce the basis of CT emission and diversified possibilities of organic CT states which open novel optoelectronic device applications.

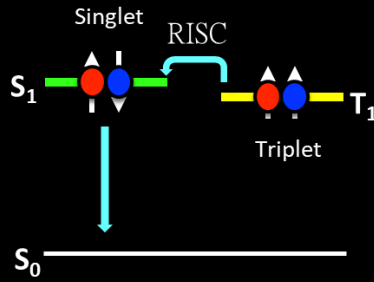
Lecture of Tamkang Clement and Carrie Chair

Challenge for next generation organic optoelectronics With finely designed organic molecules

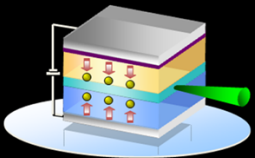
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**100% electron into photon conversion
by TADF in OLEDs**
(Thermally activated delayed fluorescence)



**Long persistent
Luminescence**



**Current driven
organic semiconductor
Laser**

Content

- 1) Discovery of highly efficient TADF emitters
- 2) TADF: Mechanism of RISC (spin-flip) and enhancement of OLED device lifetime
- 3) Advanced OLED technologies: Organic semiconductor lasers

MINUTE



Met with Chairman of the Board, Dr. Flora Chia-I Chang and TKU colleagues.



Met with President, Dr. Huan-Chao Keh and TKU colleagues.



Chairman of the Department of Chemistry presents the bronze sculpture of Tamkang Clement and Carrie Chair to Prof. Adachi.



Group photo of the attendees in Chang Yeo Lan International Conference Hall.



Prof. Adachi delivered his innovation of hyperfluorescence and TADF emitters.



Photos with TKU colleagues from Department of Chemistry, Physics and Chemical and Materials Engineering.

- Prof. Chihaya Adachi visited Tamkang University on November 5-8 in 2019. Prof. Chih-Hsin Chen at Department of Chemistry at TKU, who has previous research connection with him, invited him and hosted his stay in Taiwan. In addition to TKU, he was also invited to attend the 2019 Asian Conference on Organic Electronics (A-COE) held at Ming-Chi University of Technology as a keynote speaker during his stay.
- Before the lecture, Prof. Adachi visited President, Dr. Huan-Chao Keh and Chairman of the Board, Dr. Flora Chia-I Chang to exchange information from both sides. TKU received sake brewed by the students of Kyushu University as the gift brought by Prof. Adachi.
- In the lecture, Professor Adachi used his own learning experience as an example to explain how he learned from textbooks cleverly to combine the knowledge of physics and chemistry to create a new direction for material science. He also encouraged students to "expand your results" in the process of doing research. Regardless of whether the current experimental results are good or bad, as long as the students can learn to extend the knowledge they have learned, carefully explore the details of the reasons, their researches will eventually become good researches. Finally, he explained the current limitations in the development of OLED technology and proposed the research direction that can be challenged from the perspective of chemical molecular design, looking forward to the wider applications of OLED in the future. There are totally about 220 professors and students participating in the lecture.