

[Seminar] “Elucidation and Control of Advanced Photofunctions based on Triplet Excited States in Molecular Materials”, Prof. Kiyoshi Miyata



Date

Friday, March 7, 2025 – 15:00 to 16:00

Location

Seminar Room L4F01

Description

Elucidation and Control of Advanced Photofunctions based on Triplet Excited States in Molecular Materials

Kiyoshi Miyata, Associate Professor, Department of Chemistry, Graduate School of Science, Kyushu University, Japan

Abstract: Microscopic understanding of exciton physics in molecular materials for optoelectronics is a great challenge because of their complexity resulting from strong electron–phonon coupling and perhaps interaction to spin degree of freedom, electron spin–flip of intersystem crossing in molecular optoelectronic materials are strongly connected to molecular geometries in the excited states and vibronic coupling, and singlet fission, ultrafast generation of a correlated triplet pair state from a singlet excited state, is viewed as an extreme example of a concerted process of electron–phonon–spin degrees of freedom. To understand the complex exciton dynamics, direct observation of exciton dynamics using ultrafast spectroscopy is a key. Here, I would like to discuss a few topics mainly

focusing on triplet excited state based photofunctions: Reverse intersystem crossing (RISC), room temperature phosphorescence (RTP), triplet–triplet energy transfer (TTET), and singlet fission (SF). Using ultrafast spectroscopy such as transient absorption, time–resolved emission spectroscopy, time–resolved infrared spectroscopy, we revealed microscopic mechanisms of the photofunctions from molecular point of view, which allows us to control the functionality.

【References】

- [1] (a) M. Saigo, K. Miyata*, C. Adachi, K. Onda*, et al., *J. Phys. Chem. Lett.* 10, 2475–2480 (2019). (b) Y. Shimoda, K. Miyata*, C. Adachi, K. Onda*, et al., *J. Chem. Phys.* 153, 204702 (2020). (c) R. Koninti, K. Miyata*, M. Saigo, K. Onda*, et al. *J. Phys. Chem. C* 153, 204702 (2021). (d) T. Ryu, K. Miyata, K. Onda*, et al. *Chem. Phys. Lett.* 153, 204702 (2021). (e) A. Takada, K. Onda*, K. Albrecht*, K. Miyata*, et al., *J. Phys. Chem. C*, 128, 18820 (2024).
- [2] (a) K. Miyata, Y. Kurashige, K. Watanabe, T. Sugimoto, S. Takahashi, S. Tanaka, J. Takeya, T. Yanai, Y. Matsumoto*, *Nature Chem.* 9, 983–989 (2017). (b) K. Miyata, F. S. Conrad–Burton, F. L. Geyer, X.–Y. Zhu*, *Chem. Rev.* 119, 4261–4292 (2019). (c) Y. Kawashima, Y. Kobori, G. Watanabe*, K. Miyata*, N. Yanai*, et al. *Nature Commun.* 153, 204702 (2023). (d) A. Yamauchi, Y. Kobori*, K. Miyata*, Nobuhiro Yanai* et al. *Science. Advances.* 10, eadi3147 (2024).
- [3] Y. Tani*, K. Miyata*, et al. *Chemical Science*, 15, 10784 (2024).
- [4] (a) S. Miyazaki, K. Miyata*, K. Onda, et al. *J. Phys. Chem. A* 153, 204702 (2020). (b) S. Miyazaki, K. Miyata*, K. Onda*, et al. *Chem. Sci.* 153, 204702 (2023). S. Miyazaki, K. Miyata*, K. Onda*, et al., *J. Phys. Chem. Lett.*, 15, 10718 (2024).

Biography: Kiyoshi Miyata is an Associate Professor of Chemistry at Kyushu University, Japan. He earned his Ph.D. in Chemistry from Kyoto University in 2015 under the guidance of Prof. Yoshiyasu Matsumoto. From 2015 to 2018, he conducted postdoctoral research in the XYZ group at Columbia University, supported by a fellowship from the Japan Society for the Promotion of Science (JSPS). He joined Kyushu University as an Assistant Professor of Chemistry in 2018, and was promoted to Associate Professor in 2022. His research interests lie at the intersection of photophysics and photochemistry, with a focus on electron–phonon coupling in molecular and hybrid semiconductors, emissive materials, and photochemical processes.

Contact:

Ryota Kabe, oou [at] oist.jp