

ICB recommended seminar

Host: Nanomaterials Engineering Research Group/Prof. Dr. Chih-Jen Shih

IRON-CATALYZED NEW TRANSFORMATIONS AND THEIR APPLICATIONS FOR FUNCTIONAL ELECTRONIC MATERIALS

Prof. Dr. Rui Shang

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Friday, 03/05/2024, 5 pm

ETH Hönggerberg, HCI G 174



Abstract: Iron, as the most abundant metal on Earth, can serve as a sustainable catalytic resource in the production of organic functional materials. Through years of research on iron catalysis and conjugated materials, we have come to understand various unique properties of organic iron compounds, especially their low oxidation-reduction potentials as catalysts and the mechanism of C-H bond cleavage. The speaker acknowledges that these characteristics give iron catalysis an advantage in synthesizing highly conjugated molecules, especially those with higher HOMO energy levels that are difficult to obtain. We have successfully designed several iron-catalyzed transformations to obtain conjugated molecules, including C–H/C–H coupling for polymerization, tandem cyclization to highly strained frameworks, efficient aza- π extension, and spiro cyclizations. These new methodologies facilitate the efficient synthesis of various conjugated polymers and small ladder-type conjugated molecules. Some of the new molecules created through our iron catalysis have exhibited excellent performance in solar cells, organic photodetectors, and light-emitting diodes, demonstrating the potential for organic electronics industry.

Bio: Rui Shang is a project professor in the Department of Chemistry at the University of Tokyo. He obtained his B.Sc and Ph.D. (2014) from the University of Science and Technology of China. He also completed a joint PhD training at the University of Tokyo following a JSPS fellowship (2012-2016) under the supervision of Prof. Eiichi Nakamura. In 2017, he was appointed as a lecturer at the University of Tokyo, and in 2020, to associate professor. Dr. Shang's research interests encompass new catalytic reactions, innovative conjugated molecules, and their material functionalities. He has been recognized with several accolades, including the 100 Excellent Doctor Thesis Award from the Chinese Academy of Sciences in 2015 and the Springer Doctoral Thesis Prize in 2016. Moreover, he was appointed as an Early Career Advisory Board member for the Science of Synthesis (SoS) and a JSP fellow at the Bürgenstock Conference in 2022. In recognition, Dr. Shang has received the Banyu Chemist Award 2022, the Young Chemist Award of the Chemical Society of Japan 2022, and the Thieme Chemistry Journals Award in 2023.