Akita-Yoshizawa Lab

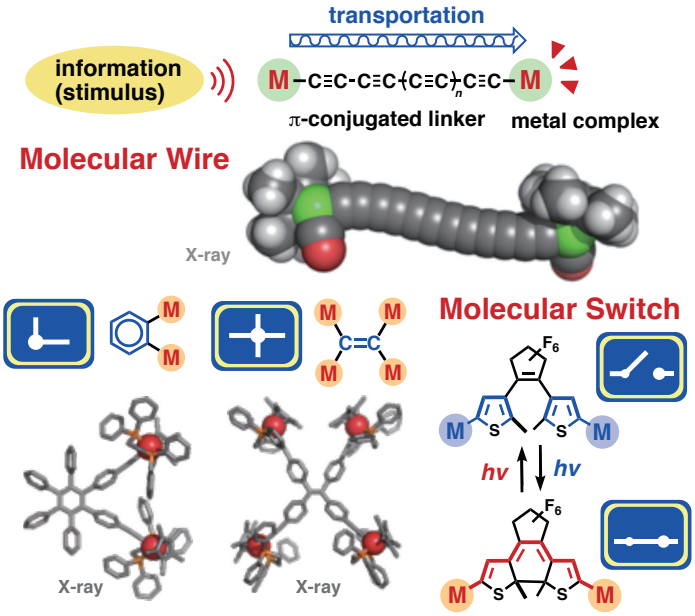
Development of Smart Chemical Systems

Laboratory for Chemistry and Life Science, Molecular Synthesis Division

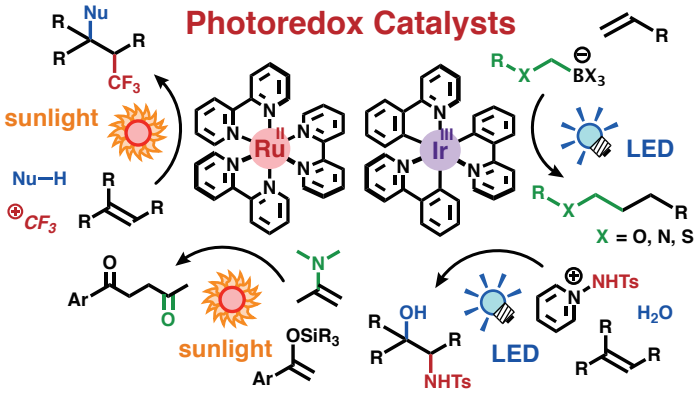
http://www.res.titech.ac.jp/smart/smart_e.html

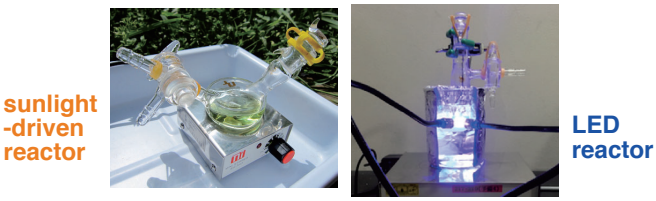
Organometallic Molecular Wires and Devices [1]

Assembly of single-molecule devices composed of the metal electrode-molecule-metal electrode (MMM) junctions is one of the methods to achieve the ultimate miniaturization of electronic devices. We have recently been exploring highly conductive organometallic molecular wires, which are potentially applicable to the single-molecule devices. The organometallic fragments turned out to enhance single-molecule conductance of the MMM junctions. Furthermore, we found long-range efficient carrier transport properties for the multi-metallic molecular wires. We have also developed functional molecular switches, which respond to photo-irradiation and redox stimuli.



Visible-light Photoredox Catalysis [2,3]



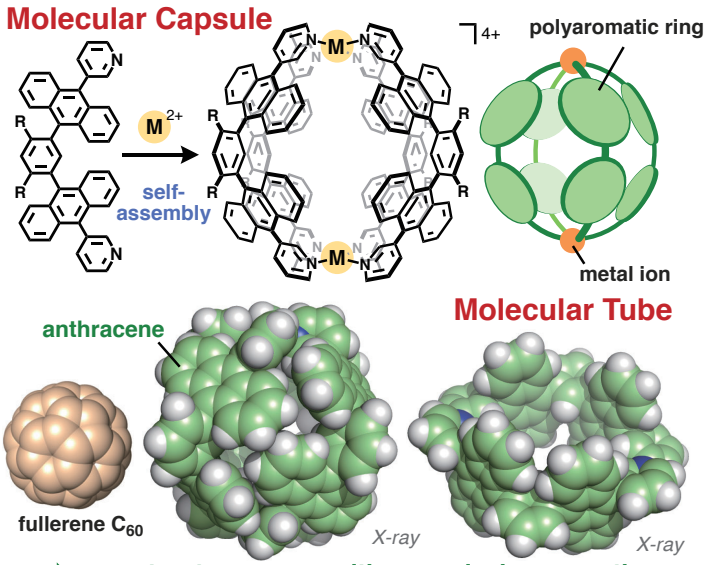


➡ development of new photocatalytic systems

Photoredox catalysis has emerged as a powerful tool for synthetic chemistry. Recently, we have developed various photoredox-catalyzed radical reactions under visible light irradiation including sunlight. In particular, we are interested in new methodologies for synthesis of pharmaceuticals and agrochemicals, e.g. organofluorine compounds, and heterocycles. Now we also pay our close attention to the development of new photocatalysts and reagents for radical reactions.

Functional Molecular Flasks with Polyaromatic Shells [4,5]

Polyaromatic rings often display attractive physical and chemical properties. We have recently focused on anthracene as a polyaromatic building block and synthesized novel molecular capsules and tubes with multiple anthracene panels. The polyaromatic capsules encapsulate various compounds, such as organic fluorescent dyes and radical initiators, biological saccharide and steroid hormones, and inorganic sulfur clusters in water. We revealed that, in the confined nanospace, these molecules show intriguing chemical and physical properties through efficient host-guest interactions.



➡ nanostructure • recognition • emission • reaction

Recent Publications: [1] Y. Tanaka, Y. Kato, T. Tada, S. Fujii, M. Kiguchi, M. Akita, *J. Am. Chem. Soc.*, **2018**, *140*, 10080. [2] T. Koike, M. Akita, *Chem* **2018**, *4*, 409. [3] N. Noto, T. Koike, M. Akita, *Chem. Sci.*, **2017**, *8*, 6375. [4] M. Yamashina, T. Tsutsui, Y. Sei, M. Akita, M. Yoshizawa, *Science Adv.*, **2019**, *5*, in press. [5] S. Matsuno, M. Yamashina, Y. Sei, M. Akita, A. Kuzume, K. Yamamoto, M. Yoshizawa, *Nature Commun.*, **2017**, *8*, 749.