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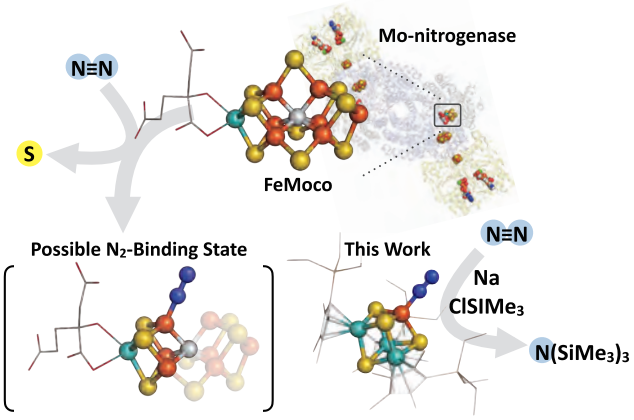
ICR News 2022

Recently Published in *Nature*!
"Nitrogen Reduction by the Fe Sites of Synthetic [Mo_3S_4Fe] Cubes"

■ Prof OHKI, Yasuhiro

In July 2022, our research paper was published in Nature. This study, entitled "Nitrogen reduction by the Fe sites of synthetic [Mo_3S_4Fe] cubes", demonstrates the first catalytic reduction of N_2 by synthetic metal-sulfur compounds and provides clues on how N_2 is captured by the enzyme in nature and why the protein matrix around the N_2-binding site is needed.

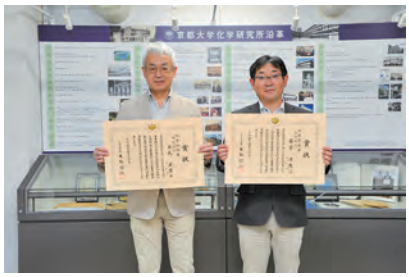
The reduction of N_2 is the key elementary step to provide nitrogen atoms in amino acids and DNA and is hence indispensable for every form of life. Nitrogenase is the enzyme for this process, and at an atomic level, FeMoco (top in the figure) consisting of iron (Fe)-molybdenum (Mo)-sulfur (S)-carbon (C) is in charge of the difficult N_2 reduction. Due to the structural complexity of FeMoco, the key elements of N_2 reduction have remained unresolved. In this study, Ohki *et al.* predicted the structure of N_2-bound FeMoco (left bottom of the figure) and the function of the protein, and synthesized cubic Mo-Fe-S compounds as simplified models (right bottom of the figure). This study not only represents the first step toward N_2 reduction by artificial metal-sulfur compounds, but also a good example of how the utilities of metal-sulfur compounds can be expanded by learning from enzymes and applying appropriate molecular design.



Remarkable Awards!
"The Commendation for Science and Technology by MEXT"

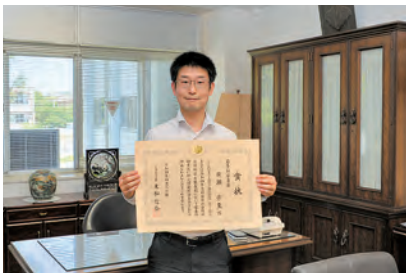
Four Professors, Institute for Chemical Research were awarded "The Commendation for Science and Technology by the Minister of Education, Culture, Sports, Science and Technology" for AY2022, to honor those who have made noteworthy contributions either to the research and development of science and technology, or to advancing the understanding of science. Prof. ONO, Prof. WAKAMIYA and Prof. KANEMITSU received Awards for Science and Technology. Assoc. Prof. HIROSE received the Young Scientists' Award.

Prof ONO, Teruo
(Nanospintronics)



Prof WAKAMIYA, Atsushi
(Molecular Aggregation Analysis)

Prof KANEMITSU, Yoshihiko
(Nanophotonics)



Assoc Prof HIROSE, Takashi
(Structural Organic Chemistry)

Green Innovation Fund Project

■ Prof WAKAMIYA, Atsushi

With the goal of achieving “carbon neutrality by 2050”, the Ministry of Economy, Trade, and Industry (METI) created the Green Innovation Fund Project (total 2 trillion yen) to support research and development over a 10-year period as part of the New Energy and Industrial Technology Development Organization (NEDO). A research team including Prof. Atsushi Wakamiya, Prof. Yoshihiko Kanemitsu, and Prof. Takeshi Hasegawa at our institute (ICR) was selected in partnership with Enecoat Technologies, Co., Ltd. to lead one of the priority areas of the Green Innovation Fund Project, “The Development of Next Generation Solar Cells”. This project aims to commercialize lightweight, flexible, and high-performance perovskite solar cells for installation in locations where traditional solar cells cannot be used, such as factory roofs and building walls with low load-bearing capacity.

TSK Corporation Bonding the People, Materials, and Nature with Chemistry

■ Prof NAKAMURA, Masaharu

TSK Corporation was established on July 1, 2021. TSK is an acronym for Tetsu Shokubai Kagaku【鐵触媒化学】. Tetsu【鐵】is the old Chinese character for iron, “the king of metals. Shokubai Kagaku【触媒化学】is catalytic chemistry. In 1996, I started researching “Iron-Catalyzed Precise Organic Synthetic Reactions” during the last year of my Dr course study. In 2006, I was appointed as a professor at the Institute for Chemical Research, Kyoto University, where I met the current CEO of TSK, Dr. Euncheol Son (then D3 in Tamao Group). Dr. Son later worked at Sekisui Chemical and Samsung Display before going independent in 2019. In 2016, I met Mr. Matsuura, the TSK COO, at an industry-academia exchange meeting at the Uji Campus. This team was selected for the 2020 Incubation Program (IPG) of Kyoto University. Under its support, Mr. Matsuda and Mr. Avena, talented synthetic organic chemists, have joined, establishing a new iron-catalyzed methodology for synthesizing organic electronic materials. At the start of 2023, Ms. Yamada, Mr. Imai, and Mr. Allys have also joined the company, and we all are pursuing New Material Resource Revolution (NMR2)” This new Chemistry will gently and joyfully re-bond nature and humanity. We are running full speed toward such a future!