Chemistry 1

Date: July 6 2:00-3:00 pm (JST)

Introduction of Organic Chemistry Groups

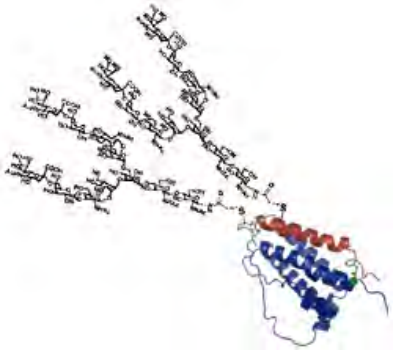
Abstract:

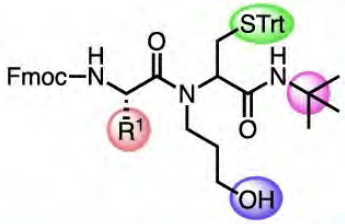
In the Division of Organic Chemistry, we observe natural phenomena through the structures and chemical behaviors of organic molecules, and try to discover the underlying principles operating in the life systems. We also actively extend our knowledge through theoretical considerations of the structures and properties of molecules and molecular interactions. These efforts will allow us to interpretate the sophisticated natural system and enable further creation of functionally interesting organic compounds. There are nine organic chemistry groups in Department of Chemistry, Graduate School of Science. This class delivers lectures of recent research results from three selected groups out of nine.

Organic Biochemistry Group (Prof. Kajihara) focuses on 1) chemical synthesis of oligosaccharides, 2) chemical synthesis of glycoproteins and glycopeptides, and 3) elucidation of oligosaccharide functions.

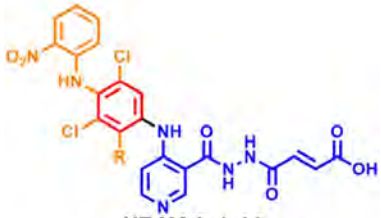
Protein Organic Chemistry Group (Prof. Hojo) is interested in 1) general studies on a chemical protein synthesis, 2) development of methods for ligation, 3) synthesis, structural and functional studies of membrane proteins, and 4) synthetic studies of post-translationally modified proteins.

Complex Molecular Chemistry Group (Prof. Suzuki) studies on 1) development of epigenetic inhibitors and their applications, 2) target-guided synthesis of enzyme inhibitors, 3) chemical biology and medicinal chemistry for refractory diseases, and 4) medicinal chemistry using artificial intelligence.





Fmoc-aminoacyl-*N*-alkylcysteine (NAC)
(Peptide Thioesterification Device)



HZ-MA hybrid
11a: R = H, 11b: R = Me
✓ *potent-FTO-inhibitory activity*
✓ *high FTO-selectivity*
✓ *cell-activity (prodrug of 11b)*

Lecturer: *Yasuhiro KAJIHARA, Hironobu HOJO, Takayoshi SUZUKI*

OSAKA UNIVERSITY
School of Science
Graduate School of Science

Chemistry 2

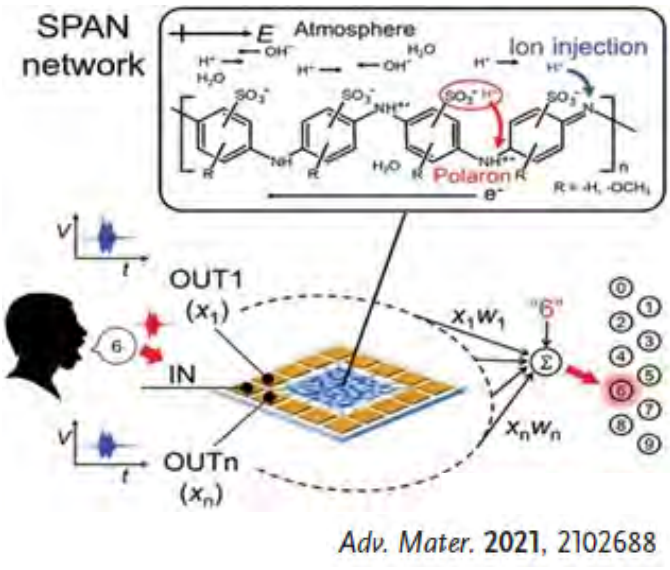
Date: July 5 5:00-6:00 pm (JST)

Neuromorphic Functions in Nonlinear Molecular Networks

Abstract:

In recent decades, studies on the electronic properties and functions of single molecules have made significant advances and single molecular transistors have been demonstrated. Such investigations, however, have not directly led to actual molecular-scale electronic devices, due to the lack of effective technologies for wiring between molecules. Beyond single molecular transistors, the exploration of device architecture is a central issue in molecular-scale electronics. One of the attractive directions is the realization of neural networks that utilize self-assembled molecular systems. The simplest neuron communication model is represented by a nonlinear response that corresponds to neuron firing.

Neuromorphic functions can be achieved by using various type of nanoscale electric properties such as Coulomb blockade, resonance tunneling and ionic conduction in molecular networks. For example, self-doped water-soluble polyaniline sulfonate (SPAN) exhibiting high conductivity indicates nonlinear I-V characteristics in nanoscale and humid condition at room temperature. The nonlinearity in SPAN network are useful for a physical reservoir computing that realize spoken-digit classification.



Adv. Mater. **2021**, 2102688

Lecturer: *Takuya MATSUMOTO*

OSAKA UNIVERSITY
School of Science
Graduate School of Science

Chemistry 3
Date: July 5 3:30-4:30 pm (JST)

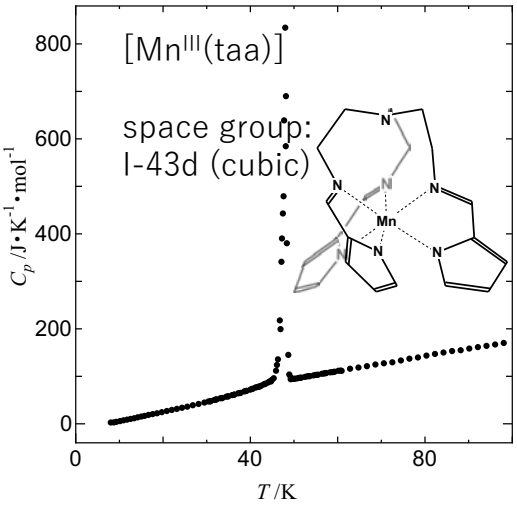
Welcome to the Research Center for Thermal and Entropic Science (RCTES)

Abstract:

This is a virtual lab tour to the Research Center for Thermal and Entropic Science (RCTES), Osaka University, where experimental thermodynamics on a variety of systems are conducted. The versatility of the discipline guarantees wide choice of samples: ionic crystals, plastic crystals, liquids, liquid crystals, condensed gases, hydrogen-bonded systems, clathrate hydrates, polymers, molecular magnets, functional metal complexes, Lipids, biomaterials, up to living cells.

At the present time, Heat Capacity Calorimetry and Reaction Heat Calorimetry facilities are mainly working. Heat capacity (C_p) is an important thermodynamic quantity which gives entropy of materials, a key information at the interface of macroscopic and microscopic worlds. The figure underneath is an example of C_p measurements on a molecule-based magnet showing a steep phase transition at the temperature 48 K. The entropy change in this isomorphic phase transition evidenced the presence of dynamic Jahn-Teller effect of the metal complex.

In this tour, we will show you the facilities and explain a part of our research.



Lecturer: *Motohiro NAKANO*

OSAKA UNIVERSITY
School of Science
Graduate School of Science

Chemistry 4

Date: July 6 3:30-4:30 pm (JST)

Chemistry Macromolecular Science Technical Support Division

Measurement of Nuclear Magnetic Resonance & *Remote Operation*

Abstract:

In this lecture, we virtually provides hands-on training in analytical methods of NMR, as well as didactic training in the fundamental principles of the techniques. We have just launched new programs that aims to allow the remote operation of our available instruments by students and researchers from overseas. This initiative seeks to address the restrictions imposed on research activities by the unavailability of advanced instrumentation, particularly on developing countries. https://www.sci.osaka-u.ac.jp/en/news/2540_1/

Lecturer: *Dr. Shinya Hanashima*

OSAKA UNIVERSITY
School of Science
Graduate School of Science

Chemistry 5

Date: Archived video
(July 5 6:00-11:55 pm, July 6 6:00-11:55 pm, July 7 3:00-11:55 pm)

Chemistry
Macromolecular Science
Technical Support Division

X-ray Crystallographic Analysis
& Remote Operation

Abstract:

In this lecture, we virtually provides hands-on training in analytical methods of X-ray crystallographic analysis, as well as didactic training in the fundamental principles of the techniques. We have just launched new programs that aims to allow the remote operation of our available instruments by students and researchers from overseas. This initiative seeks to address the restrictions imposed on research activities by the unavailability of advanced instrumentation, particularly on developing countries. https://www.sci.osaka-u.ac.jp/en/news/2540_1/

Lecturer: *Dr. Anas Santria*

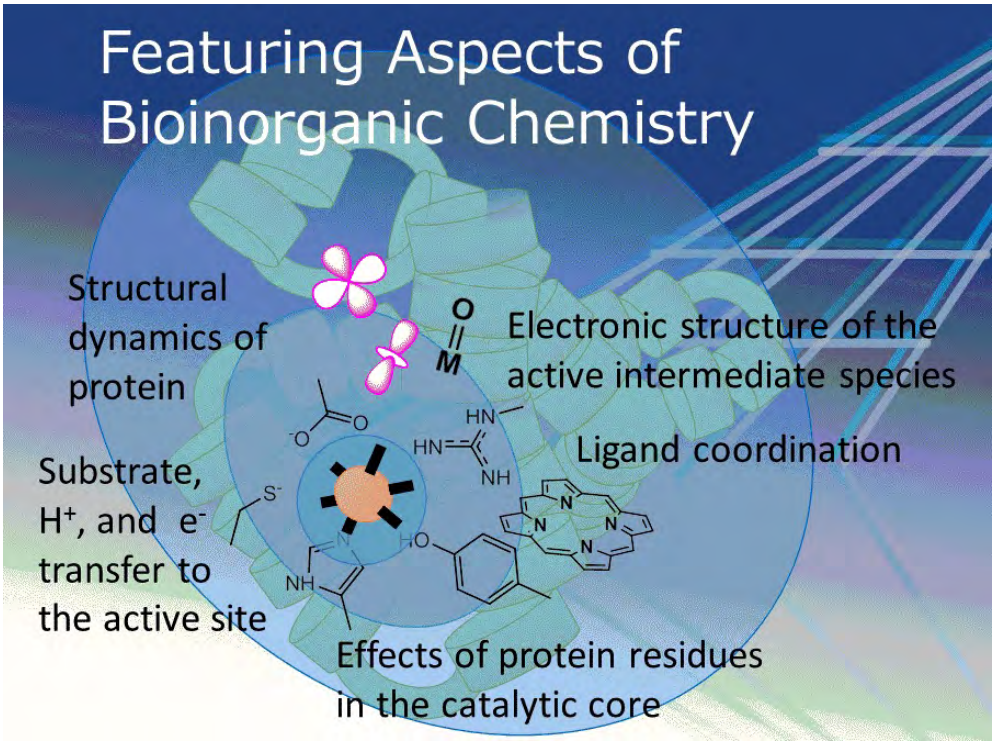
OSAKA UNIVERSITY
School of Science
Graduate School of Science

Chemistry 6
Date: July 7 2:00-3:00 pm (JST)

Inorganic Aspects in Biological Systems

Abstract:

Surprisingly, the term of “Inorganic Chemistry" literally means the chemistry of "non-living or non-biological“ compounds. Nowadays, such the classification had become incorrect. This lecture will be mainly given on metalloproteins including metals at the active sites to understand their structures, functions, and chemical and mechanistic properties. The metal ions are Lewis acid catalysts in hydrolysis, and frequently show various oxidation states upon electron transfer and redox reaction. These chemical properties of metal centers can be fundamentally controlled by coordination structures at the active sites. In the protein environments, the proximal and distal amino acid residues strongly assist the functions of the active metal centers.



Lecturer: *Prof. Yasuhiro Funahashi*

OSAKA UNIVERSITY
School of Science
Graduate School of Science