



Name: Tatsumi Kazuyuki

Date of Birth: January 26, 1949 (in Nara, Japan)

Education: 1971 B.Sc., 1976 Ph.D. Osaka University

Professional Carrier:

1977-1979 Postdoctoral Fellow, Texas A&M University (Prof. M. Tsutsui)

1979-1982 Postdoctoral Fellow, Cornell University (Prof. R. Hoffmann)

1982-1991 Assistant Professor, Osaka University

1991-1994 Associate Professor, Osaka University

1994-present Professor, Nagoya University

2003-present Director, Research Center for Materials Science, Nagoya University

Activities (2000 -):

1998-2002 International Advisory Editorial Board: JCS, Dalton Transactions

2000 - National Committee for Chemistry: Science Council of Japan

2000 - Associate Editor: The Chemical Record (Chemical Society of Japan, Wiley)

2002 - Regional Editor: Journal of Organometallic Chemistry (Elsevier)

2002-2006 Head Investigator: Grant-in-Aid on Priority Area:

“Reaction Control of Dynamic Complexes”

2004 - Vice President: Division II, Inorganic Chemistry, IUPAC

(International Union of Pure and Applied Chemistry)

2005 - Committee Member: Subdivision on Science, Council for Science and Technology
Ministry of Education

2006 - Vice Chair: International Organizing Committee (Pacifichem 2010)

2006 - ACES Committee Member: Editorial Board: Chemistry: An Asian Journal (Wiley)

2006 - Head Investigator: Grant-in-Aid on Creative Scientific Research:

“Organometallic and Cluster Chemistry in Metalloenzymes with Reducing Activities”

2008 - President: Division II, Inorganic Chemistry, IUPAC

2010 -2012 Vice President: IUPAC

2012 -2013 President: IUPAC

Honors

1998 Inoue Prize for Science, Inoue Foundation (Japan)

2000 Lectureship, Chinese Academy of Science (China)

2003 Lectureship, National Science Council (Taiwan)

2004 Humboldt Senior Research Award, Av Humboldt Foundation (Germany)

2006 The Chemical Society of Japan Award (Japan)

Research Interests

1) Transition Metal Chalcogenide Chemistry and Theoretical Inorganic Chemistry

2) Synthesis of Reactive Organometallic Complexes and Activation of Small Molecules

3) Synthesis of the Active Sites of Nitrogenase, Hydrogenase, CO-Dehydrogenase, Acetyl-CoA Synthase, and Methyl-CoM Reductase

Metalloproteins that play important roles for life, transition metal catalysts that are indispensable to organic syntheses and to environmental benignity, high-temperature superconductors such as copper oxides and niobium chalcogenides, and non-linear optical and magnetic/electronic materials of practical use. These are highly systematized inorganic compounds containing metal elements. Transition metal chemistry and modern inorganic chemistry are rapidly growing and appealing research areas, which elucidate mechanisms of the important inorganic functionality, and thereby provide us with tools to create new chemical functions.

Our research group has been engaged in such emerging areas of inorganic chemistry. The specific interests include the structures and reactions unique to the active sites of various metalloenzymes, development of new organometallics with catalytic activity, and the synthesis of inorganic supramolecules relevant to nano-sciences. The research subjects are broad in scope, yet rigorous in approach, encompassing bioinorganic chemistry, organometallic chemistry, materials chemistry, and the interface with other disciplines. We are aiming at the comprehensive and fundamental understanding of the role of metal elements in various inorganic systems, leading to better designs and efficient syntheses of the desired compounds.

In the area of metalloenzymes, our research is focused on those consisting of transition metal clusters with sulfur-donor ligands and/or cysteine. They are nitrogenase, CO dehydrogenase, acetyl-CoA synthase, hydrogenase, molybdoenzyme, and iron-sulfur proteins. We are actively seeking to reproduce the fascinating structures and reactivity of their active sites in vitro. Recently an [8Fe-7S] iron-sulfur cluster was successfully synthesized by us, which reproduces the core geometry of PN-cluster in nitrogenases. The isolation of the [8Fe-7S] cluster complex is a breakthrough in synthetic inorganic chemistry, because the cluster geometry is so unusual among the known iron-sulfur clusters in nature that the structure has been thought to exist only in certain protein environments. We have also achieved synthesis of Mo/Fe/S clusters, the structures of which are close to the FeMo-co core of nitrogenase, if not quite there yet.

The second major area of our research is organometallic chemistry. Among others, we have been particularly interested in developing coordinatively unsaturated and/or stereo-electronically dynamic complexes showing high reactivity toward organic/inorganic substrates. Bulky thiolate ligands are often utilized for the purpose. A topical example of recent outputs is a novel molybdenum(II) -sandwiched bis-arylthiolato complex which has a highly labile aryl-Mo bond. Another specific example is an electron-deficient ruthenium(II) complex with bulky 2,6-dimesitylphenyl thiolate which serves as a precursor of coordinatively unsaturated species in two ways; one with lability of the ipso-carbon and the other with reversible dissociation/association of the thiolate ligand. We have also synthesized a series of S-bridged W-Ru dinuclear complexes that are capable of splitting molecular hydrogen into proton and hydride under mild conditions,

mimicking the function of hydrogenase.

The third major area of research concerns construction of gigantic nano-scale transition metal sulfide clusters and polymers. We have developed a new synthetic route to aggregation of preformed molybdenum/iron/sulfide cubes, leading to an unprecedented cyclic tricubane cluster and to higher nucleation. Also synthesized are heterometallic sulfide clusters and polymers showing characteristic non-linear optical properties. Furthermore, use of thiolate/thioether hybrid ligands was found to give large-size clusters and 1-dimensional polymers of iron and nickel. An interesting feature of the polymers is that they can be dissolved in toluene by virtue of coordination of thioether-type sulfur atoms, and that the polymer structures are regenerated upon recrystallization.

Modern inorganic chemistry is a realm of unlimited possibility. Our research laboratory deals with nearly all elements in the periodic table, trying hard to find something new, something important, and something fulfilling our intellectual curiosity in chemistry. A group of able students, postdocs and young researchers from various countries have contributed much to an excellent atmosphere of our laboratory with an international flavor.