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Laboratory for Function Chemistry

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http://www.sci.osaka-cu.ac.jp/chem/aa/aa.pdf

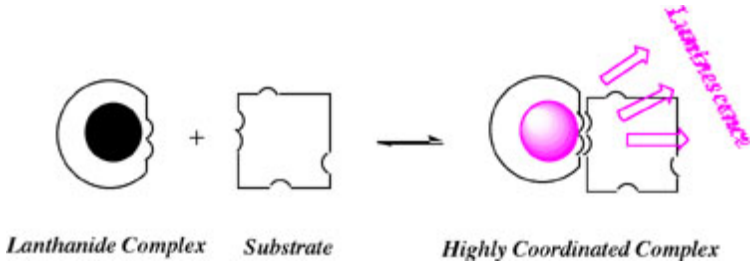
1. Current Research and Principal Research Interests

Our research interests all come under the general heading of "Molecular Recognition Chemistry", "Coordination Chemistry", and "Supramolecular Chemistry". The actual research projects range from inorganic, organic, analytical, and biological chemistry to integrated systems chemistry.

Recent Reviews:
1) S. Shinoda and H. Tsukube, **Chem. Sci.**, in press. DOI:10.1039/c1sc00162k. 2) S. Shinoda and H. Tsukube, **Analyst**, 136, 431-435 (2011). 3) H. Sugimoto and H. Tsukube, **Chem. Soc. Rev.**, 37, 2609-2619 (2008). 4) S. Mameri, S. Shinoda, and H. Tsukube, **Heterocyclic Supramolecules I (Series: Topics in Heterocyclic Chemistry, Vol. 17)**, Springer-Verlag, pp. 1-42, (2008).

(1) Molecular Recognition & Coordination Chemistry

In the synthetic approaches to the artificial receptors which should be highly specific, very strong complexing agents, various types of lanthanide complexes were designed to offer the sophisticated molecular recognition and subsequent refined functions. Based on their unique coordination and molecular recognition chemistry, efficient chirality sensing and selective luminescence detection systems were developed in our research group.

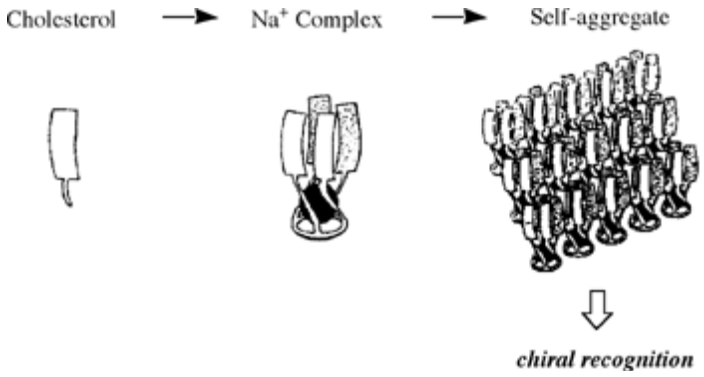


***"Lanthanide Complexes"* Specific for Luminescence Sensing**: Several series of lanthanide complexes were successfully developed as new specific luminescent probes, which were characterized by chromophoric synthetic ligands and luminescent lanthanide centers. Inorganic anions, amino acids, dipeptides and other bio-targets were specifically sensed by monitoring the visible and near-infrared lanthanide luminescence.

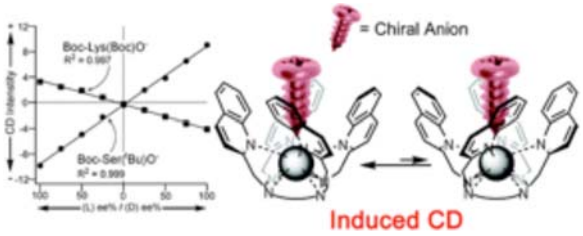
***"Lanthanide-Substituted Proteins"* as Specific Bio-Tools**: Luminescent lanthanide centers were combined with biological proteins such as transferrin and ferritin to provide nano-scale molecular recognition and luminescence sensing phenomena. Proper combinations of lanthanide centers and structured protein ligands led to a novel family of specific bio-tools for wide applications.

(2) Supramolecular Chemistry toward Systems Chemistry:The supramolecular approaches were extensively investigated on the basis of molecular recognition and coordination chemistry, which provided promising possibilities in creating new functional chemical systems at nano-meter levels.

***"Functional Integration"* on Supramolecular Assembly**: Chiral cholesterol-armed cyclen – metal complexes were demonstrated to have unique quadruplicated helical geometry and to form chiral supramolecular vesicles in the aqueous solutions and monolayer membranes at the air-water interfaces. They offered enantiomer-selective amino acid inclusion and precise recognition of thymine derivatives.



"Chemical Switching with Labile Metal Complexes": Several labile metal complexes including armed cyclen-Ca^{2+}complexes, synthetic peptide-Co^{2+} complexes, and trivalent lanthanide complexes well worked as dynamic molecular switches. They quickly responded H^+, anion, electron and other external stimuli and dynamically altered the three-dimensional structures and chemical functions of the molecular systems.



2. Selected Original Papers (2006-2011)

1. Mixed-Metal Complexes Incorporating Platinum and Lanthanide Centers for Selective Binding and Chirality Sensing of Succinates, S. Shinoda, A. Mizote, M. Eiraku Masaki, M. Yoneda, H. Miyake, and H. Tsukube, **Inorg. Chem.**, 50, 5876-5878 (2011).

2. Mechanical Tuning of Molecular Recognition to Discriminate the Single-Methyl-Group Difference between Thymine and Uracil, T. Mori, K. Okamoto, H. Endo, J. P. Hill, S. Shinoda, M. Matsukura, H. Tsukube, Y. Suzuki, Y. Kanekiyo, and K. Ariga, **J. Am. Chem. Soc.**, 132, 12868-12870 (2010).

3. Poly(arginine)-Selective Coprecipitation Properties of Self-Assembling Apoferritin and Its Tb^{3+} Complex: A New Luminescent Biotool for Sensing of Poly(arginine) and Its Protein Conjugates, H. Tsukube, Y. Noda, and S. Shinoda, **Chem.–Eur. J.**, 16, 4273-4278 (2010).

4. Asymmetric Twisting and Chirality Probing Properties of Quadruple-Stranded Helicates:

Coordination Versatility and Chirality Response of Na^{+}, Ca^{2+}, and La^{3+} Complexes with Octadentate Cyclen Ligand, H. Misaki, H. Miyake, S. Shinoda, and H. Tsukube, **Inorg. Chem.**, 48, 11921-11928 (2009).

5. Chemical Device Exhibiting Dual Mode Motions: Dynamic Coupling of Amide Coordination Isomerism and Metal-Centered Helicity Inversion in Chiral Cobalt(II) Complex, H. Miyake, M. Hikita, M. Itazaki, H. Nakazawa, H. Sugimoto, and H. Tsukube, **Chem.–Eur. J.**, 14, 5393-5396 (2008).

6. Experimental and Theoretical Approaches Toward Anion-Responsive Tripod–Lanthanide Complexes: Mixed Donor Ligand Effects on Lanthanide Complexation and Luminescence Sensing Profiles, Y. Kataoka, D. Paul, H. Miyake, T. Yaita, E. Miyoshi, H. Mori, S. Tsukamoto, H. Tatewaki, S. Shinoda, and H. Tsukube, **Chem.–Eur. J.**, 14, 5258-5266 (2008).

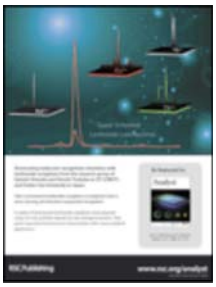
7. Time-Programmed Peptide Helix Inversion of Synthetic Metal Complex Triggered by Achiral NO_3^{-} Anion, H. Miyake, H. Kamon, I. Miyahara, H. Sugimoto, H. Tsukube, **J. Am. Chem. Soc.**, 130, 792-793 (2008).

8. "Pocket Dendrimers" as Nanoscale Receptors for Bimolecular Guest Accommodation, S. Shinoda, M. Ohashi, and H. Tsukube, **Chem.–Eur. J.**, 13, 81-89 (2007).

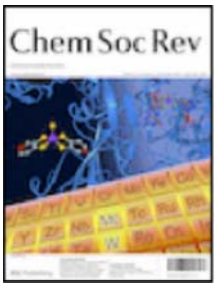
9. Mechanical Control of Enantioselectivity of Amino Acid Recognition by Cholesterol-Armed Cyclen Monolayer at the Air-Water Interface, T. Michinobu, S. Shinoda, T. Nakanishi, J. P. Hill, K. Fujii, T. N. Player, H. Tsukube, and K. Ariga, **J. Am. Chem. Soc.**, 128, 14478-14479 (2006).

10. Reversible Sulfurization-Desulfurization of Tungsten-Bis(dithiolene) Complexes, H. Sugimoto, R. Tajima, T. Sakurai, H. Ohi, H. Miyake, S. Itoh, and H. Tsukube, **Angew. Chem. Int. Ed.**, 45, 3520-3522 (2006).

3. Journal Cover Gallery



Analyst 2011



Chem. Soc. Rev. 2008

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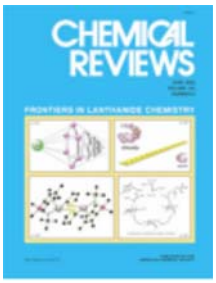

Chem. Rev. 2002

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	昭和53年3月	東京大学大学院　修了			
	昭和56年3月	京都大学大学院　修了			
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	昭和59年4月 から 平成6年9月 まで	岡山大学	教養部化学教室	助教授	
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学　　位	理学博士（昭和56年3月23日　京都大学）				