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Major Research Interests: **Synthetic Organic Chemistry;**
Other Interests: **Organometallics, Organic Reaction Mechanism**

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Development of New Synthetic Reactions

The development of new synthetic organic reactions has made great impacts not only to basic chemistry but also medicinal, material, and biological sciences. Our group has a longstanding program on exploration of new-types of synthetic reactions and methodologies, which have been never realized and/or ignored by the organic common sense. For examples, we have found an asymmetric thermal [2+2] cycloaddition reaction, intermolecular radical reactions by single electron transfer, and nucleophilic substitution reaction at sp^2 atoms. Currently, the scope and limitation of concerted nucleophilic substitution reactions at sp^2 atoms (which has been noted in organic chemistry textbooks as not to proceed) will be studied in detail to provide new synthetic methods for hetero- and carbocyclic compounds. The mechanisms ($S_NV\pi$ or $S_NV\sigma$) of the reactions are studied by experimental and theoretical methods. Furthermore, the transformation of various small ring compounds prepared of these substitution reactions also examined to develop organic synthetic methods.

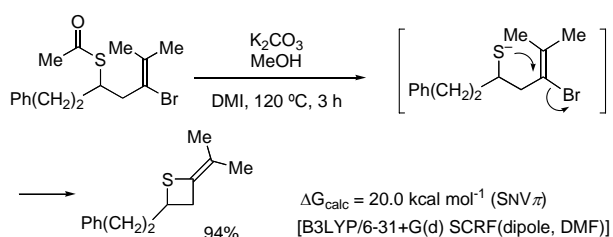
Catalytic Electron Transfer Reactions for Organic Synthesis

We are interested in activation of organic molecules by one-electron oxidation and reduction, which enables the intermolecular bond formation via the generation of carbo cations, and carbon- and nitrogen radicals. For example, β -keto radicals can be generated by the oxidation of cyclopropanols with Mn or Ag complexes and the addition reaction to alkenes proceeds smoothly. Now, we are devoting to carry out the electron transfer pathways in a catalytic manner. Particularly, the generation of nitrogen radicals is investigated starting from oxime derivatives and azido compounds.

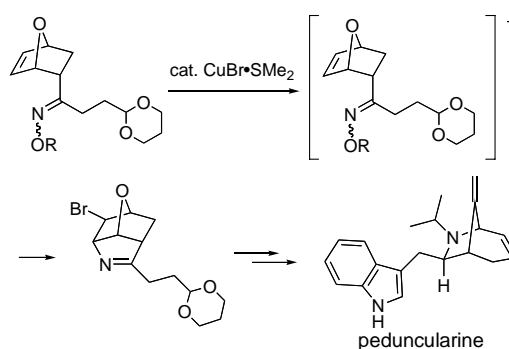
Selected Publications

H. Miyauchi, S. Chiba, K. Fukamizu, K. Ando, and K. Narasaka, Synthesis of Hetero- and Carbocycles by Nucleophilic Substitution at sp^2 Carbon. *Tetrahedron, Special Issue (in press, 2007)*.

K. Ando, M. Kitamura, K. Miura, and K. Narasaka, Theoretical and Experimental Study on the In-Plane $SN2$ -type Substitution Reaction of haloalkenes with Inversion of Configuration at the sp^2 Carbon, *Organic Letters*, 6, 2461-2463 (2004).



Even a $S_NV\pi$ reaction occurs in vinyl bromide to give methylene thiethanes. Theoretical calculation suggests a reasonable activation energy.



Radical cyclization of olefinic oximes proceeds by using $CuBr$ as a redox catalyst, which is applied to the construction of framework of peduncularine.

K. Narasaka and M. Kitamura, Amination with Oximes, *European Journal of Organic Chemistry*. 2005, 4505-4519 (2005).

T. Mikami and K. Narasaka, Generation of Radical Species by Single Electron Transfer Reactions and Their Application to Synthetic Reactions. in "Advances in Free Radical Chemistry", ed. by S. Z. Zard, JAI Press, Greenwich, Vol. 2, p. 45-88 (1999).

K. Narasaka and N. Iwasawa, Asymmetric Reactions Promoted by Titanium Reagents, "Organic Synthesis: Theory and Applications", ed. by T. Hudricky, JAI Press, Greenwich, Vol. 2, p. 93-112 (1993).