

Studies on Diversity and Synergy of Elements Directed toward Organic Synthesis

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【Outline of survey】

The state-of-the-art catalysis often relies on intricate interplay of elements, especially metal elements, during the reaction. Synthetic chemists have so far obtained intuitive knowledge about the characteristics of various metal elements through experimental trials and errors. This research project aims at "rational design on the basis of synergy of elements", focusing on Group 8-13 metal elements: these groups involve several key elements such as iron, copper, zinc etc. that will be useful for the study of environmentally benign synthetic processes. Theoretical and experimental elucidation of reaction mechanisms and synergy between elements involved in reactions catalyzed by these metals will be carried out, and the knowledge obtained here will be used for the development of environmentally benign catalytic reactions.

【Expected results】

Through designing of new synthetic reactions on the basis of multi-elemental synergism, innovative catalysis and organic synthesis will be developed. Thus, feedback between theory and experiments will open up a new route to efficient, selective and environmentally benign synthetic transformations. One of the specific subjects will be organocopper catalysis, the ambiguous mechanisms of which have so far hampered rational design of copper-catalysis. Researchers trained both in theory and in synthesis will make significant contributions to the future of the academia and industry of this country.

【References by the principal researcher】

(1) Nickel-Catalyzed Cross-Coupling of Aryl Fluoride and Gignard Reagent Under Bimetallic Cooperation, Yoshikai, N.; Mashima, H.; Nakamura, E. *J. Am. Chem. Soc.* **2005**, *127*, 17978-17979.

(2) Reactivity and Stability of Organocopper(I), Silver(I), and Gold(I) Ate Compounds and Their Trivalent Derivatives, Nakanishi, W.; Yamanaka, M; Nakamura, E. *J. Am. Chem. Soc.* **2005**, *127*, 1446-1453.

【Term of project】 FY2006 - 2010

【Budget allocation】 19,400,000 yen

【Homepage address】 <http://www.chem.s.u-tokyo.ac.jp/~common/NakamuraLabE.html>