

**Development and Control of Highly Efficient Catalytic Systems
for Cross- and Multicomponent-Coupling Reactions**

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【Outline of survey】

Transition metal catalyzed bond forming reactions are among the most useful and reliable methods for organic synthesis that have been widely employed in synthetic reactions. However there still remain many unsolved problems and undeveloped areas in this field of chemistry. For example, alkyl halides, silyl chlorides, and some heteroatom compounds including organochalcogenides have been considered to be difficult to use as the reagents in transition metal catalyzed reactions. The present project aims at developing new catalytic systems of cross coupling and multi component coupling to attain efficient carbon-carbon and carbon-heteroatom bonds formation by use of these compounds. To reach these goals our studies are focused on the catalytic reactions involving anionic transition metal complexes as the active key species and also on the synthesis and application of dynamically flexible ligands for transition metals as well as the mechanistic details of the reactions that are essential to control these reactions.

【Expected results】

The present research project will provide a new method for controlling the carbon-carbon and carbon-heteroatom bond forming reactions. These results lead to the development of the useful synthetic methodologies for creating novel materials possessing new functions. A significant progress will be expected not only in synthetic applications but also in the fundamental inorganic chemistry as well as in the field of catalyst design by way of studying anionic metal intermediates. In addition, creation and application of new flexible ligands for transition metal intermediates will contribute a lot to the development of new catalytic reactions.

【References by the principal investigator】

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- Palladium-Catalyzed Intramolecular Selenocarbonylation of Alkynes with Carbamoselenoates: Formation of α -Alkylidene- β -lactam Framework. Toyofuku, M.; Fujiwara, S.-i.; Shin-ike, T.; Kuniyasu, H.; Kambe, N. *J. Am. Chem. Soc.*, **2005**, *127*, 9706-9707.
- Cu-Catalyzed Cross-Coupling Reaction of Grignard Reagents with primary-Alkyl Chlorides: Remarkable Effect of 1-Phenylpropyne. Terao, J.; Todo, H.; Begum, S. A.; Kuniyasu, H.; Kambe, N. *Angew. Chem. Int. Ed.* **2007**, *46*, 2086-2089.

【Term of project】 FY2008—2012

【Budget allocation】

122,700,000 yen (direct cost)

【Homepage address】

<http://www.chem.eng.osaka-u.ac.jp/~catsyn/>