Title of Project : Innovative Chemical Synthesis through Carbon-Hydrogen Bond Transformation

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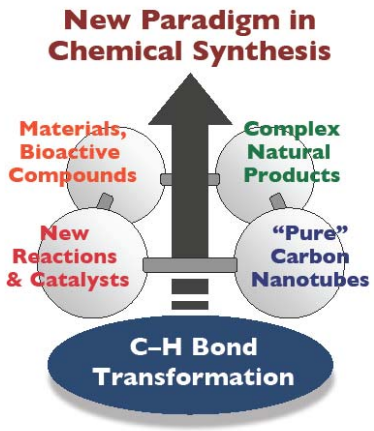
Research Area : Synthetic Organic Chemistry, Molecular Catalysis

Keyword : Carbon–Hydrogen Bond Transformation

【Purpose and Background of the Research】

Chemical synthesis is not merely an intellectual challenge but also a crucial technology for the survival of human beings. Catalysis plays an important role as a core technology in making valuable substances, but the current state-of-the-art technologies are far from ideal, exhibiting limited environmental friendliness, limited ability to activate/convert chemical bonds, and limited substances that can be created. The selective transformation of ubiquitous but inert carbon-hydrogen (C-H) bonds not only represents an important and long-standing goal in chemistry, but also has far-reaching practical implications. Minimizing waste and unwanted steps during synthesis is critical for the future of organic chemistry. We believe that such a direct transformation technology not only contributes to the realization of "greener" chemistry, but also unlocks opportunities for markedly different strategies in chemical synthesis. In this research program, we will develop truly innovative catalysts and catalytic processes for C-H bond transformation.

【Research Methods】



The goal of this program is to achieve innovation in the approach to chemical synthesis by C-H bond transformation. We will tackle this by two distinct approaches; methodology-oriented and target-oriented approaches for C-H bond transformation. The former projects include (i) development of new reactions and catalysts for C-H bond transformations, and (ii) applications of the thus-developed methodologies to the synthesis of organic optoelectronic materials and drug (or drug-like) compounds. As for the latter target-oriented projects, (iii) the synthesis of complex natural products, and (iv) the bottom-up organic synthesis of structurally uniform carbon nanotubes will be investigated. The C-H bond transformations will be the key in both of these synthetic campaigns.

【Expected Research Achievements and Scientific Significance】

The final goal of our research is to make C-H bond transformation as a standard technology in chemical synthesis, thereby changing the chemists' way and strategy of making molecules. Our five-year campaign of "C-H transformation" will culminate in a wealth of new concepts, methodologies, and tools for every area of chemistry-based science and technology. Synthesis is a fundamental aspect of all science and technology and the outcomes of our program will be multidirectional with an unlimited potential impact on society.

【Publications Relevant to the Project】

・Iridium Catalysis for C-H Bond Arylation of Heteroarenes with Iodoarenes, B. Join, T. Yamamoto, and K. Itami, *Angew. Chem. Int. Ed.*, **48**, 3644-3647 (2009).

・Direct C-H Arylation of (Hetero)arenes with Aryl Iodides via Rhodium Catalysis, S. Yanagisawa, T. Sudo, R. Noyori, and K. Itami, *J. Am. Chem. Soc.*, **128**, 11748-11749 (2006).

【Term of Project】 FY2009-2013

【Budget Allocation】 81,300 Thousand Yen

【 Homepage Address and Other Contact Information】

http://synth.chem.nagoya-u.ac.jp