Innovative Asymmetric Synthesis of Pharmaceuticals Through Strategic Development of Multifunctional and Multimetallic Catalysts

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【Outline of survey】

Development of pharmaceuticals involves state-of-the-art multidisciplinary researches and directly contributes to human health all over the world. Although a drug discovery research based on human genome sequence and *in silico* analysis have become more and more popular, a technology to produce complex small molecules with minimum environmental impact still constitutes a fundamental and indispensable research area. Our research group has developed several conceptually new multifunctional asymmetric catalysts to achieve highly efficient stereoselective synthesis of functionalized molecules. In the present research program, we envisioned an thorough elucidation of the origin of high catalytic activity and stereoselectivity of our multimetallic asymmetric catalysts through extensive spectroscopic analysis, leading to a new concept in the strategic development of multifunctional catalysts. These multifunctional asymmetric catalysts will boost practical synthesis of many therapeutic targets.

【Expected results】

Conventional design of asymmetric catalysts is based on the combination of one ligand—one Lewis acidic (or transition) metal. In contrast, we have designed asymmetric catalysts that constitute multi metallic center. Thus obtained multimetallic asymmetric catalysts activate multiple substrates simultaneously in theasymmetric environment, exhibiting extraordinarily high catalytic activity and stereoselectivity under mild reaction conditions. Our catalysts and newly developed catalysts in this research program will find a lot of opportunities to be applied in the practical synthesis of significant pharmaceuticals and smart materials. In particular, high catalytic activity allows for the use of non-activated substrates, which contributes to make a synthetic process atom-economical, environmentally benign and cost-effective in the industrial scale synthesis.

【References by the principal investigator】

reviews:

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【Term of project】 FY2008-2012	【Budget allocation】 160,700,000 yen (direct cost)

【Homepage address】 http://www.f.u-tokyo.ac.jp/~kanai/index.html