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Design of nano-structured catalysts for environmentally benign and selective molecular transformations

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More efficient catalysts can efficiently transform raw materials, thereby eliminating the use of hazardous substances, reducing waste and increasing energy efficiency. Consequently, a better use of resources, less energy consumption and lower environmental degradation across the entire chemical process can be achieved. We have developed high performance heterogeneous metal nanoparticle catalysts such as metal oxide-supported metal nanoparticles and core-shell metal nanoparticles based on the concept of precise control of cooperative catalysis between metal nanoparticles and metal oxides. In the developed catalysts, the active metal nanoparticles and metal oxide are able to cooperatively activate reactants, leading to unprecedented superior activities, selectivities and durabilities to the traditional catalysts in various important organic reactions, including selective oxidations using O2, chemoselective hydrogenations. The key aspects of these newly developed catalyst systems are the following: High catalytic activities and selectivities under mild reaction conditions, high atom-efficiencies, simple preparations of the catalysts, excellent reusabilities, applicabilities to broad substrate-scope and applicabilities to flow column reactors in scaled-up reactions. Some representative achievements in the development of various green sustainable molecular transformations using these catalysts based on the concept of metal oxide-nanoparticle cooperative catalysis are will be presented.

Biography

Takato Mitsudome received his PhD from Osaka University, after obtaining his PhD he joined the group of Professor Kiyotomi Kaneda and Koichiro Jitsukawa as an Assistant Professor in 2007 in the Graduate School of Engineering Science at Osaka University and was promoted as Associate Professor in 2016. His research interest is to design of nano-structured heterogeneous catalysts for environmentally benign and selective molecular transformations. He has published more than 90 papers in reputed journals.

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