Toshiyuki Moriuchi, Organic Chem Curr Res 2017, 6:2 (Suppl)
DOI: 10.4172/2161-0401-C1-019

Vanadium-catalyzed bromination reaction with molecular oxygen

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Bromination of organic compounds is one of the most fundamental reactions in organic synthesis, providing important precursors and substrates in various coupling reactions. Hazardous and toxic elemental bromine is utilized in a conventional bromination reaction. To avoid the use of bromine, considerable efforts have been devoted to develop an environmentally-favorable bromination method with a bromide ion as a bromide source. Vanadium bromoperoxidase catalyzes two-electron oxidation of a bromide ion in the presence of hydrogen peroxide, affording a bromonium cation-like species, which induces the bromination of organic compounds. So, the bromination reaction mimicking a catalytic activity of vanadium bromoperoxidase has attracted much attention. These methodologies, however, require a stoichiometric amount of a strong oxidant to generate a bromonium-like species. A more practical catalytic bromination reaction system without use of hazardous reagents is to be developed. From the view point of green chemistry perspective, molecular oxygen is considered as an ideal oxidant. We embarked upon the development of an environmentally-favorable catalytic system for selective bromination of a wide range of substrates. In this presentation, versatile and practical catalytic bromination systems by the combination of a commercially available inexpensive vanadium catalyst and a Brønsted acid or a Lewis acid under molecular oxygen will be described.

Biography

Toshiyuki Moriuchi received his Bachelor's degree in 1991 and his Doctoral degree in 1995 under the supervision of Professor Toshikazu Hirao, both from Osaka University. He became Assistant Professor at Osaka University and was a Post-doctoral fellow at California Institute of Technology with Professor Jacqueline K Barton (1996–1997). He was promoted as Associate Professor in 2004. His current research interests focus on the development of novel artificial bioconjugated systems based on self-organization of biomolecules and redox-active π-conjugated systems for functionalized catalysts and materials. He received the Inoue Research Award for Young Scientists in 1997 and HGCS Japan Award of Excellence 2011 in 2012.

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