Silane- and Peroxide-Free Hydrogen Atom Transfer Hydrogenation Using Ascorbic Acid and Cobalt-Photoredox Dual Catalysis

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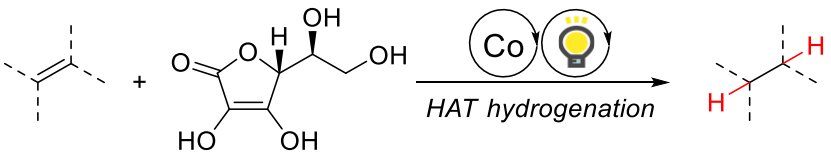
Hydrogen atom transfer (HAT) hydrogenation of alkenes developed by Shenvi[1] and Herzon[2] provides a complementary method for conventional noble metal-catalyzed hydrogenation and is increasingly appreciated in natural-product synthesis. However, reported catalytic HAT hydrogenation generally requires stoichiometric silane and peroxide in order to achieve a wide substrate scope.[3] This limitation has posed challenges regarding sustainability and safety concerns.

Herein we report a dual cobalt-photoredox catalytic system which enables silane- and peroxide-free HAT hydrogenation using ascorbic acid (also known as vitamin C) as a sole stoichiometric reactant.[4] The cobalt complex with a planar tetradentate ligand is identified as the optimal cocatalyst and realizes HAT hydrogenation with a broad substrate scope including amino acid derivatives, terpenes and drug molecules. Notably, the developed method is uniquely effective for hydrogenation of unprotected sugar derivatives compared to the established HAT hydrogenation protocols. The proposed dual catalytic mechanism is supported by experimental and theoretical studies.



Unique FG tolerance
Silane- and peroxide-free
Suitable for hydrophilic compounds

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