Abstract

Green Catalysis for Sustainable Organic Synthesis: Towards Development of Novel Catalytic Methodologies *via* Aerobic Oxidation Approach

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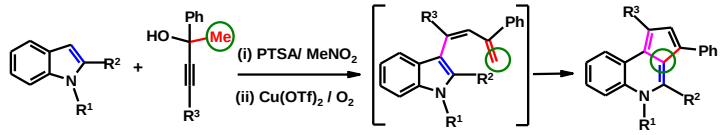
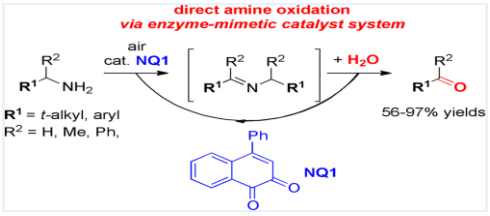
Over the past few decades, plenty of oxidation methods have been developed for the synthesis of pharmaceutically important molecules, however, most of these are producing hazardous chemicals as by-products. Therefore, it is an urgent need to design and develop novel oxidation methods involving reduced production of harmful chemicals that can potentially damage the environment. In recent years, there has been a growing interest in the *"development of safe and sustainable oxidation methodologies" (green catalysis)* using molecular oxygen as an oxidant.[1,2] Catalytic methodologies combined with aerobic oxidation will ensure mild, efficient, and more selective oxidation approaches for sustainable organic synthesis.

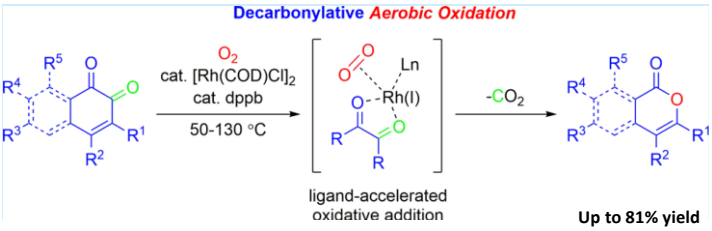
Herein, I present some of our green catalytic methodologies developed towards the synthesis of pharmaceutically important small molecules using molecular oxygen as an oxidant, which are part of my Ph.D. and Post-doctoral research. Our green catalytic methodologies including i) Copper-catalyzed oxidative ring-expansion of 3-dienylindoles leading to cyclopenta[*c*]quinolines under aerobic conditions.[3] It is a novel one-pot reaction involving alkenylation/ cycloisomerization and aerobic oxidative ring expansion. ii) A Rhodium-catalyzed decarbonylative aerobic oxidation of cyclic *α*-diketones leads to the regioselective formation of isocoumarins, where the molecular oxygen from air acts as a reactant.[4] The current decarbonylative aerobic oxidation pathway proceeds *via* two C−C bond cleavages followed by two C−O bonds formation. iii) An *ortho*-naphthoquinone-catalyzed biomimetic oxidative deamination of various amines, amino acids, and DNA nuclear bases have been developed, using molecular oxygen and water as the sole oxidant and nucleophile.[5] iv) Solvent controlled divergent reactivity of amines to nitriles and imines *via* copper(II)-catalyzed aerobic oxidation strategy.[6]

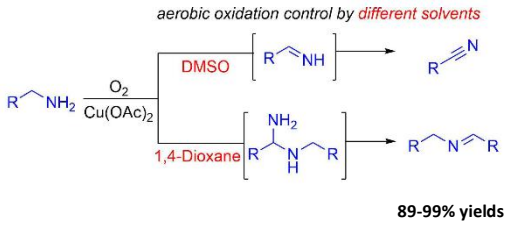
Finally, my future research plans on "the development of novel aerobic oxidative methodologies for small molecules synthesis *via* sequential cascade catalytic approach" will be discussed.



One pot reaction involving alkenylation/ cycloisomerization and oxidative ring expansion







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