Photocatalytic redox-neutral hydroxyalkylation of *N*-heteroaromatics with aldehydes

([1]*Graduate School of Pharmaceutical Sciences, The University of Tokyo*, [2]*Graduate School of Engineering, Osaka University,* [3]*Institute for Molecular Science*) ○Hiromu Fuse,[1] Hiroyasu Nakao,[1] Yutaka Saga,[2] Arisa Fukatsu,[3] Mio Kondo,[2] Shigeyuki Masaoka,[2] Harunobu Mitsunuma,[1] Motomu Kanai[1]

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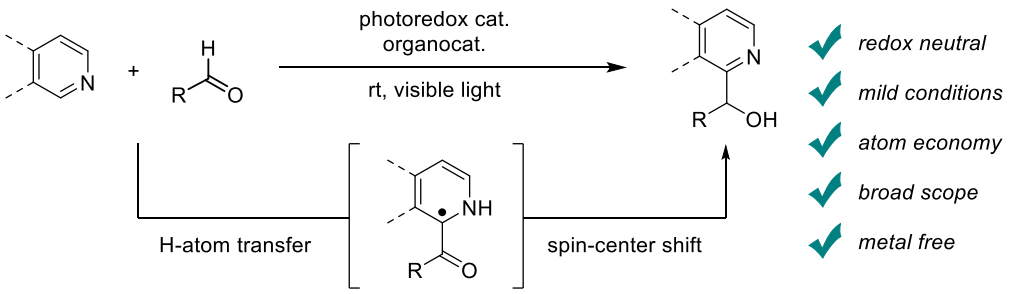
N-Heteroarylation of aldehydes affords hydroxyalkylated *N*-heteroaromatics as important intermediates for the synthesis of pharmaceuticals and agrochemicals. In conventional methods, however, strong base was required for deprotonation of less acidic C(sp^2)-H bond in *N*-heteroaromatics. Recently, several C-H hydroxyalkylation reactions utilizing radical reactions were developed, but they suffered from unsatisfactory atom economy or substrate generality.[1,2] Therefore, we envisioned the development of *N*-heteroarylation of aldehydes which proceeded under mild conditions with excellent atom economy.

As a result, we developed hybrid catalysis comprising an acridinium photoredox catalyst and a thiophosphoric acid organocatalyst to activate the formyl C-H bonds in aldehydes and achieved the desired *N*-heteroarylation of aldehydes. The key steps in proposed catalytic cycle are 1) hydrogen atom transfer from formyl C-H bonds, 2) Minisci-type radical addition to *N*-heteroaromatics, 3) a subsequent spin-center shift process and 4) single-electron reduction and protonation of the benzylic anion. This reaction proceeded under mild conditions of visible light irradiation at room temperature without metal species. This method was applicable to various *N*-heteroaromatics including isoquinolines, quinolines and pyridines. Moreover, due to the high functional group compatibility, late-stage modification of drugs and their leads was achieved.[3]



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