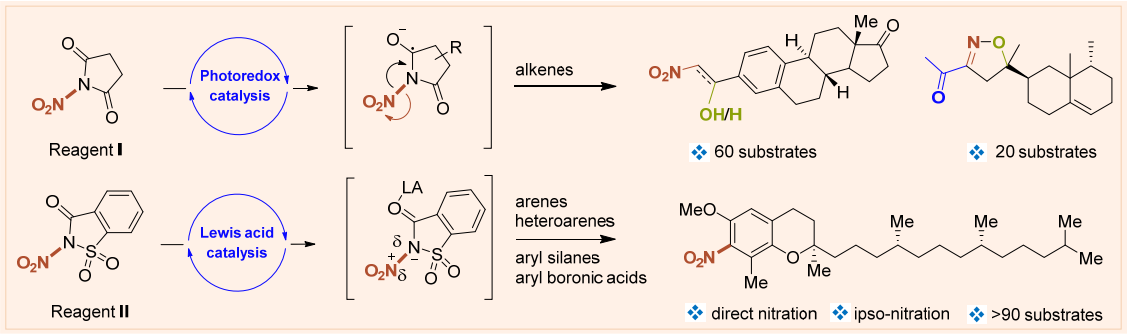
N-NITROHETEROCYCLES: EASILY ACCESSIBLE, BENCH-STABLE AND BROADLY APPLICABLE NITRATING REAGENTS

Dmitry Katayev

Department of Chemistry and Applied Biosciences,
Swiss Federal Institute of Technology, 8059 Zürich, Switzerland

Nitro compounds are essential constituents of drugs and intermediates in the synthesis of biorelevant molecules, agrochemicals and materials. The most frequently exploited synthetic method for the nitration of various C−H bonds involves the use of a mixture of concentrated nitric and sulphuric acid. The methodology is limited in its application in the synthesis of complex molecules, since such harsh conditions do not tolerate acid-sensitive functionalities, and results in numerous by-products. Herein, we report the design, synthesis and applications of one of the first, bench-stable non-metal based, organic nitrating reagents, which can be prepared from cheap, commercially available chemicals in one-step on a large scale [1]. These reagents act as a controllable source of both the nitronium ion using Lewis acid catalysis and the nitryl radical species using photoredox catalysis. In the first case, broad range of Lewis acids were found to be efficient catalysts to promote an electrophilic nitration through the direct or ipso-substitution reaction of aromatic and heteroaromatic compounds. Due to the reagent's excellent reactivity and the very mild and neutral conditions of methods, reactions exhibit an unprecedentedly broad substrate scope, and were successfully used for the nitration of various pharmaceuticals and biorelevant molecules. Furthermore, a single-electron reduction enables the formation of NO_2 radicals in a controlled and selective fashion under visible-light photocatalytic conditions, allowing access to nitrated molecules such as nitroolefins, β-nitrohydrines and 3-acylisoxazoles [2].



[1] D. Katayev, K. Zhang, R. Calvo, **2019**, 2 patent applications, EP1820295.6 and EP1820299.6.

[2] D. Katayev, K. Zhang, R. Calvo, **2019**, 3 manuscripts submitted.