C(sp^3)-H Cyanation Promoted by Visible-Light Photoredox/Phosphate Hybrid Catalysis

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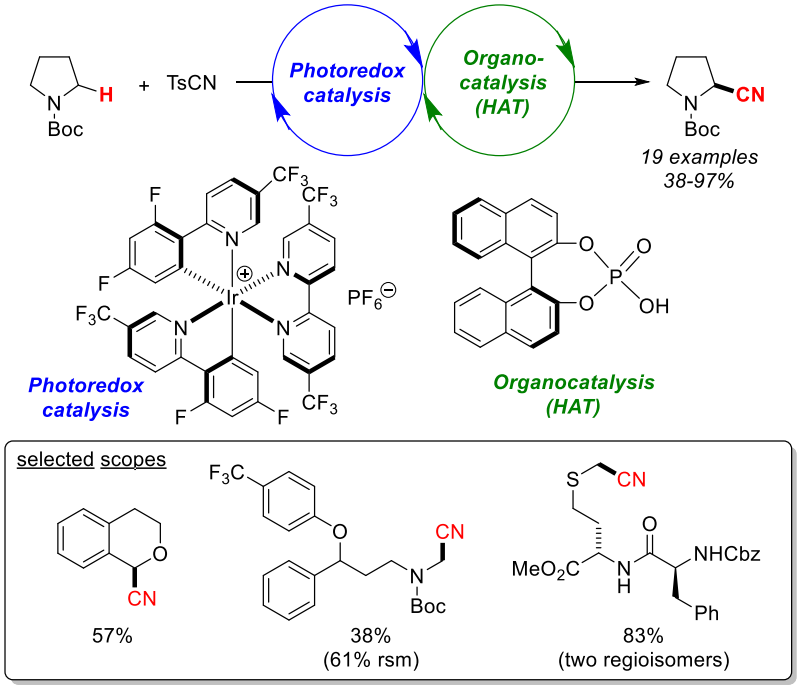
Inspired by the reaction mechanism of photo-induced DNA-cleavage in nature[1], a C(sp^3)–H cyanation reaction promoted by visible-light photoredox/phosphate hybrid catalysis was developed. Phosphate radicals, generated by one-electron photooxidation of phosphate salt, functioned as a hydrogen atom transfer catalyst to produce nucleophilic carbon radicals from C(sp^3)–H bonds with a high bond dissociation energy. The resulting carbon radicals were trapped by a cyano radical source (TsCN) to produce the C-H cyanation products. Due to the high functional-group tolerance and versatility of the cyano group, the reaction will be useful for realizing streamlined building block syntheses and late-stage functionalization of drug-like molecules.[2] Details on optimization study of the reaction conditions, substrate scopes, and mechanistic analysis will be discussed.



References

1. A. Adhikary, D. Becker, B. J. Palmer, A. N. Heizer, M. D. Sevilla, *J. Phys. Chem. B* **2012**, *116*, 5900-5906.
2. T. Wakaki, K. Sakai, T. Enomoto, M. Kondo, S. Masaoka, K. Oisaki, M. Kanai, *Chem. Eur. J.*, **2018**, DOI: 10.1002/chem.201801746.