C(sp³)-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 nature¹, a C(sp³)–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(sp³)–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