

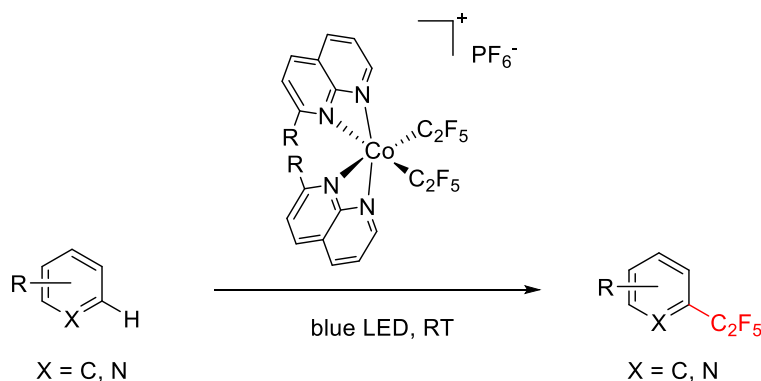
Photo-induced pentafluoroethylation mediated by cobalt(III) complexes supported by naphthyridine-based ligands

(¹Okinawa Institute of Science and Technology) ○Hoan Minh Dinh¹, Julia R. Khusnutdinova¹

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Incorporating fluoroalkyl groups into drug molecules has attracted great attention recently as a powerful tool to modulate metabolic stability and biological activity of pharmaceuticals. While radical trifluoromethylation mediated by first-row base metal has been widely applied in medicinal chemistry, the analogous strategy to introduce pentafluoroethyl or longer-chain fluoroalkyl group is relatively rare, even though the extra CF₂ group may cause a significant change in steric demand, dipole moment and lipophilicity.¹ Among the base metal, nickel has emerged as a powerful, cheap alternative to precious second and third-row transition metals for radical perfluoroalkylation.² Cobalt complexes, on the other hand, have gained less attention since they are considered relatively less active in trifluoromethylation than nickel complexes.

Recently, our group reported photoinduced protocols for trifluoromethylation of arenes and heteroarenes catalyzed by high-valent nickel(III) complexes supported by simple dimethylnaphthyridine ligands.³ This report has shown that even the simple naphthyridine ligand can promote photo-induced CF₃ radical formation from nickel complexes. Considering the easy accessibility of cobalt precursors with longer fluoroalkyl chains, in this study, we use the simple naphthyridine-based ligands to support the formation of cobalt-pentafluoroethyl complexes. Under blue LED irradiation, these cobalt complexes exhibit facile cobalt-pentafluoroethyl bond homolysis and the release of a C₂F₅ radical, which can be trapped by TEMPO. Those complexes are also competent in stoichiometric C(sp²)-H pentafluoroethylation in arenes and heteroarene under blue LED visible light irradiation.



1) B. Linclau et al., *J. Med. Chem.* **2018**, *61*, 23, 10602. 2) a) N. Nebra et al., *Angew. Chem. Int. Ed.* **2017**, *56*, 12898. b) D. A. Vivic et al., *Angew. Chem. Int. Ed.* **2021**, *60*, 18162. E. Khaskin et al. *Chem. Sci.*, **2022**, *13*, 12971. 3) J. R. Khusnutdinova et al., *Angew. Chem. Int. Ed.* **2021**, *60*, 24620.