

# AN ELECTROCHEMICAL APPROACH TO RADICAL TRIFLUOROMETHYLATIONS AND OXYTRIFLUOROMETHYLATIONS

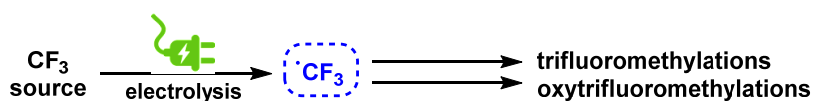
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Synthetic electrochemistry has seen a resurgence in recent years as a method to effect redox processes in a controlled manner by simply applying electricity to the reaction medium.<sup>[1]</sup> Electrochemical methods have the capacity to generate radicals and other high energy intermediates under mild, typically ambient conditions, which can provide with new strategies to solve challenging synthetic transformations. C-H trifluoromethylations of unactivated substrates such as arenes and olefins are examples of reactions that can only be tackled via radical chemistry.<sup>[2]</sup> Trifluoromethylations, in general, are among the most pursued transformations in organic and medicinal chemistry during the past decade due to the enhanced biological properties provided by the fluorinated moiety. Generation of CF<sub>3</sub> radicals from suitable reagents can be accomplished using thermal or photochemical methods, as well as via stoichiometric amounts of redox reagents (e.g. tBuOOH). Electrochemical methods are a very attractive alternative, as such redox processes can be enabled by electricity, which avoids the use of often toxic or expensive reagents and reduces the generation of waste.

Herein, we present electrochemical procedures for the generation of CF<sub>3</sub> radicals under ambient conditions, which have been successfully applied to trifluoromethylations and oxytrifluoromethylations of unactivated scaffolds. While the trifluoromethylation can be considered as a simple radical addition/single-electron transfer sequence, the oxytrifluoromethylation entails a paired electrolysis process in which the intermediate generated by the anodic oxidation event reacts with the product of the concurrent cathodic reduction. Details on the reactions mechanisms including cyclic-voltammetry data and radical trapping experiments will also be presented.



[1] (a) M. Yan, Y. Kawamata, P. S. Baran, *Chem. Rev.* **2017**, *117*, 13230; (b) S. R. Waldvogel, A. Wiebe, T. Gieshoff, S. Möhle, E. Rodrigo, M. Zirbes, *Angew. Chem. Int. Ed.* **2018**, *57*, 5594.

[2] a) D. Staveness, I. Bosque, C. R. J. Stephenson, *Acc. Chem. Res.* **2016**, *49*, 2295; b) T. Koike, M. Akita, *Acc. Chem. Res.* **2016**, *49*, 1937.