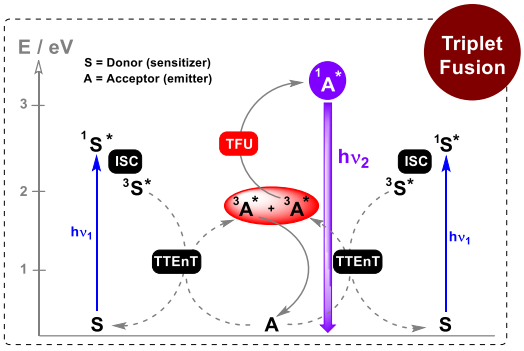
Application of Triplet Fusion Upconversion to Photoredox Catalysis: Functionalization of 5-Membered Heteroarenes

Jorge Castellanos-Soriano[1]*, M. Consuelo Jiménez[1] and Raúl Pérez-Ruiz[1]

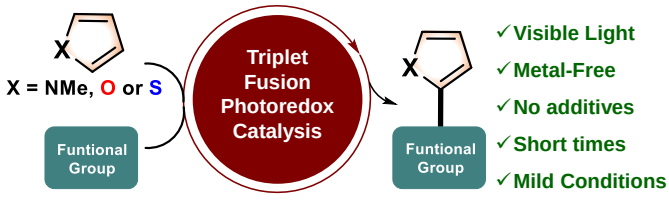
[1]Departamento de Química (5M), Universitat Politècncia de València (UPV), Camino de Vera, s/n, 46022, Valencia, España

*jorcass1@qim.upv.es

Application of photon upconversion (UC) that transforms low-energy (visible light) into higher-energy (UV or near-vis) radiation has been potentially ranged from energy to biology fields constituting nowadays an active area of research. In particular, triplet fusion upconversion (**TFU**, also so-called triplet-triplet annihilation, TTA)[1] is one of the most attractive wavelength conversion technologies and has been successfully applied in several scientific topics. This biphotonic process involves the association of multistep photochemical events and a variety of organic dyes and metal complexes showing **TFU** can be currently found in literature.[1]



Visible light photoredox catalysis represents a novel emerging method to drive chemical reactions. Activation of molecules with visible light offers the possibility of reaction routes which are otherwise impossible to reach with classical nonphotochemical strategies. In this context, implementation of **TFU** holds great potential for challenging bond activations with the occurrence of presenting some advantages over other photocatalytic protocols, which includes very mild reaction conditions (visible light, room temperature and ambient pressure), employment of stable and commercially available reactants as well as metal-free photocatalysts, no additives (sacrificial donors/acceptors) in the medium and shorter irradiation times. Despite the fact that this biphotonic process can be a potential synthetic tool, very few examples in organic reactions are reported. Here, we will show our contribution to this field by the functionalization of 5-memberd heteroarenes by **TFU** technology.[2]



References

[1] (a) Majek, M.; Faltermeier, U.; Dick, B.; Perez-Ruiz, R.; Jacobi von Wangelin, A. *Chem. Eur. J.* **2015**, *21*, 15496; (b) Haering, M.; Perez-Ruiz, R.; Jacobi von Wangelin, A.; Diaz Diaz, D. *Chem. Commun.* **2015**, *51*, 16848; (c) Castellanos-Soriano, J.; C. Herrera-Luna, J.; Díaz Díaz, D.; Jiménez M. C. and Pérez-Ruiz, R. *Org. Chem. Front.*, **2020**,*7*, 1709.

[2] (a) López-Calixto, C. G.; Liras, M.; de la Peña O'Shea, V. A.; Pérez-Ruiz, R. *Appl. Catal. B.* **2018**, *237*, 18; (b) Garnes-Portolés, F.; Greco, R.; Oliver-Meseguer, J.; Castellanos-Soriano, J.; Jiménez, M. C.; López-Haro, M.; Hernández-Garrido, J. C.; Boronat, M.; Pérez-Ruiz, R.; Leyva-Pérez, A. *Nat. Catal.* **2021**, *4*, 293; (c) Castellanos-Soriano, J.; Jiménez, M. C.; Pérez-Ruiz, R. *submitted.*