

# Development of uranyl-based photo-catalysts

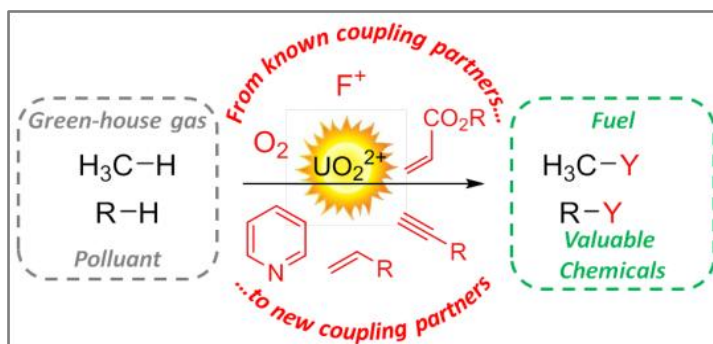
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The photoactivity of  $\text{UO}_2^{2+}$  has been known for decades,<sup>i</sup> but only recently have chemists been interested in using uranyl as a photocatalyst to perform organic transformations.<sup>ii</sup> The long-lived fluorescence lifetime (up to  $\mu\text{s}$ ) combined with its high oxidation ability ( $E^0 = +2.6 \text{ V vs. SHE}$ ) make the excited uranyl species ( $^*\text{UO}_2^{2+}$ ) a good candidate to unlock new organic transformations. Moreover,  $^*\text{UO}_2^{2+}$  undergoes ligand-to-metal charge transfer generating a highly reactive oxyl radical, a strong hydrogen abstractor that can proceed to C-H activation of hydrocarbon molecules with BDE higher than  $100 \text{ kcal.mol}^{-1}$ .

Despite these interesting properties, the photo-activity of uranyl and notably the involved processes to activate organic substrates are not well rationalized, in particular toward the ligand on its coordination sphere. The latter seems to have a strong influence on the reactivity as described in the literature.<sup>iii</sup>

Therefore, we decided to synthesize and investigate different uranyl-based complexes carrying N-heteroaromatics ligand in order to evaluate and rationalize their photo-reactivity. This study will allow to identify original uranyl-based photo-catalysts and employ them in unprecedented organic transformations involving hydrocarbon pollutants (methane, plastic).



<sup>i</sup> H. D. Burrows, T. J. Kemp, The photochemistry of the uranyl ion. *Chem. Soc. Rev.*, **1974**, 3, 139, DOI: [10.1039/CS9740300139](https://doi.org/10.1039/CS9740300139).

<sup>ii</sup> X. Jiang, Perspectives for Uranyl Photoredox Catalysis. *Synlett* **2021**, 32, 1330, DOI: [10.1055/a-1493-3564](https://doi.org/10.1055/a-1493-3564).

<sup>iii</sup> D. Hua, X. Jiang, Stepwise benzylic oxygenation via uranyl-photocatalysis. *Green Chem.*, **2022**, 24, 124, DOI: [10.1039/D1GC04042A](https://doi.org/10.1039/D1GC04042A).