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Moderately Oxidizing Thioxanthylium Organophotoredox Catalyzed Radical Cation Cycloaddition Reactions

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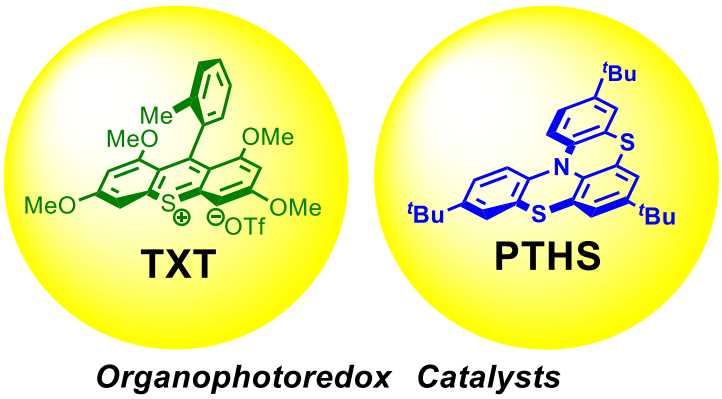
Visible-light-mediated chemical transformations have attracted much attention in recent years especially with regard to designing sustainable energy conversion systems. Classically, photochemical reactions in organic synthesis have used ultraviolet (UV) light, which can damage substrates and/or products due to its high energy and thus result in undesirably complex product mixtures. To circumvent this obstacle, catalytic photoredox reactions have been developed over the past decade. While metal complexes based on ruthenium and iridium have been widely used as photoredox catalysts in these systems, the focus of interest has shifted toward the development of metal-free photoredox catalysts, which represent a more cost-effective and sustainable approach.

Recently, we have reported the design and synthesis of the thioxanthylium organophotoredox catalysts (TXT), which have moderate excited-state reduction potentials [$E_{1/2}^{red}$* = +1.75〜+1.94 V vs SCE].[1] In this presentation, I will discuss the thioxanthylium organophotoredox catalyzed radical cation cycloaddition reactions. Additionally, we have developed a new series of phenothiazine photocatalysts (PTHS), which exhibits low excited state oxidation potentials [$E_{1/2}^{ox}$* = −2.34〜−2.40 V vs SCE].[2] I will also discuss the phenothiazine organophotoredox catalyzed phosphonation of aryl halides.



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