

The Wavelength Matters

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The combination of photo- and nickel catalysis (metallaphotocatalysis) has emerged as a powerful strategy for carbon–carbon and carbon–heteroatom cross couplings.¹ Key to the success are redox or photosensitization events between a nickel- and a photocatalyst (PC). These protocols rely on a few photocatalysts that can only convert a small portion of visible light (<500 nm) into chemical energy. The high-energy photons that excite the photocatalyst can result in unwanted side reactions. Dyes that absorb a much broader spectrum of light are not applicable due to their short-lived excited states. We demonstrate a self-assembling catalyst system that overcomes this limitation. Immobilization of a nickel catalyst on dye-sensitized titanium dioxide results in a material that catalyzes carbon-heteroatom and carbon-carbon bond formations. The modular approach of dye-sensitized metallaphotocatalysts (DSMPs) accesses the entire visible light spectrum and allows tackling selectivity issues resulting from low-wavelengths strategically. The concept overcomes current limitations of metallaphotocatalysis by unlocking the potential of dyes that were previously unsuitable.²

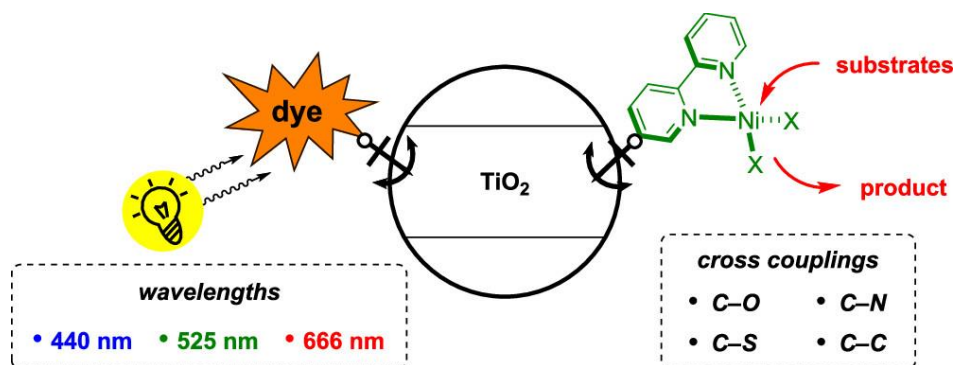


Figure 1: Concept of dye-sensitized metallaphotocatalysts (DSMP) overcoming excited state lifetime limitations.

References:

[1] J. Twilton, C. Le, P. Zhang, M. H. Shaw, R. W. Evans, D. W. C. MacMillan, *Nat.Rev. Chem.* **2017**, 1, 0052.

[2] S. Reischauer, V. Strauss, B. Pieber, *ACS Catal.* **2020**, 10, 13269–13274.