

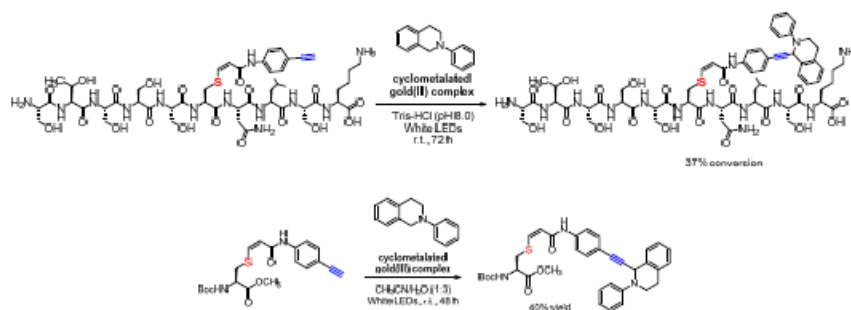
# Gold-Catalyzed Photooxidative Alkynylation of Tetrahydroisoquinolines using Visible Light

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Gold catalysis has contributed to a variety of conceptually new synthetic methods greatly facilitating organic synthesis with excellent reactivity, selectivity, and operational simplicity. Visible light photoredox catalysis providing efficient pathways for selective functionalization of organic compounds has emerged as a fast expanding research area in organic chemistry. Combining the unique strengths from the two areas, synergistic use of gold and visible light photoredox catalysis would provide green, efficient, and sustainable synthetic technologies for selective chemical synthesis that would not be possible by employing either one of the catalysis approaches.

We have developed a diversity-oriented synthesis of a new class of fluorescent quinolinium compounds via a photosensitizer-free visible light-mediated gold-catalyzed *cis*-difunctionalization of silyl-substituted alkynes.<sup>[1]</sup> Spectroscopic experiments revealed that the fluorescent quinoliniums exhibit full color tunable emission properties in visible light region ( $\lambda_{em}$  = 450 to 640 nm) and large Stokes shifts (up to 6,797  $cm^{-1}$ ). Built upon this work, we set out to explore the combination of gold and visible light photoredox catalysis for alkynylation of tetrahydroisoquinolines. We found that treatment of tetrahydroisoquinolines with terminal alkynes and a catalytic amount of cyclometalated gold(III) complexes afforded alkynylated products with up to 73% isolated yields under irradiation (White, LEDs 5W) in 48 h under air at room temperature. Interestingly, the product distribution varied with substituents on the terminal alkynes. More favorable alkynylation was found by using electron-donating 4-ethynylanisole. In addition, we have employed the newly developed gold and visible light photoredox catalysis for multifunctional modification of peptides and proteins in aqueous medium.



## Reference

[1] Jie-Ren Deng, Wing-Cheung Chan, Nathanael Chun-Him Lai, Bin Yang, Chui-Shan Tsang, Ben Chi-Bun Ko, Sharon Lai-Fung Chan, and Man-Kin Wong\* *Chemical Science*, 2017, 8, 7537.

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