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Visible-Light-Induced Copper Catalyzed C-C and C-N Cross Coupling Reactions

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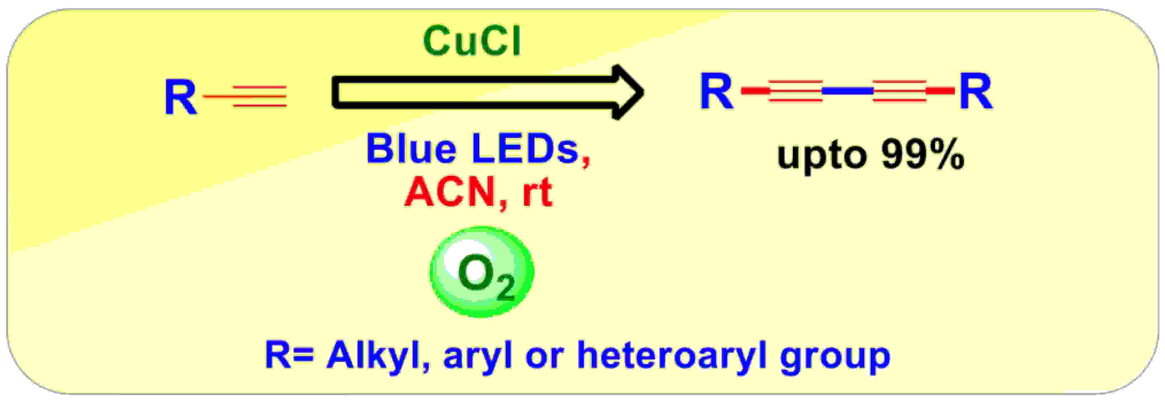
Abstract

We have demonstrated the visible light induced copper catalyzed process for C-C/C-N cross coupling and C-H annulation reactions. We hypothesized that the copper(I) acetylide acts as a photocatalyst under visible light irradiation and undergoes photo-induced single electron transfer (SET) with O_2 as oxidant to achieve essential coupling reactions.

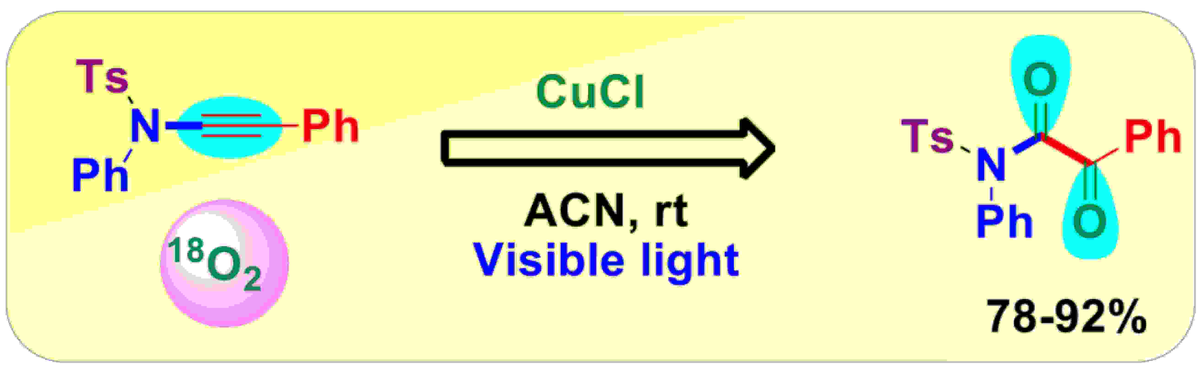
Research Work

1. Copper(I) chloride catalyzed room temperature Csp–Csp homocoupling of terminal alkynes mediated by visible light



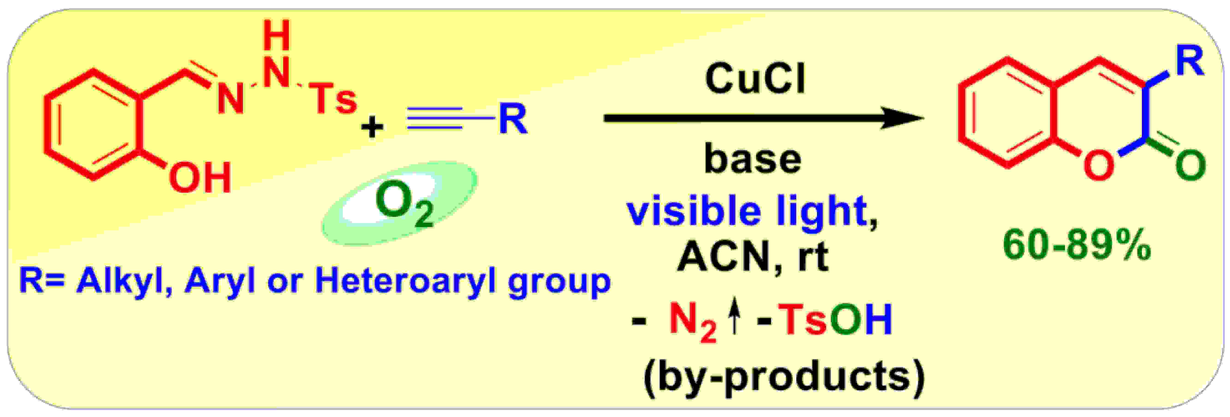
2. Visible light copper photoredox-catalyzed aerobic oxidative coupling of phenols and terminal alkynes: Regioselective synthesis of functionalized ketones via C-C triple bond cleavage

3. Visible light-mediated copper(I)-catalysed aerobic oxidation of ynamides/ynamines at room temperature: A sustainable approach to the synthesis of α-ketoimides/α-ketoamides



4. Visible-light induced copper(I)-catalyzed denitrogenative oxidative coupling of hydrazinylpyridines with terminal alkynes

5. Visible-light-driven copper-catalyzed aerobic oxidative cascade cyclization of *N*-Tosylhydrazones and terminal alkynes: Regioselective synthesis of 3-arylcoumarins



Conclusion

- We have demonstrated the first visible-light-induced copper-catalyzed C-C and C-N cross-coupling reactions without using external photocatalyst
- These reactions use simple, inexpensive copper chloride as a catalyst and O_2 as oxidant.
- These reactions are highly efficient, environmentally benign, and economically feasible.

References

1) A. Sagadevan, V. P. Charpe and K. C. Hwang, *Catal. Sci. Technol.*, 2016, 6, 7688. 2) A. Sagadevan, V. P. Charpe, A. Ragupathi and K. C. Hwang, *J. Am. Chem. Soc.*, 2017, 139, 2896. 3) A. Ragupathi, V. P. Charpe, A. Sagadevan and K. C. Hwang, *Adv. Synth. Catal.*, 2017, 359, 1138. 4) V. P. Charpe, A. Hande, A. Sagadevan and K. C. Hwang, *Green. Chem.*, 2018, 20, 4859. 5) A. Ragupathi, A. Sagadevan, V. P. Charpe, C. C. Lin, J. R. Hwu and K. C. Hwang, *Chem. Commun.*, 2019, 55, 5151.

Acknowledgment

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