Radical Strategies for Functionalization of C-H and C=C Bonds

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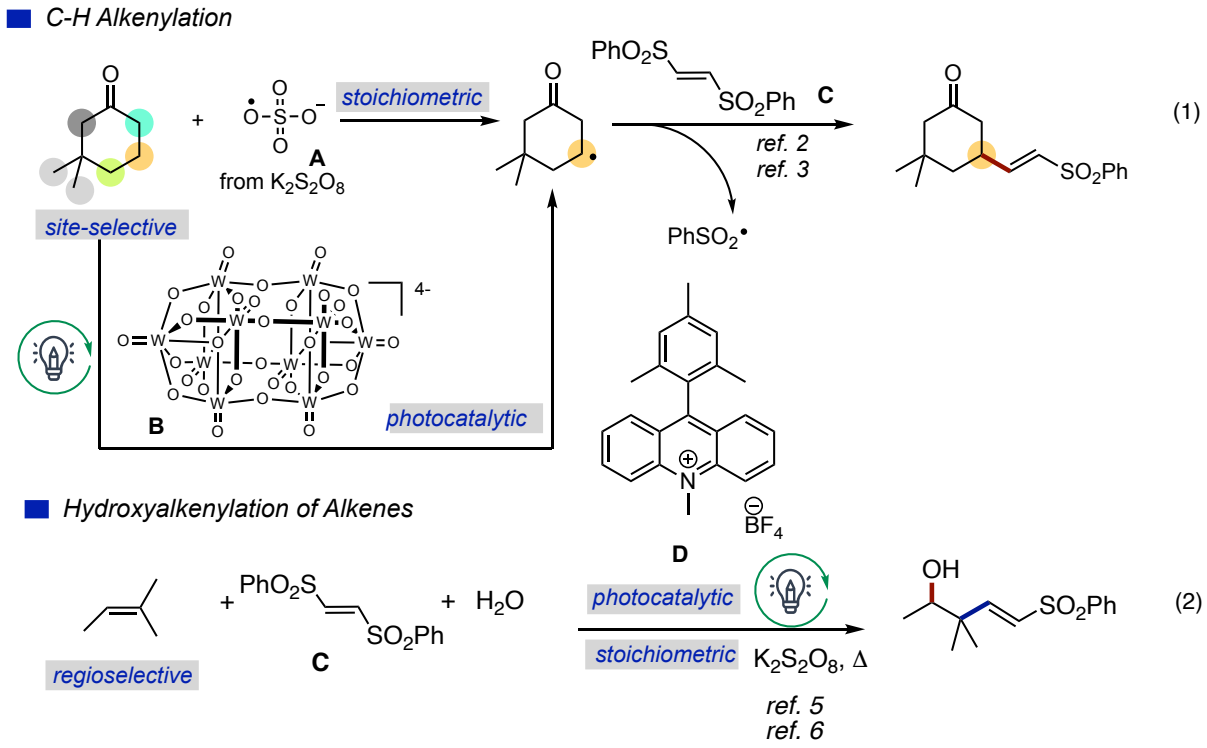
Developing new strategies to functionalize basic organic molecules such as alkanes and alkenes is at the forefront of synthetic organic chemistry. We have been involved in this challenge, capitalizing on the potential of radical-based strategies involving photocatalyst **B** for alkane functionalization.[1] Our recent efforts involve C(sp^3)-H alkenylation using 1,2-bis(phenylsulfonyl)ethylene **C**, [2,3] and the related allylation, alkynylation, and imination, [4] in which the site-selectivity was ensured by an S_H2 process caused by oxygen-centered radical species such as **A** (stoichiometric) and **B** (photocatalytic) (eq 1). This Lecture focuses on the regioselective hydroxyalkenylation of alkenes using **C** (eq 2), for which either a stoichiometric protocol using **A**[5] or a photocatalytic protocol using Fukuzumi catalyst **D**[6] works well.



References

[1] Ravelli, D.; Fagnoni, M.; Fukuyama, T.; Nishikawa, T.; Ryu, I. *ACS Catal.* **2018**, *8*, 701–713.
[2] Ueda, M.; Kamikawa, K.; Fukuyama, T.; Wang, Y. -T.; Wu, Y. -K.; Ryu, I. *Angew. Chem. Int. Ed.* **2021**, *60*, 3545-3550.
[3] Wang, Y. -T.; Shih, Y. -L.; Wu, Y. -K.; Ryu, I. *Adv. Syn. Catal.* **2022**, *364*, 1039-1043.
[4] Shi, Y. -L.; Huang, S. -H.; Wu, Y. -K.; Ryu, I. *Bull. Chem. Soc. Jpn.* **2022**, *95,* 1501-1505.
[5] Tsai, C. -Y.; Jhang, Y. -J.; Wu, Y. -K.; Ryu, I. *Angew. Chem. Int. Ed.* **2023**, *62*, e202311807.
[6] Tsai, C. -Y.; Chen, C.-Y.; Wu, Y. -K.; Ryu, I. *Helv. Chim. Act.* **2024**, e202400017.