New photocatalytic reactions enabled by ketyl radicals

A fully funded 4 year PhD studentship is available in the Noble group in the School of Chemistry at the University of Bristol to start in September 2026.

About the project

Ketyl radicals are highly useful synthetic intermediates that are commonly accessed by single-electron reduction of carbonyls. These nucleophilic radicals represent a polarity reversal from traditional electrophilic carbonyl reactivity, which has allowed ketyl radicals to be used in diverse carbon–carbon bond forming reactions that are not possible through polar pathways.[1] However, accessing ketyl radicals by single-electron reduction of aldehydes and ketones is challenging because of their large negative reduction potentials, which require the use of highly reducing reaction conditions. The Noble group recently developed a new strategy to access ketyl radicals from aldehydes and ketones that avoids the direct single-electron reduction pathway.[2] We demonstrated that α-hydroxy sulfinates undergo facile photoredox-catalysed single-electron oxidation and desulfination to form ketyl radicals. This sulfinate to ketyl radical conversion represents an intriguing example of reductant upconversion,[3] where a weak reductant is converted to a powerful reductant under mildly oxidising conditions. As a result, it provides new opportunities to exploit oxidatively generated ketyl radicals as 'reagents' to enable energetically demanding radical reactions beyond carbon–carbon bond formation.

The proposed PhD project will explore the reactivity of oxidatively-generated ketyl radicals, with the aim of developing a toolbox of 'radical reagents' with broad applications in photoredox-catalysed transformations.

The successful applicant will receive high level training in organic synthesis, photocatalysis, and compound purification/characterisation. You will gain experience of flow chemistry and – for interested candidates – computational methods. You will also have the opportunity to further your knowledge of theory/mechanism, and to gain strong transferable skills (e.g., presentations and report writing).

References:
(1) A. Péter, S. Agasti, O. Knowles, E. Pye, D. J. Procter, *Chem. Soc. Rev.* **2021**, *50*, 5349.
(2) Z. Li, J. A. Tate, A. Noble, *J. Am. Chem. Soc.* **2024**, *146*, 26616.
(3) I. V. Alabugin et al., *Angew. Chem. Int. Ed.* **2019**, *58*, 5532.

Candidate Requirements

Applicants must have obtained, or be about to obtain, a First or Upper Second Class UK first degree, or the equivalent qualifications gained outside the UK, in chemistry or in a related discipline (biochemistry, biogeochemistry, environmental sciences).

How to Apply

Please make an online application for this project at the following page How to apply | Study at Bristol | University of Bristol, and please also email Adam Noble directly with a copy of your CV, cover letter, and the details of two referees.

Funding

A full studentship will cover UK tuition fees, a training support fee and a stipend (£20,780 p.a. in 2025/26, updated each year) for 4 years. Due to funding restrictions the project is only available to UK candidates. The start date is September 2026.

Getting in Contact

For informal enquiries, please email your CV and cover letter to Dr Adam Noble (a.noble@bristol.ac.uk). Further information about the Noble group's research can be found here: https://www.noblechemistry.com/