

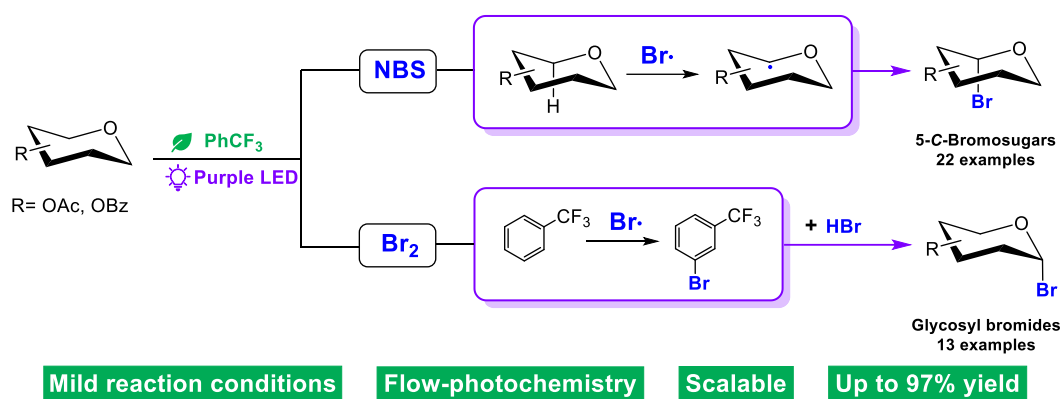
SITE-SELECTIVE PHOTOBROMINATION OF CARBOHYDRATES

Guoqing Zhang^a, Nicholas W. See^{a,b}, Norbert Wimmer^a, Michael J. Godinez^b,
Scott A. Cameron^b, Richard H. Furneaux^b, Vito Ferro^a

^aThe University of Queensland, Brisbane QLD 4072, Australia
guoqing.zhang@uq.edu.au

^bFerrier Research Institute, Victoria University of Wellington, Lower Hutt 5040, New Zealand

The Ferrier photobromination provides direct synthetic access to valuable 5-C-bromosugars [1]. However, its broader application is constrained by the use of energy-inefficient heat lamps for irradiation and the reliance on highly toxic (and banned) CCl₄ under reflux conditions. Herein, we demonstrate that the reaction proceeds rapidly and efficiently under mild conditions (≤40 °C) using benzotrifluoride (PhCF₃) as a safe and environmentally benign alternative to CCl₄, with irradiation by a compact photoreactor fitted with purple LEDs (405 nm), and NBS serving as the bromine source.



Furthermore, the introduction of 2.5 mol% bromine significantly enhances substrate conversion rates and reaction efficiency [2]. However, excessive bromine results in the formation of the glycosyl bromide, which gradually becomes the dominant product and eventually the sole product as bromine equivalents increase. We have thus optimized this latter pathway for the efficient photochemical synthesis of glycosyl bromides. The proposed mechanism is attributed to the *in situ* generation of HBr from bromine and PhCF₃ under light irradiation [3], followed by substrate bromination to form glycosyl bromide in accordance with the classical bromination pathway. Introducing a base neutralizes the HBr, resulting in only trace amounts of 5-C-bromosugar being formed via the radical pathway.

This strategy demonstrates excellent substrate generality for the synthesis of both 5-C-bromo sugars and glycosyl bromides, depending on the conditions. Notably, this strategy is compatible with continuous production via the use of a continuous-flow photoreactor.

References:

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