



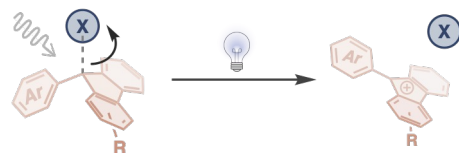
The Synthesis and Characterization of Novel Photocages for Efficient Photorelease

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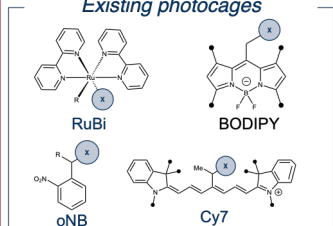


Introduction



- Photocages contain chemical scaffolds that undergo bond breakage upon photoirradiation.
- Light responsive compounds can offer an orthogonal dimension of control for chemical synthesis, materials science, and biological research.

Existing photocages

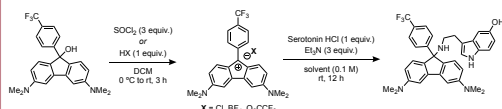


- Commercial photocages often lack synthetic accessibility.

- Can we create photocages with high versatility?

Methods

- Photocages are synthesized through a cationic intermediate.



Optimization of attachment step

X =	Solvent	Product	SM (alcohol)
Cl	DCM	31%	68%
	MeCN	13%	88%
BF ₄	DCM	95%	<5%
	MeCN	70%	<2%
TFA	DCM	90%	<5%
	MeCN	90%	<2%

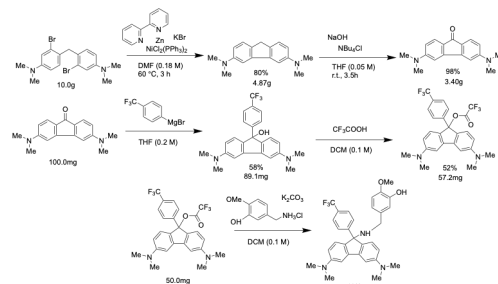
- Dissociation of the carbocation improves the yield of caging.

Acknowledgements

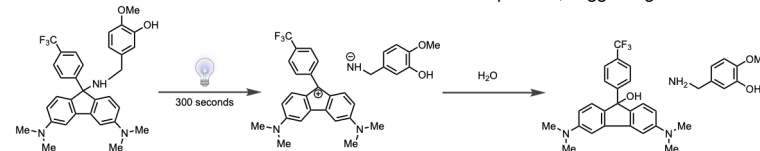
This work was guided by my mentor, Ariel Wang, a PhD student at the Richard Liu Lab and supported by the Office of Undergraduate Research and Fellowships.

Results

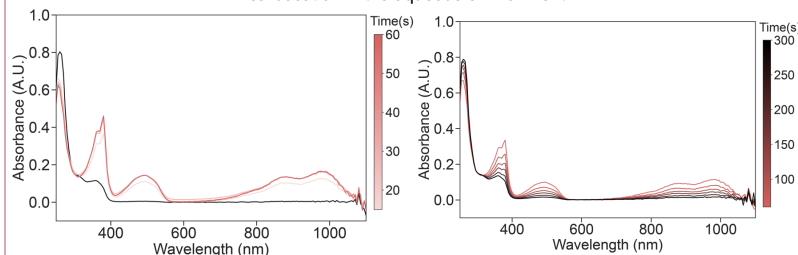
- The synthesis of the examined photocages followed a multistep pathway.



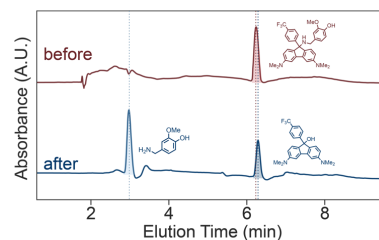
- Analysis using UV-Vis spectroscopy and Liquid chromatography-mass spectrometry was performed to track the mechanism of carbocation formation and decomposition, suggesting this mechanism.



- UV-Vis spectroscopy experiment results confirmed the formation and decomposition of the carbocation in the aqueous environment.



- Liquid chromatography-mass spectrometry results confirmed the formation of two final products.

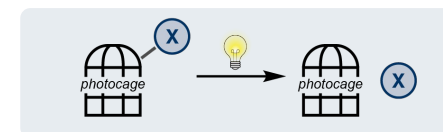


References

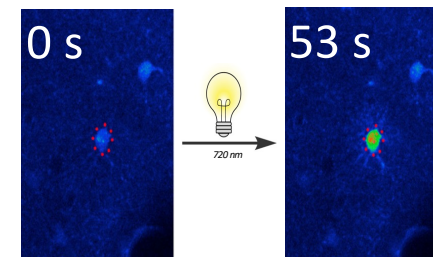
Chem. Rev. 2013, 113(1), 119-191; Chem. Sci. 2024, 16(4), 1677-1683; Inorg. Chem. 2020, 59(2), 1006-1013; IScience 2020, 23(12), 101850; J. Org. Chem. 2024, 89(10), 6740-6748; JACS Au 2025 5(1), 3-16, Nat. Chem. <https://doi.org/10.1038/s41557-025-01901-0> (2025)

Conclusion

- Photocages enable precise control of release of molecular cargo.

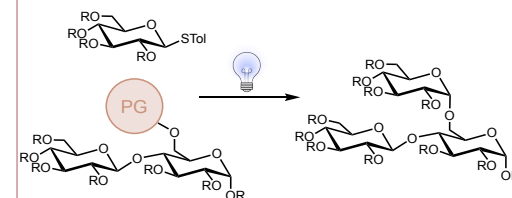


- Photolabile bond in the photocages enables drug release by biorthogonal stimuli.



Next Steps

- The use of photodeprotection in multistep organic synthesis could lower reagent and solvent use, in line with green chemistry principles.



- I will further pursue my studies of chemistry and research involvement in the field of organic chemistry as sophomore at Harvard College.
- I will leverage the skillset gained during my laboratory work to design and implement an impactful Leadership in Action Project as part of my further engagement as a Laidlaw Scholar.

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