

Organocatalyzed Enantioselective Synthesis of *N* and *S*- Containing Chiral Heterocyclic Compounds



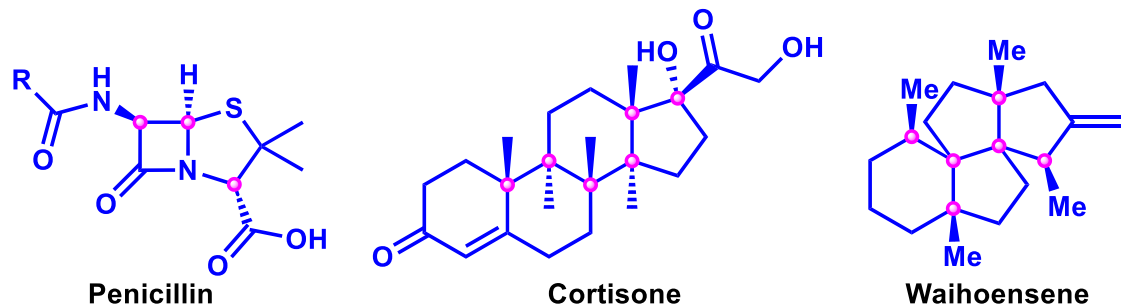
Dr. Pandidurai Solai

30-10-2025

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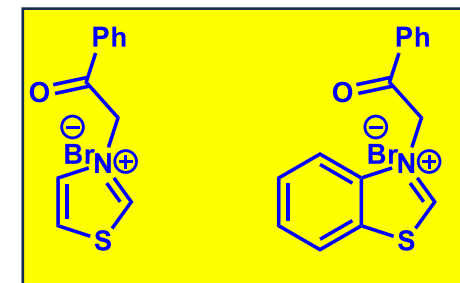
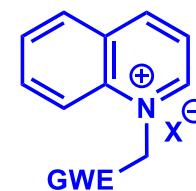
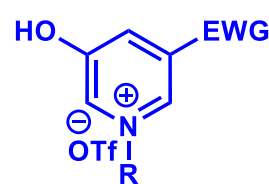
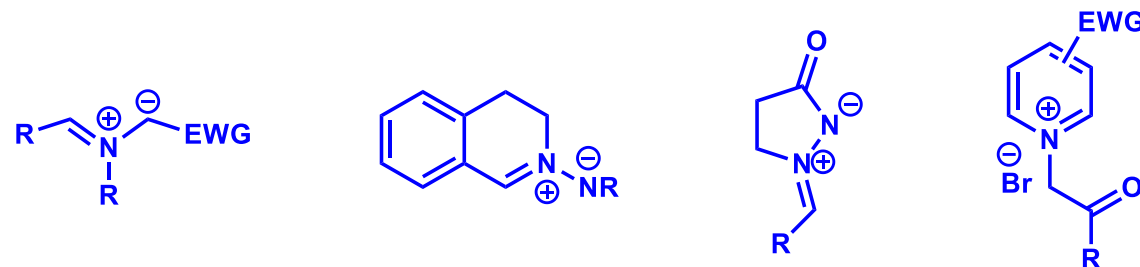
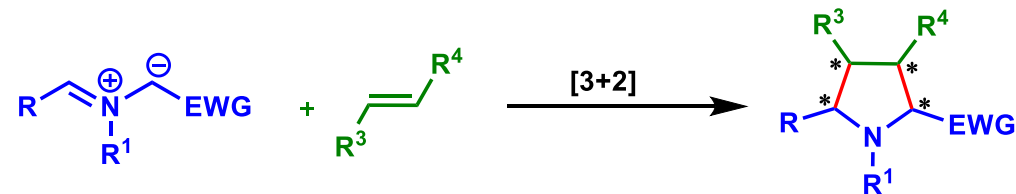
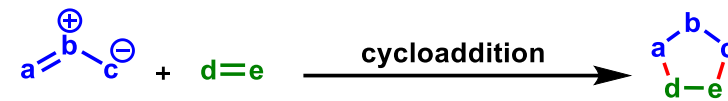
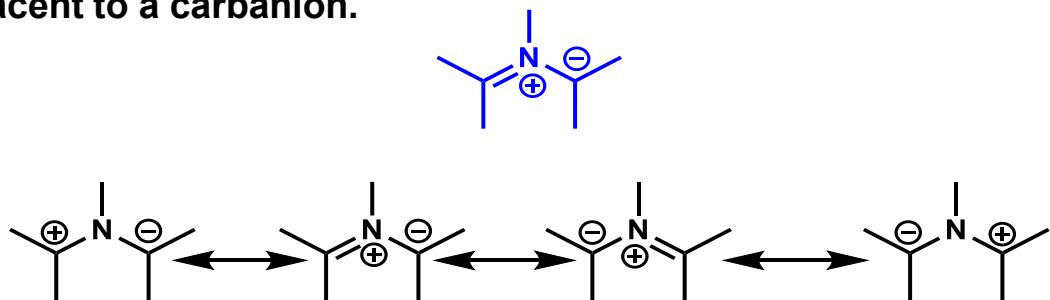
Introduction



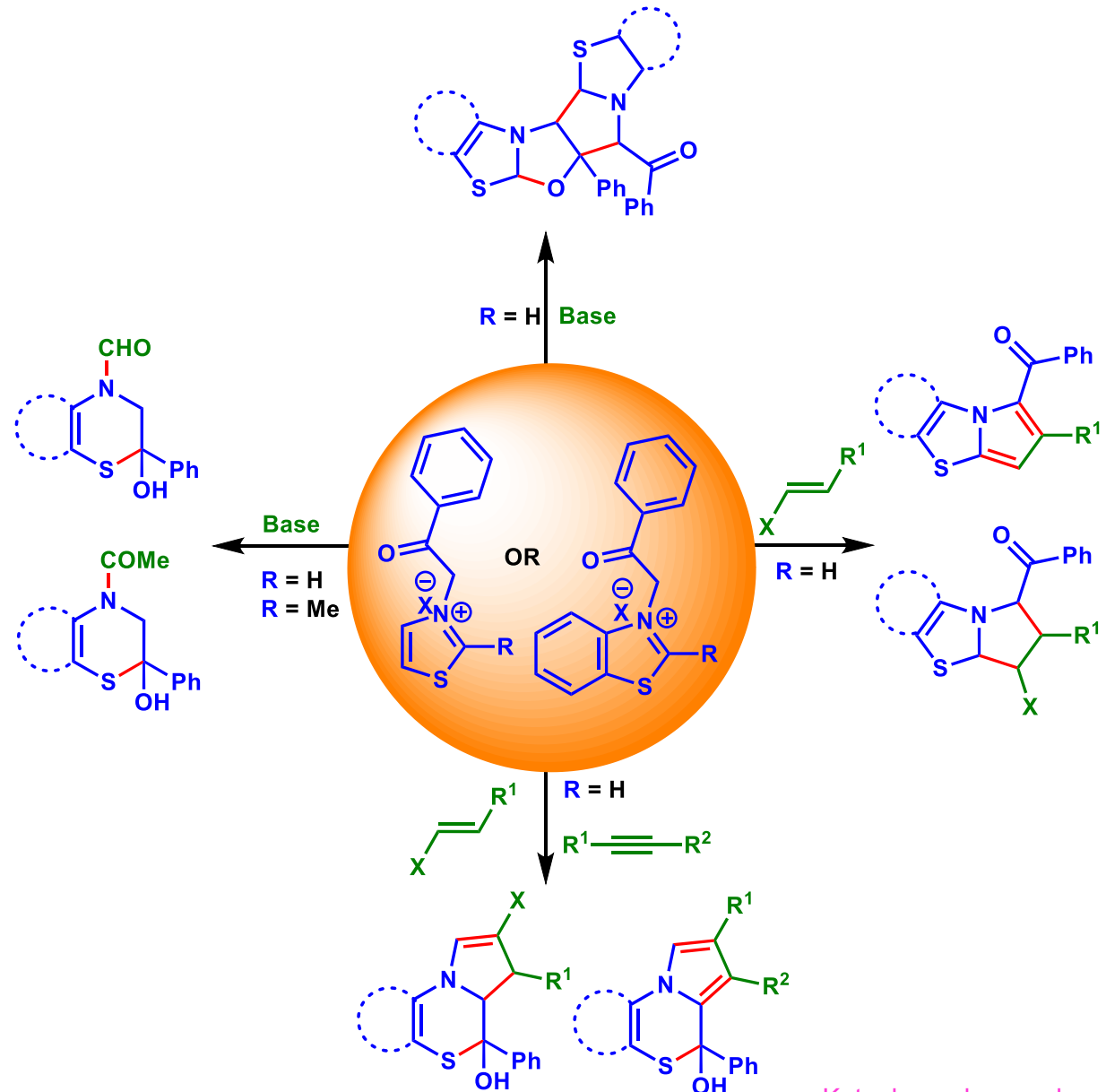
Cycloaddition reactions

1,3-Dipolar cycloaddition via azomethine ylides

- ✓ Azomethine ylides are reactive intermediates.
- ✓ 1,3-dipoles nitrogen based and comprise an iminium ion adjacent to a carbanion.



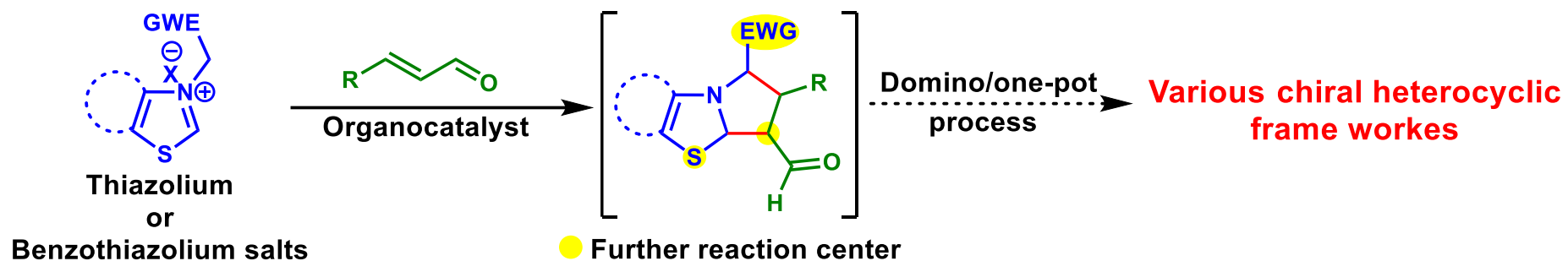
Unusual reactivity of azolium salts



- ✓ Dimerization
- ✓ Cycloaddition
- ✓ Rearrangement
- ✓ Ring-opening
- ✓ Ring expansion

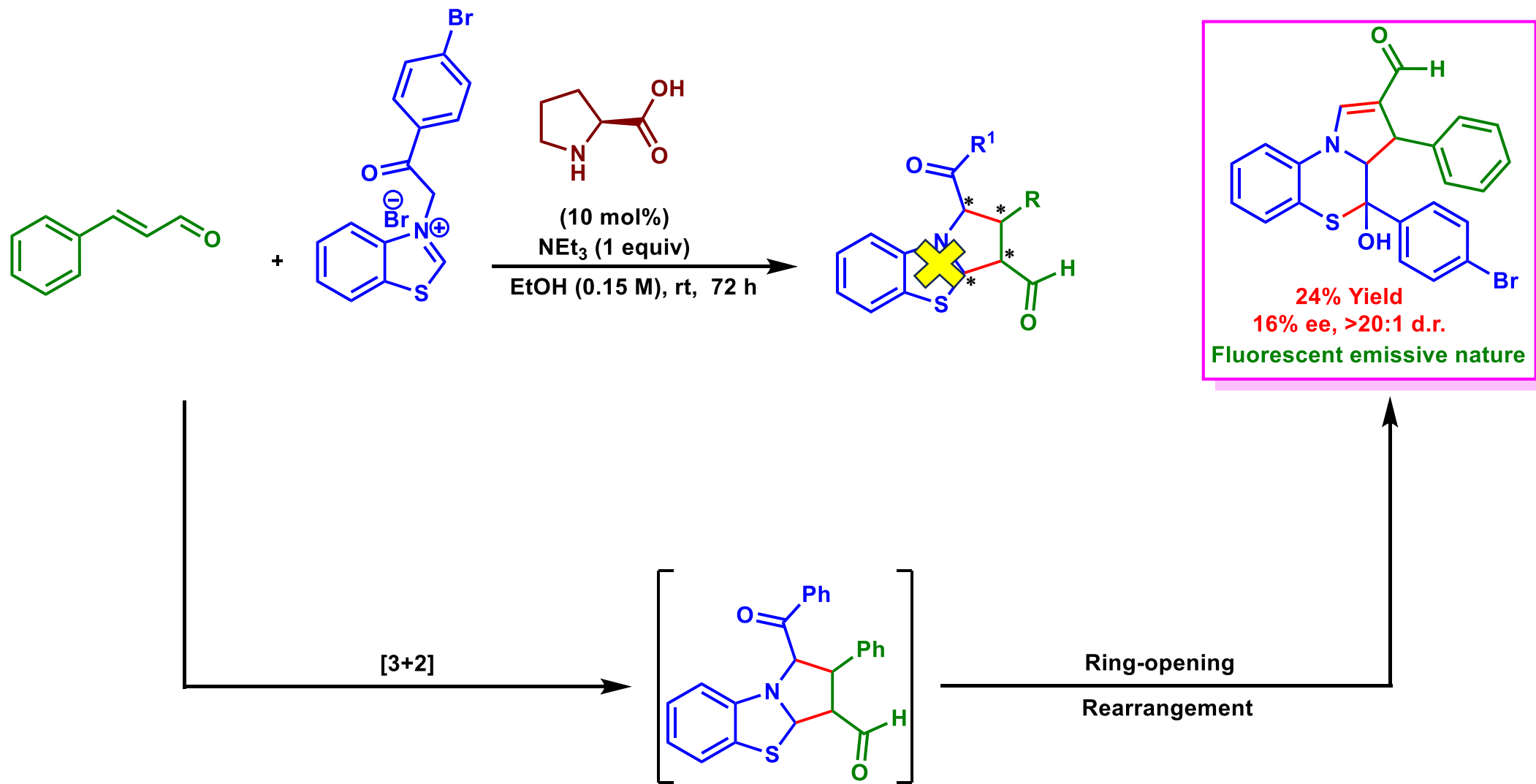
Yan and co-workers, *Chemistry Select*, **2020**, *5*, 1092-1096.
Singh and co-workers, *Tetrahedron*, **1992**, *48*, 4545-4550.

Kataoka and co-workers, *J. Chem. Soc., Perkin Trans. 1*, **1996**, 629-635.
Feng and co-workers, *Org. Chem. Front.* **2018**, *5*, 2126-2131.

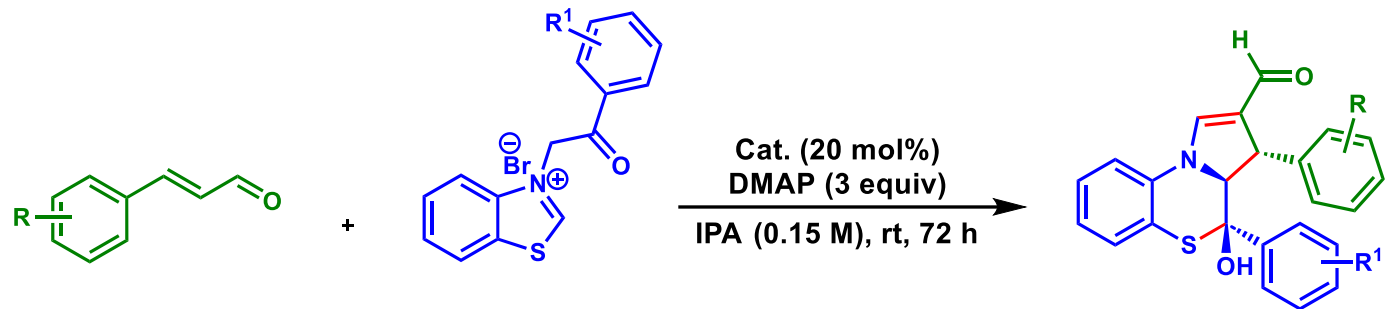


- ✓ Cycloiminium salts process *via* inter or intra-molecular fashion
- ✓ Utilizing environment friendly chiral amine organocatalysts
- ✓ Development of new domino and one-pot methodology
- ✓ Synthesis of various chiral heterocyclic frameworks
- ✓ Easy operating procedures, mild conditions

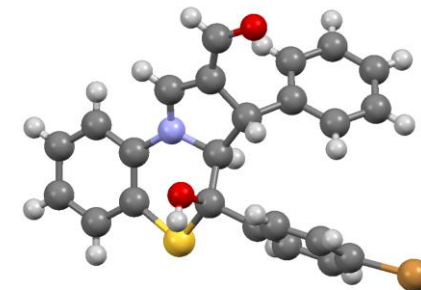
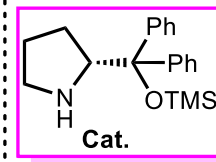
Domino synthesis of pyrrolo-thiazine



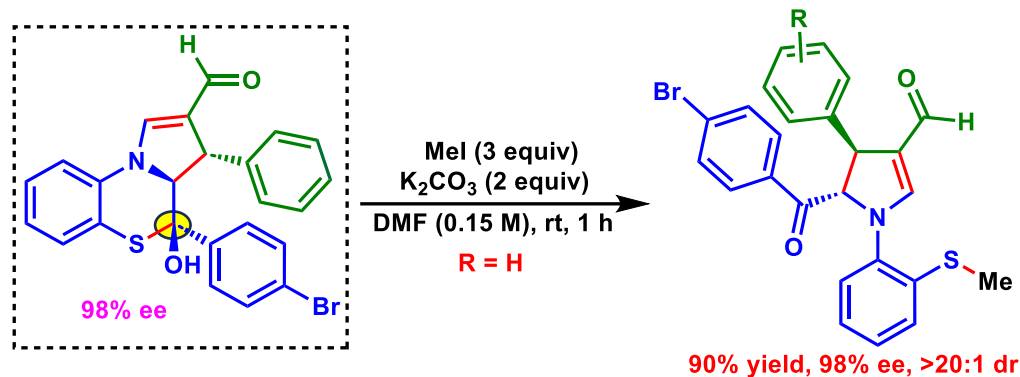
Substrate scopes



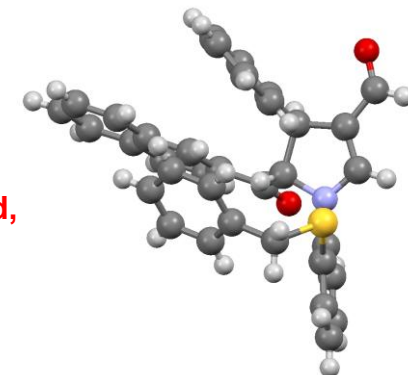
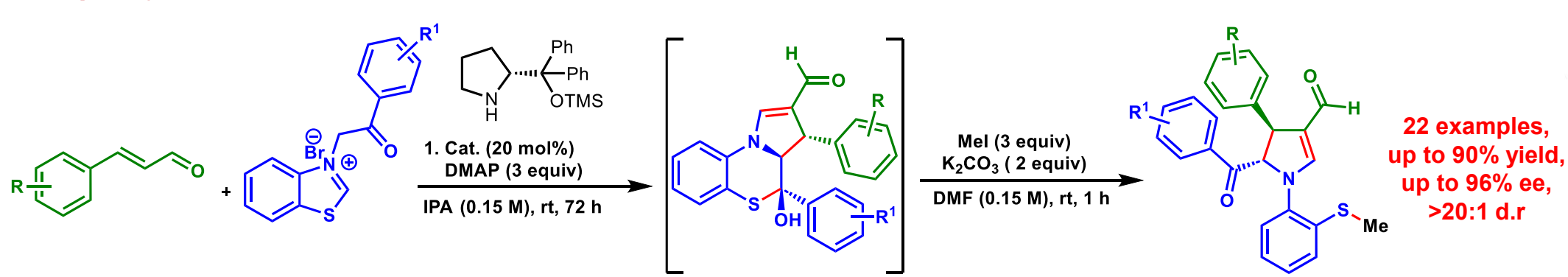
30 examples,
up to 92% yield,
up to $\geq 99\%$ ee, $>20:1$ d.r.



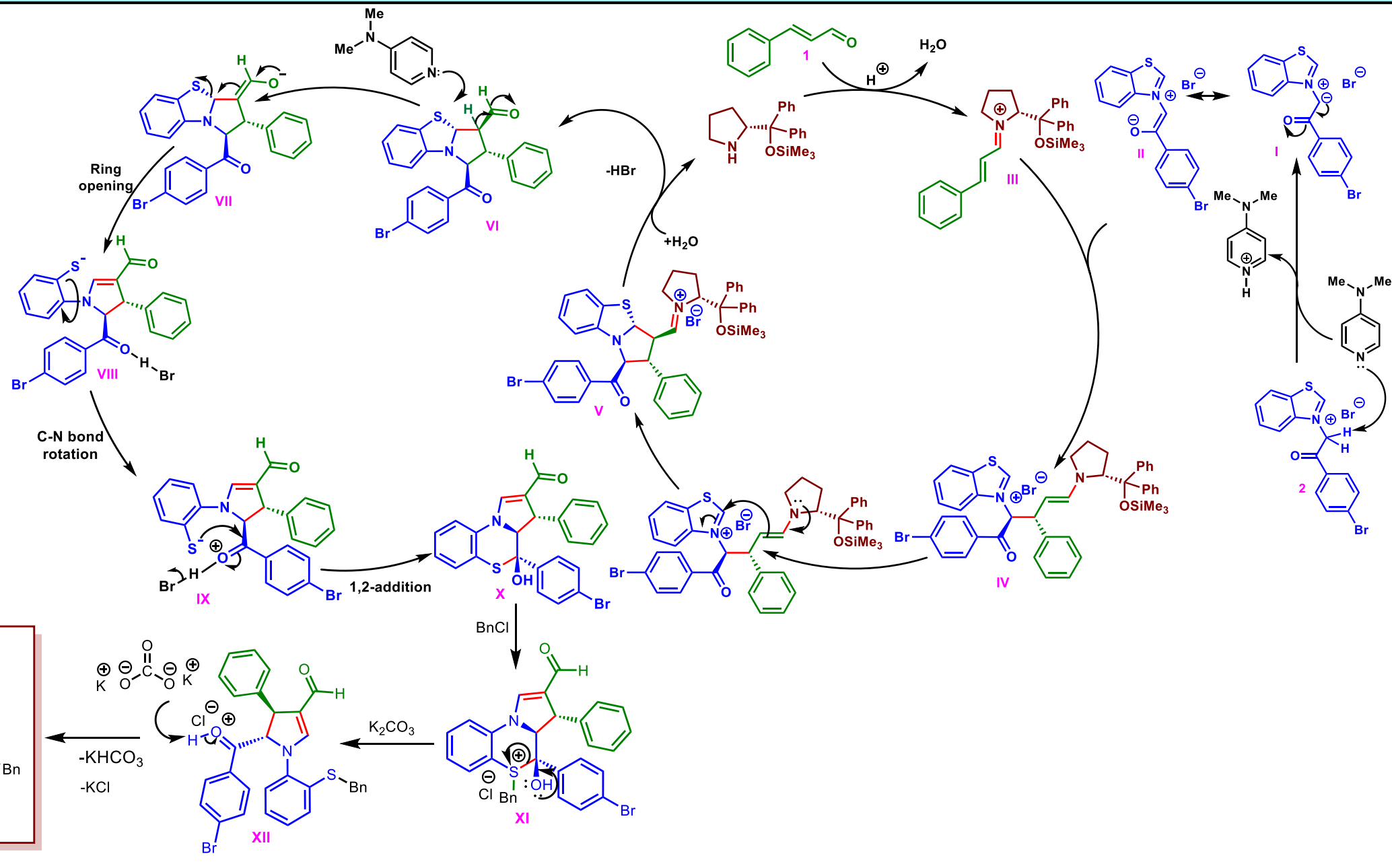
Synthetic transformations



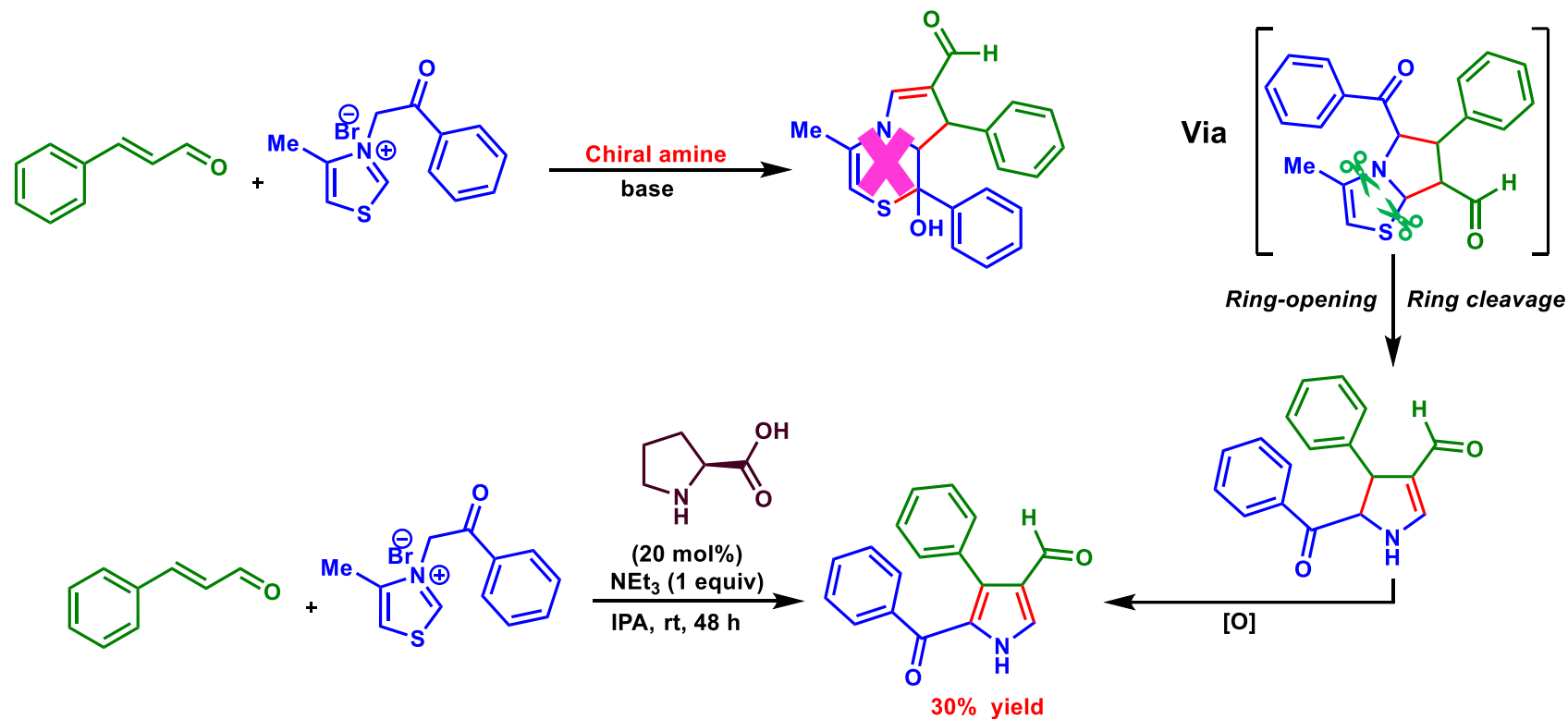
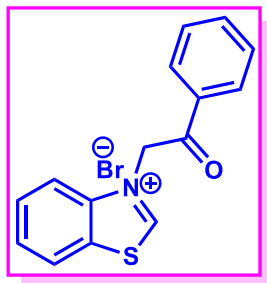
One-pot synthesis



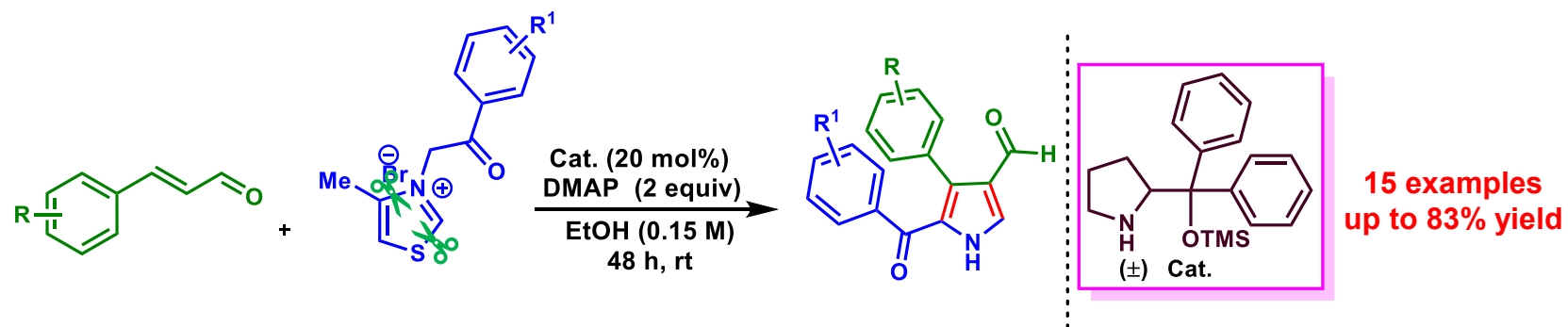
Plausible mechanism



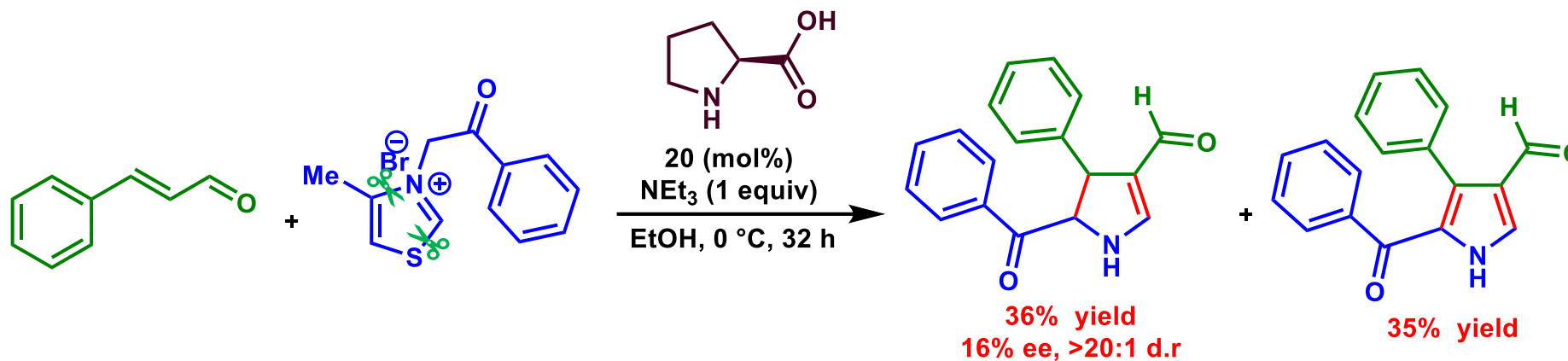
Domino Synthesis of trisubstituted 1H-pyrroles



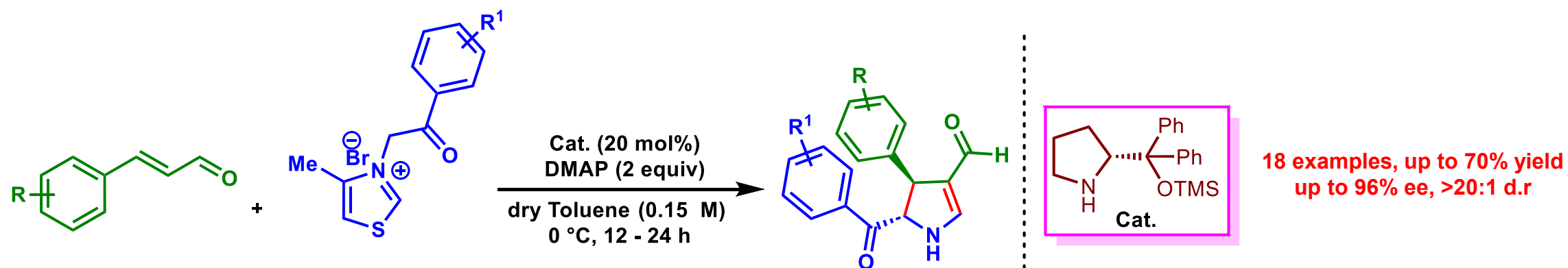
Domino synthesis



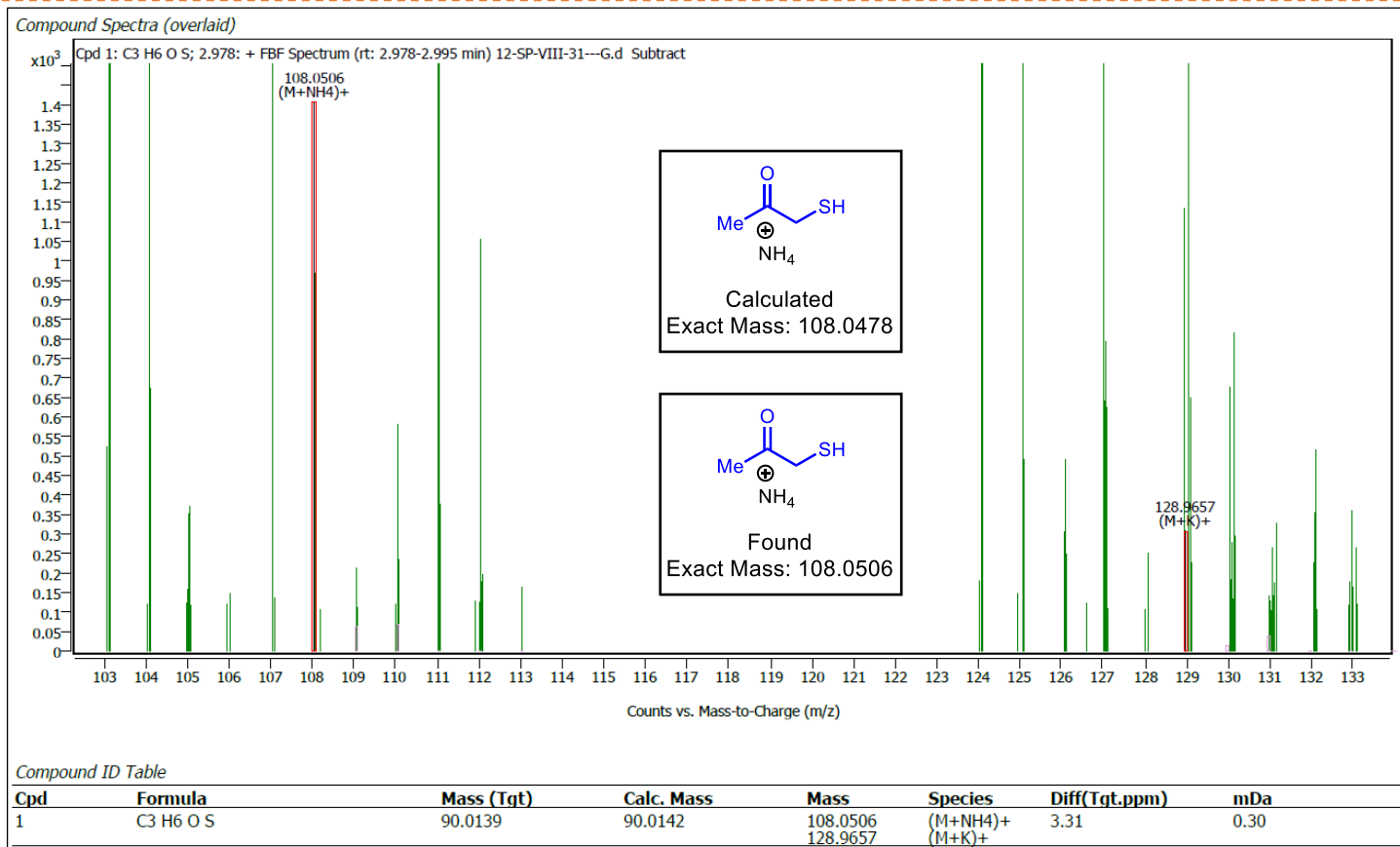
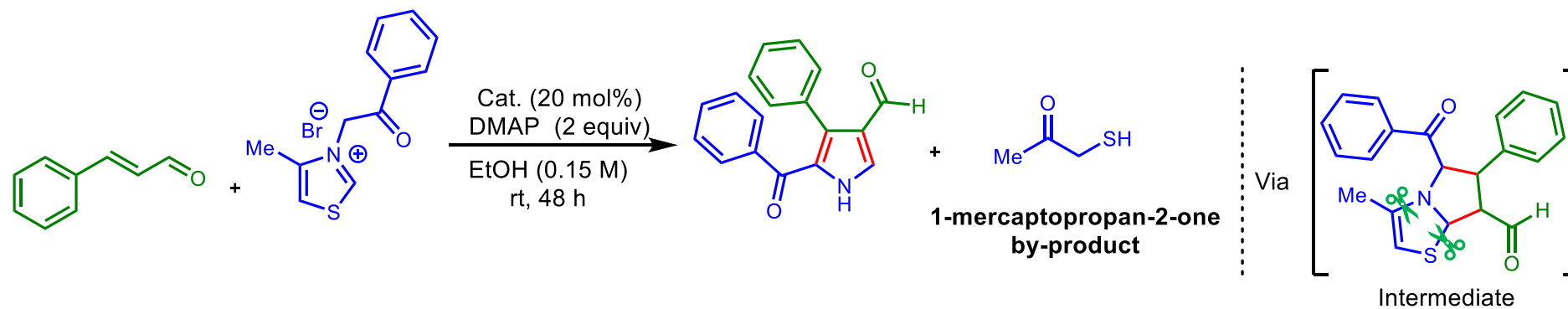
Domino Synthesis of trisubstituted chiral dihydro-1H-pyrroles



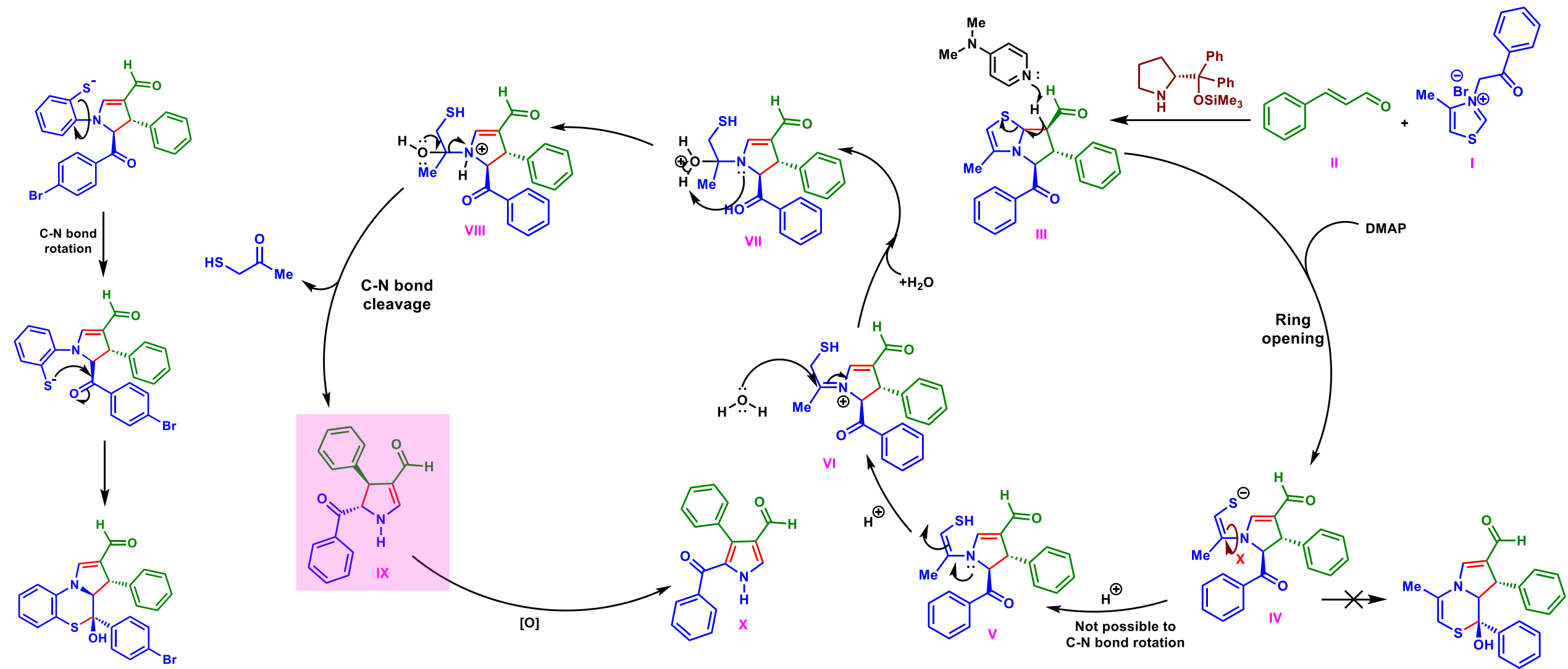
Domino synthesis



Mechanistic investigation



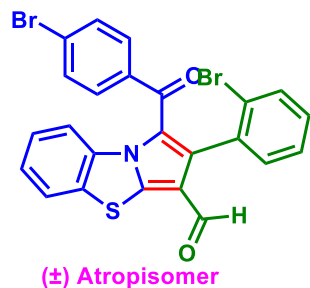
Plausible mechanism



Summary

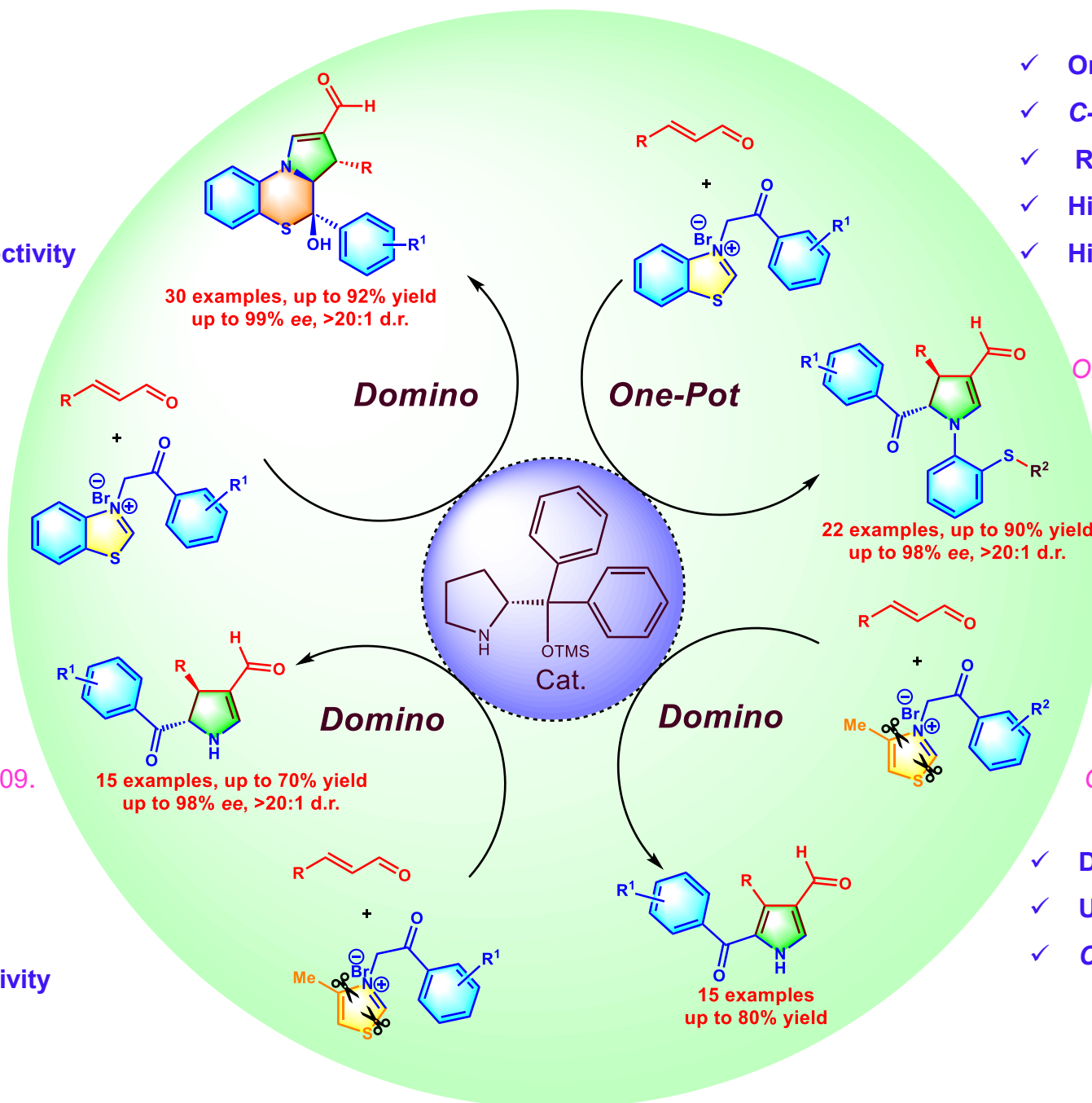
- ✓ Domino synthesis
- ✓ Fluorescent active
- ✓ DFT and docking study
- ✓ Anticancer activity
- ✓ High enantio- and diastereoselectivity

Org. Lett. **2024**, *26*, 2971–2975.



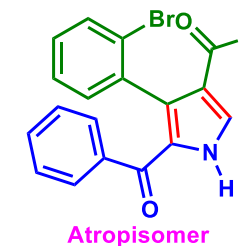
Chem. Commun. **2025**, *61*, 5806–5809.

- ✓ Unprecedented reactivity
- ✓ Domino synthesis
- ✓ C-S and C-N bond cleavage
- ✓ High enantio- and diastereoselectivity



- ✓ One-pot synthesis
- ✓ C-S bond formation
- ✓ Ring-opening
- ✓ High functional group tolerance
- ✓ High enantio- and diastereoselectivity

Org. Biomol. Chem. **2024**, *22*, 8119–8124.



Chem. Commun. **2025**, *61*, 5806–5809.

- ✓ Domino synthesis
- ✓ Unprecedented reactivity
- ✓ C-S and C-N bond cleavage

Acknowledgments

amU
Aix Marseille Université



stereoO
Stéréochimie et Réactivité Organique

**IIT
MADRAS**



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Thank You