Inherent Chirality of Au-Cavitands in Catalyzing the Cycloisomerization of Nitrogenous Enynes

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ABSTRACT • Gold is a popular organometallic catalyst to influence the activation of unsaturated bonds. Now, monofunctionalized gold cavitands with external-facing phosphoramidite ligands potentially serve as new enantioselective catalysts. These inner-oriented P-Au cavitand complexes have had variable success in catalyzing the hydration of terminal alkynes[1] and the regioselective hydration of simple internal alkynyl groups.[2] Recently, diastereomeric mixtures of inherently chiral allylsilane cavitands have been produced,[3] and modifications to synthesize chiral functional groups on the phosphoramidite ligand may now be used to examine asymmetric reactions of gold cavitands. We aim to convert nonchiral, nitrogen-containing starting material into enantiomerically enriched, complex products using inherently chiral Au-cavitands. The results of the gold-catalyzed cycloisomerization reactions will hopefully contribute towards the development of new therapeutic compounds and understanding of supramolecular catalysts.

BACKGROUND • Enantioselective reactions are specialized transformations that produce one enantiomer of a potential isomeric pair. This area of study is essential to drug synthesis as pairs of enantiomers can stimulate drastically different physiological responses – where one may have detrimental side effects. Many biocatalysts, including enzymes, are capable of forming enantiomerically-pure products due to their inherently chiral active sites. In supramolecular chemistry, chiral cavitands can possess similar structural characteristics that may influence uneven product distribution of enantiomers.

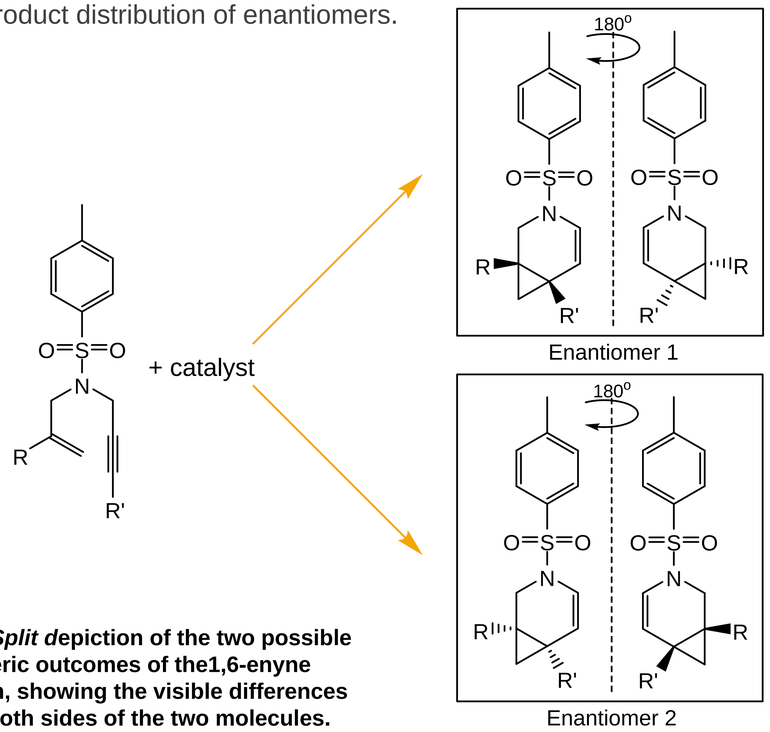

***Figure 1. Split d*epiction of the two possible enantiomeric outcomes of the1,6-enyne cyclization, showing the visible differences between both sides of the two molecules.**

RESEARCH GOAL • Examine how inherent chirality influences the formation isomers in nitrogen-tethered, 1,6-enyne cyclization reactions to determine whether chiral cavitands can direct substrates to favor specific bond orientations.

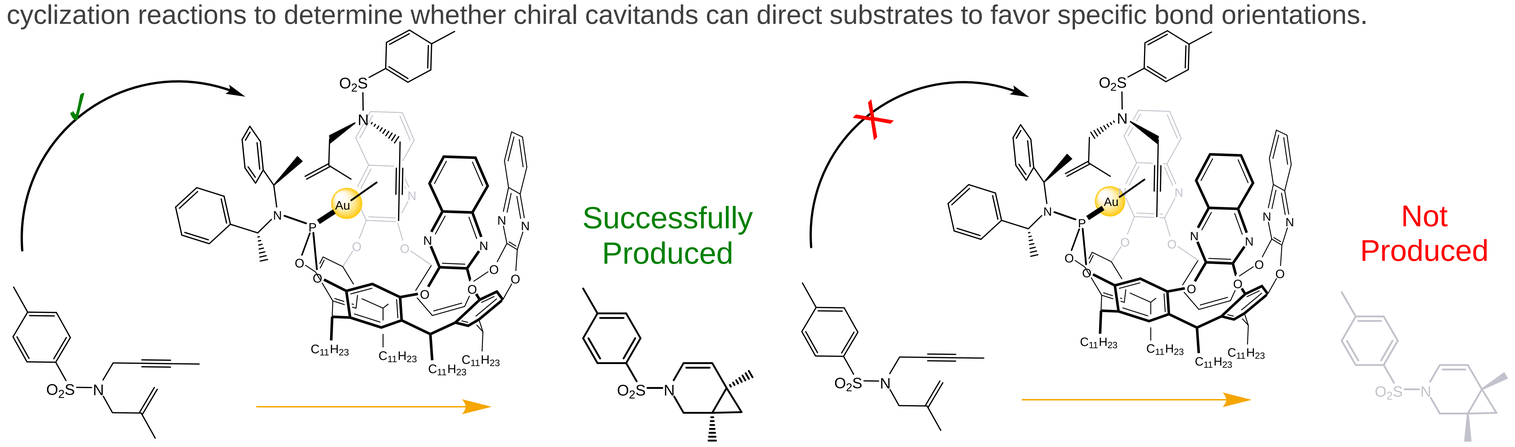

***Figure 2.* Stereochemical model created to demonstrate expected findings.**

METHODS • Substrates will react with our chiral cavitand in a liquid medium to form cyclic products. Isomers will be verified via NMR and crystallography.

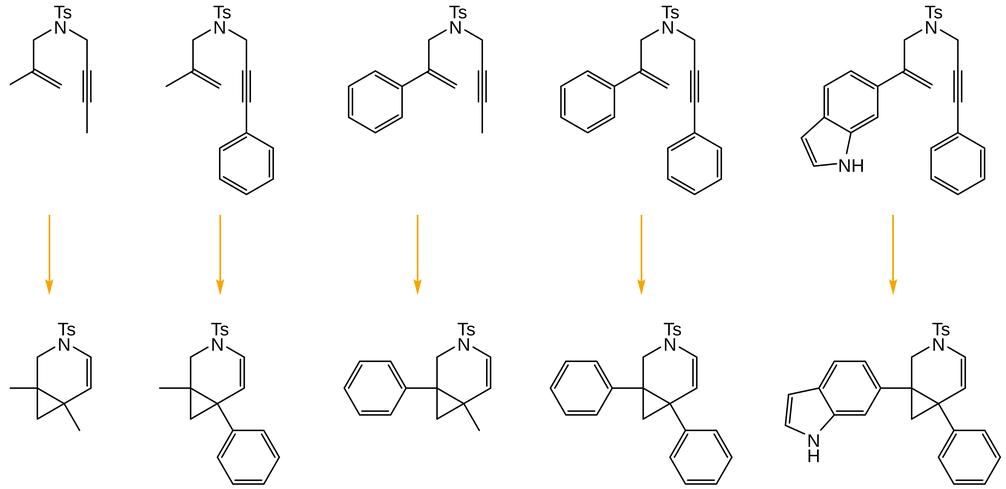

***Figure 2.* Prototypical substrate examples (top) and cyclomerized products (bottom) – stereochemistry omitted.**

REFERENCES

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2.Endo, N.; Inoue, M.; Iwasawa, T. *European Journal of Organic Chemistry* **2018**, *2018*, 1136–1140.
3.Inoue, M., et al. *European Journal of Organic Chemistry* **2019**, *2019*, 5862–5874.

ACKNOWLEDGEMENTS

This research was supported by the National Institute of General Medical Sciences of the National Institutes of Health under Award Numbers; UL1GM118979; TL4GM118980; RL5GM118978. The content is solely the responsibility of the authors and does not necessarily represent the official views of the National Institutes of Health.