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*Major Research Interest*: **Organic Synthesis; Asymmetric Catalysis; Medicinal & Bioorganic Chemistry**

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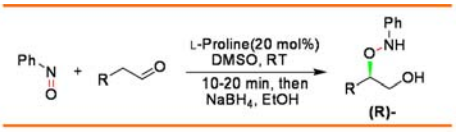
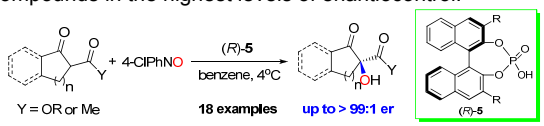
**Asymmetric Catalysis, Organic Synthesis and Medicinal & Bioorganic Chemistry**

We are interested in the development of new synthetic methodologies in organic synthesis, asymmetric catalysis and their applications in the synthesis of biologically active compounds. Learning from Nature is always inspiring. Our studies started from developing new approaches to mimic the natural Class-I aldolases that use an amine functionality in its active site and a covalent catalysis involving imine and enamine intermediates. Antibody catalysis provided significant conceptual model which promoted our interest to find organocatalysts of similar reactions. New asymmetric routes with organocatalysis were then developed, that can be ideally performed under ambient conditions in benign media using small organocatalysts. With the development of organocatalytic asymmetric reactions, a new asymmetric aminoxylation was discovered.[1]

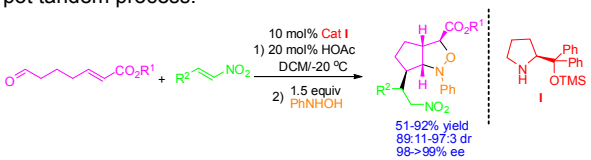



**Enantioselective α-Aminoxylation of Aldehydes (up to ≥ 99% ee)**

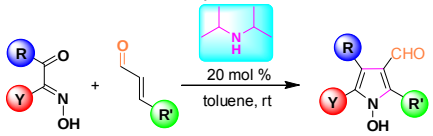
A novel, facile, and highly enantioselective Brønsted acid catalyzed α-hydroxylation of β-dicarbonyl compounds using nitroso compounds as the oxygen source has been developed. This allows expeditious, straightforward, and efficient access to valuable α-hydroxy-β-dicarbonyl compounds in the highest levels of enantiocontrol.[2, 3]



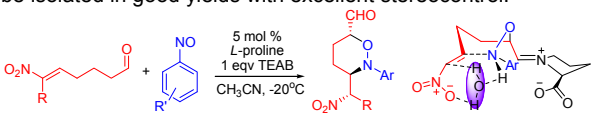

A highly facile and stereoselective synthesis of bicyclic isoxazolidines has been developed with the control of five stereogenic centres via an organocatalytic asymmetric one-pot tandem process.[4]




A facile synthesis of N-hydroxy pyrroles, involving sequential Michael addition/intramolecular aldol condensation reactions, has been developed by using readily available starting materials. The domino reaction proceeds via an iminium activation of unsaturated aldehydes, Michael addition using oximes as N-selective nucleophiles and aldol condensation.[5]

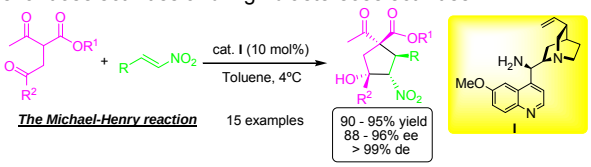



The aminoxylation directed domino reactions have been developed, from which pure aldehyde cyclic products could be isolated in good yields with excellent stereocontrol.[6, 7]

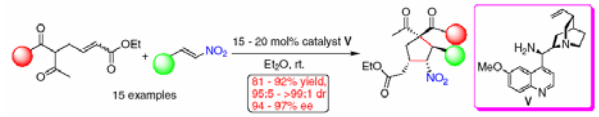



17 examples, up to 90% yield, >=99% e.e., >99:1 d.r.

The asymmetric construction of a quaternary carbon atom represents one of the most challenging and demanding topics in the synthesis of natural products and chiral drugs. A novel organocatalytic tandem Michael-Henry reaction was efficiently catalyzed by readily available 9-amino-9-deoxyepiquinine (**V**) to afford synthetically useful, highly functionalized chiral cyclohexanes with four stereogenic centers containing two quaternary stereocenters in excellent yields, enantioselectivities and high diastereoselectivities.[8 - 10]




Extending the above process to the domino double Michael reaction provides expedited access to highly functionalized cyclopentane derivatives. Simple operational procedures, excellent stereoselectivities, and immense potential of synthetic versatility of the products render this new methodology highly appealing for asymmetric synthesis.[11 - 13]

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1. P. J. Chua, B. Tan, G. Zhong, *Green Chem.* **11** (2009), 543.
2. M. Lu, D. Zhu, Y. Lu, X. Zeng, B. Tan, Z. Xu, G. Zhong, J. *Am. Chem. Soc.* **131** (2009), 4562. (**highlighted by *Synfacts***)
3. X. Zeng, X. Zeng, Z. Xu, M. Lu, G. Zhong, *Org. Lett.* **11** (2009), 3036. (**highlighted by *Synfacts***)
4. D. Zhu, M. Lu, L. Dai, G. Zhong, *Angew. Chem. Int. Ed.* **48** (2009), 6089. (**highlighted by *Synfacts***)
5. B. Tan, Z. Shi, P. J. Chua, Y. Li, G. Zhong, *Angew. Chem. Int. Ed.* **48** (2009), 758.
6. M. Lu, D. Zhu, Y. Lu, Y. Hou, B. Tan, G. Zhong, *Angew. Chem. Int. Ed.* **47** (2008), 10187. (**highlighted by *Organic Chemistry Portal***)
7. D. Zhu, M. Lu, P. J. Chua, B. Tan, F. Wang, X. Yang, G. Zhong, *Org. Lett.* **10** (2008), 4585. (**highlighted by *Organic Chemistry Portal***)
8. B. Tan, P. J. Chua, Y. H. Li, G. Zhong, *Org. Lett.* **10** (2008), 2437. (**highlighted by *Organic Chemistry Portal***)
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10. B. Tan, X. Zeng, Y. Lu, P. J. Chua, G. Zhong, *Org. Lett.* **11** (2009), 1927. (**highlighted by *Synfacts***) (**the 2nd most read paper in June 2009 and the 10th most read paper among 12 months in August 2009 by *Organic Letters***)
11. B. Tan, P. J. Chua, X. Zeng, M. Lu, G. Zhong, *Org. Lett.* **10** (2008), 3489. (**highlighted by both *Synfacts* and *Organic Chemistry Portal***)
12. B. Tan, X. Zhang, P. J. Chua, G. Zhong, *Chem. Commun.* **2009**, 4585. (**highlighted by the *ChemComm* front cover**)
13. L. Yang, B. Tan, F. Wang, G. Zhong, *J. Org. Chem.* **74** (2009), 1744.