

## Associate Professor ZHAO Yu

S5-03-09, Department of Chemistry, National University of Singapore  
3 Science Drive 3, Singapore 117543  
Phone: 65-65167964; Email: zhaoyu@nus.edu.sg



### Employment

Jul 2017-present	Associate Professor of Chemistry, NUS
Aug 2011-Jun 2017	Assistant Professor of Chemistry, NUS
2008-2011	Postdoctoral associate with Prof. Richard R. Schrock Massachusetts Institute of Technology

### Education

2002- 2008	Ph.D. in Chemistry with Profs. Marc L. Snapper & Amir H. Hoveyda, Boston College
1998- 2002	B.S. in Chemistry with Prof. Limin Qi, Peking University

### Research interests

- Efficient catalytic methodology development
- Medicinal chemistry
- Pharmaceutical manufacturing
- Organic material and polymer chemistry

### Representative publications in the last five years

1. "Highly Regio- and Stereodivergent Access to 1,2-Amino Alcohols or 1,4-Fluoro Alcohols by NHC-Catalyzed Ring Opening of Epoxy enals," Poh, S. B.; Ong, J. Y.; Lu, S.;\* **Zhao, Y.** *Angew. Chem. Int. Ed.* **2018**, *57*, 1645-1649.
2. "Pd-Catalyzed Enantioselective [6+4] Cycloaddition of Vinyl Oxetanes with Azadienes to Access Ten-Membered Heterocycles," Wang, Y. N.;<sup>†</sup> Yang, L. C.;<sup>†</sup> Rong, Z.-Q.; Liu, T.-L.; Liu, R.; **Zhao, Y.** *Angew. Chem. Int. Ed.* **2018**, *57*, 1596-1600.
3. "Nickel-catalyzed Difunctionalization of Allyl Moieties Using Organoboronic Acids and Halides with Divergent Regioselectivities," Li, W.; Boon, J. K.; **Zhao, Y.** *Chem. Sci.* **2018**, *9*, 600-607.
4. "Nine-Membered Benzofuran-Fused Heterocycles: Enantioselective Synthesis by Pd-Catalysis and Rearrangement via Transannular Bond Formation," Rong, Z.-Q.;<sup>†</sup> Yang, L.-C.;<sup>†</sup> Liu, S.; Yu, Z.; Wang, Y.-N.; Tan, Z. Y.; Huang, R.-Z.; Lan, Y.;\* **Zhao, Y.** *J. Am. Chem. Soc.* **2017**, *139*, 15304-15307.
5. "Enantioselective Synthesis of Tetrahydroquinolines Using Borrowing Hydrogen: Cooperative Catalysis by Achiral Iridacycle and Chiral Phosphoric Acid," Lim, C. S.; Quach, T. T.; **Zhao, Y.** *Angew. Chem. Int. Ed.* **2017**, *56*, 7176-7180 (VIP).
6. "Divergent Reactivities in Fluorination of Allylic Alcohols: Synthesis of Z-Fluoroalkenes via Carbon-Carbon Bond Cleavage," Liu, T.-L.; Wu, J.; **Zhao, Y.** *Chem. Sci.* **2017**, *8*, 3885-3890.
7. "Rhodium-Catalyzed Enantioselective Isomerization of Secondary Allylic Alcohols," Liu, T.-L.; Ng, T. W.; **Zhao, Y.** *J. Am. Chem. Soc.* **2017**, *139*, 3643-3646.
8. "Construction of Nine-Membered Heterocycles through Palladium-Catalyzed Formal [5 + 4] Cycloaddition," Yang, L.-C.;<sup>†</sup> Rong, Z.-Q.;<sup>†</sup> Wang, Y.-N.; Tan, Z. Y.; Wang, M. **Zhao, Y.** *Angew. Chem. Int. Ed.* **2017**, *56*, 2927-2931.
9. "Acid-Assisted Ru-Catalyzed Enantioselective Amination of 1,2-Diols through Borrowing Hydrogen," Yang, L.-C.; Wang, Y.-N.; Zhang, Y.;\* **Zhao, Y.** *ACS Catal.* **2017**, *7*, 93-97.
10. "Access to Acyclic (Z)-Enediyne via Alkyne Trimerization: Cooperative Bimetallic Catalysis Using Air as the

- Oxidant," Lee, J. T. D.; **Zhao, Y. *Angew. Chem. Int. Ed.* 2016, 55, 13872–13876.**
11. "Asymmetric Transfer Hydrogenation of Imines using Alcohol: Efficiency and Selectivity Are Affected by the Hydrogen Donor," Pan, H.-J.; Zhang, Y.; Shan, C.; Yu, Z.; Lan, Y.;\* **Zhao, Y.\* *Angew. Chem. Int. Ed.* 2016, 55, 9615–9619.**
  12. "Cobalt-Catalyzed Enantioselective Vinylation of Activated Ketones and Imines," Huang, Y.;<sup>†</sup> Huang, R.-Z.;<sup>†</sup> **Zhao, Y. *J. Am. Chem. Soc.* 2016, 138, 6571–6576.**
  13. "Cobalt-Catalyzed Allylation of Heterobicyclic Alkenes: Ligand-Induced Divergent Reactivities," Huang, Y.; Ma, C.; Lee, Y. X.; Huang, R.-Z.; **Zhao, Y. *Angew. Chem. Int. Ed.* 2015, 54, 13696–13700.**
  14. "Dynamic Kinetic Asymmetric Amination of Alcohols: From A Mixture of Four Isomers to Diastereo- and Enantiopure  $\alpha$ -Branched Amines," Rong, Z. Q.;<sup>†</sup> Zhang, Y.;<sup>†</sup> Chua, R. H. B.; Pan, H.-J.; **Zhao, Y. *J. Am. Chem. Soc.* 2015, 137, 4944–4947.**
  15. "Catalytic Divergent Synthesis of 3*H* or 1*H* Pyrroles by [3+2] Cyclization of Allenolates with Activated Isocyanides," Liao, J.-Y.;<sup>†</sup> Shao, P.-L.;<sup>†</sup> **Zhao, Y. *J. Am. Chem. Soc.* 2015, 137, 628–631.**
  16. "Kinetic Resolution of 1,1'-Biaryl-2,2'-Diols and Amino Alcohols through NHC-Catalyzed Atroposelective Acylation," Lu, S.; Poh, S. B.; **Zhao, Y. *Angew. Chem. Int. Ed.* 2014, 53, 11041–11045.**
  17. "Highly Diastereo- and Enantioselective Ag-Catalyzed Double [3+2] Cyclization of  $\alpha$ -Imino Esters with Isocyanacetate," Shao, P.-L.; Liao, J.-Y.; Ho, Y. A.; **Zhao, Y. *Angew. Chem. Int. Ed.* 2014, 53, 5435–5439.**
  18. "Catalytic Enantioselective Amination of Alcohols by the Use of Borrowing Hydrogen Methodology: Cooperative Catalysis by Iridium and a Chiral Phosphoric Acid," Zhang, Y.; Lim, C.-S.; Sim, D. S. B.; Pan, H.-J.; **Zhao, Y. *Angew. Chem. Int. Ed.* 2014, 53, 1399–1403.**
  19. "Practical, Highly Stereoselective Allyl- and Crotylsilylation of Aldehydes Catalyzed by Readily Available Cinchona Alkaloid Amide," Huang, Y.; Yang, L.; Shao, P.; **Zhao, Y. *Chem. Sci.* 2013, 4, 3275–3281.**
  20. "Kinetic Resolution of Tertiary Alcohols: Highly Enantioselective Access to 3-Hydroxy-3-Substituted Oxindoles," Lu, S.; Poh, S. B.; Siau, W.-Y.; **Zhao, Y. *Angew. Chem. Int. Ed.* 2013, 52, 1731–1734.**

## Patents and applications

1. "Highly Z-Selective Olefin Metathesis," Schrock, R. R.; Hoveyda, A. H.; Jiang, A. J.; Zhao, Y.; Flook, M. M. **US patent No. 9713808** (issued on 25-07-2017).
2. "Catalytic Enantioselective Silylations of Substrates," Snapper M. L.; Hoveyda A. H.; Rodrigo, J.; Zhao, Y. **PCT Int. Appl. 2007, # WO2007082026.**
3. "Novel Cinchona Alkaloid Derived Catalyst Available in One-Pot Synthesis for Highly Diastereo- and Enantioselective Addition of Allyltrichlorosilane and Crotyltrichlorosilane to Aldehydes," Zhao, Y.; Huang, Y.; Shao, P.; Yang, L. **US 61/765,315.**

## Awards

- 2017 **Outstanding Chemist Award**, Department of Chemistry, NUS
- 2016 **Thieme Chemistry Journal Award**
- 2015 **Young Scientist Award**, Faculty of Science, NUS
- 2015 **Asian Core Program Lectureship Award** from Japan and Hong Kong
- 2014 **Asian Core Program Lectureship Award** from Taiwan and Thailand
- 2013 **Asian Core Program Lectureship Award** from China and South Korea
- 2011-2016 **Singapore National Research Foundation Fellowship**, Singapore