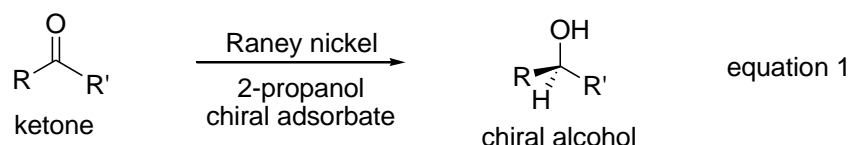


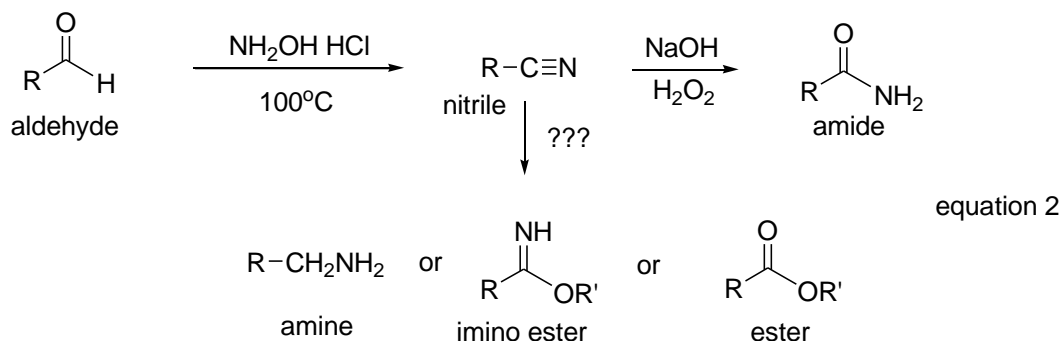
Synthetic Method Development

[Robert C. Mebane](#) URP 2015

Project 1: For several years my research has focused on synthetic method development. My previous students have shown that Raney nickel in refluxing 2-propanol is an effective catalytic system for the reduction of a variety of functional groups including aryl alcohols¹, iodolactones², alkyl nitriles³, aldehydes⁴, and ketones⁵. Given the recent success of reducing ketones, I would like to explore if this reduction can be performed in an asymmetric manner to give chiral secondary alcohols. To test this hypothesis, we will modify the surface of the Raney nickel by adsorbing inexpensive chiral substances (e.g. tartaric acid) prior to performing the reductions (equation 1). The progress of the reaction and any asymmetric induction in the product alcohols will be monitored by GC-MS using a chiral GC column.



Project 2: Several summers ago, my research group discovered that nitriles can be conveniently prepared from aldehydes using hydroxylamine hydrochloride in dimethyl sulfoxide solvent.⁶ Recently, we extended this methodology to a one-pot tandem synthesis of amides⁷ and ethyl esters⁸ from aldehydes. To make this transformation more “green” we decided to see if we could eliminate the use of DMSO (and solvents all together). Much to our delight, we were successful in developing a solvent-free method for converting aldehydes into nitriles. For future work I would like to see if we can extend this solvent-free reaction into a one-pot conversion of aldehydes into other functional groups such as amines, imino esters, and esters.



The student involved in this project will make extensive use of the Department's GC/MS and FT-NMR systems. Furthermore, the student will have an opportunity to present his/her work at a professional meeting. **Only students capable of starting work at 7 a.m. should consider working with me.**

References

1. Mebane, R.C.; Gross, B.H.; Armstrong, D. *J. Appl. Cat.: A*, 219, 281 (2001).
2. Grimes, K.D.; Jenkins, S.R.; Deardorff, J.D.; Gross, B.H. *Synth. Commun.*, 32, 2049 (2002).
3. Jensen, D.R.; Rickert, K.R.; Gross, B.H.; Mebane, R.C. *Synth. Commun.*, 33, 3373 (2003).
4. Mansfield, A.; Mebane, R.C. *Synth. Commun.*, 35,3083 (2005).
5. Holte, K.; Mebane, R.C. *Synth. Commun.*, 37, 2787 (2007).
6. Chill, S.T.; Mebane, R.C. *Synth. Commun.*, 39, 3601 (2009).
7. Chill, S.T.; Mebane, R.C. *Synth. Commun.*, 40, 2014 (2010).
8. Siler, P.J.; Chill, S.T.; Mebane, R.C. *Synth. Commun.*, 41, 1247 (2011).