Department of Chemistry
MCMICKEN COLLEGE OF ARTS AND SCIENCES

SUMMER RESEARCH OPPORTUNITIES
FOR UNDERGRADUATE WOMEN

APPLICATION DEADLINE: March 3, 2008

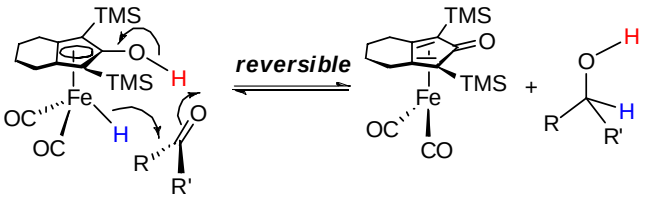
The Department of Chemistry is pleased to offer the following research project for the summer of 2008. Interested students are urged to contact the faculty member(s) directing the project that most interests them. By contacting the faculty member, you can discover more about the project, learn what your responsibilities will be and, if possible, develop a timetable for the twelve-week research period.

PROJECT TITLE: SELECTIVE DEHYDROGENATION OF ALCOHOLS CATALYZED BY IRON COMPLEXES

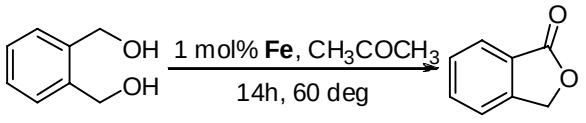
Professor Hairong Guan
Department of Chemistry
503 Crosley Tower
Cincinnati, OH 45221-0172
Tel: (513) 556-6377
Fax: (513) 556-9239
Email: Hairong.guan@uc.edu

Project Description

Dehydrogenation of alcohols is an important process in industry. Current technology is primarily based on precious metal catalysts and/or harsh reaction conditions that require high temperature. We have reported that a hydride derived from iron (thus inexpensive) catalyzes the hydrogenation of aldehydes and ketones with high efficiency and high chemoselectivity. The detailed mechanistic studies on this hydrogenation system suggest that the H-atom transfer step is reversible. Dehydrogenation of alcohols, *the reverse step of hydrogenation*, is therefore possible if one can identify a suitable hydrogen acceptor.



Our preliminary results show that acetone serves as the desired hydrogen acceptor. In fact, it can also be used as the solvent for dehydrogenation reactions. We have successfully demonstrated two examples where secondary alcohols (1-phenylethanol and 1-phenyl-1-buten-3-ol) are efficiently dehydrogenated to give ketones in high chemical yields. Dehydrogenation of primary alcohols is also feasible. We have isolated an ester product in excellent yield from the dehydrogenation of a diol. Our future



direction is to study the scope and mechanism of this catalytic system. This project is very promising and specifically designed for undergraduate students with interest in organic synthesis. Students in our group will learn various synthetic (both inorganic and organic) techniques, particularly manipulating compounds that are moisture or air sensitive. We also expect that students will receive proper training on how to utilize a variety of spectroscopic tools and how to think about a chemical reaction mechanistically. Please feel free to contact us if you are interested and would like to know more about the details of the research.