TSP Proposal for SCTP3xxx

Catalysis for Sustainability

Introduction
One of the centerpieces of sustainability is improved catalytic processes, particularly with a view to reduction of waste, process intensification and the use of renewable resources. This project examines the utility of two novel catalyst types – ship in a bottle and triphasic catalysts.

Project Proposal
(1) Examine Cu(salen) as a Lewis base, particularly with respect to co-ordination of known organic Lewis acids and other copper complexes, so as to obtain the epr spectra of these complexes for comparison with those reported for copper/salen/zeolite Y “ship in a bottle” complexes.
(2) The dehydration of lactic and 3-hydroxypropionic acids from biomass yields acrylic acid, a valuable commodity chemical for the production of acrylate polymers, at present produced entirely from fossil oil. Currently, both lactic acid and 3-hydroxypropionic acid are best converted to acrylate by catalytic dehydration in the gas phase (high temperature!) and in the presence of an alcohol. The dehydration of lactic acid to produce acrylic acid under mild reaction conditions would be a significant advance, potentially possible using triphasic catalyst systems based on ionic liquids.

Research Questions
How do the reported epr spectra of copper/salen/zeolite Y complexes compare with those of Cu(salen)X complexes?
Do these spectra confirm the presence of Cu(salen)X compounds within the copper/salen/zeolite Y/acetonitrile materials?
Can acrylic acid be produced from lactic acid by triphasic catalysis under mild reaction conditions?

Research Methodology
Literature searches
Experimental laboratory work (synthesis, characterization by gc, mass spec, hplc, esr, ir, nmr)

Assessment
- A written report (5,000 – 6,000 words; up to 20 pages double spaced; 12 point) (60%)
- Preparation of a journal article for submission as a communication to a refereed journal (e.g., *Chem. Commun.*) (note – preparation only for the assessment, not publication). (20%)
- Oral research presentation on the project in May/June 200X (20%)

Examiners
Prof AAA
A/Prof BBB
Dr CCC