Green Chemistry (Chemistry 393-0), Spring 2003

Literature Summaries

Literature Assignment #1: Begins March 31, 2003

What are the general areas of investigation in green chemistry?

What is green chemistry?

What is atom economy?

What is click chemistry?

How can atom efficiency be applied?

Literature Assignment #2: Begins April 7, 2003

In what way(s) is click chemistry related to green chemistry?

Explain sustainable development and the triple bottom line.
2.2 http://www.sustainability.com/philosophy/triple-bottom/tbl-intro.asp
http://www.sustainability.com/philosophy/what-is-sustainable-development.asp

How does polymer regeneration differ from standard recycling methods?

Are the properties of recycled plastics as good as the properties of virgin plastics?

Discuss the life cycle of plastics and why reducing is better than recycling and reusing.
2.5 http://www.plasticsresource.com/disposal/life_cycle_feature/index.html
Literature Assignment #3: Begins April 14, 2003

Why is Life Cycle Assessment important?

What is green analytical chemistry entail? How can analytical techniques be used to follow the course of a reaction? Why was IR the best method to study this reaction?

What is the Toxics Release Inventory?
3.3 http://www.epa.gov/tri/

What are green metrics? Are mass and energy good enough indicators of environmental impact?

Literature Assignment #4: Begins April 21, 2003

Why are solid, largely unmodified alumina, silicas, and zeolites able to be used as catalysts?

Are lanthanide catalysts really environmentally friendly?

What are solid acids and solid bases and how can they be used for catalysis?

Why is catalysis a foundational pillar of green chemistry?

What are the advantages of using a totally chlorine free bleaching process? If hydrogen peroxide bleaching has been know for years why did the TAML process warrant an award?

**Literature Assignment #5:**

Begins April 28, 2003

What solvents are green? What needs to be considered before a solvent can be classified as green?


What are fluorous solvents? Why are fluorous solvents green? What research is still needed? What are the advantages and drawbacks of using fluorous solvents?


What are ionic liquids? Why are ionic liquids green? What research is still needed? What are the advantages and drawbacks of using ionic liquids?

5.3 Holbrey, J.D.; Seddon, K.R. “Ionic Liquids,” *Clean Products and Processes*, 1999, 1, 223 – 236. Explain the difference between the current ionic liquids that have been developed. How can each be used?


Why is supercritical carbon dioxide a green solvent? What practical considerations does one need to consider if supercritical carbon dioxide is used? What is the cost involved?


**Literature Assignment #6:**

Begins May 5, 2003

What is biocatalytic synthesis? How are biocatalytic syntheses developed if a new target molecule is desired?


What are fuel cells? How do they work?


How can chemicals be produced from renewable resources?


What is the biofine process? Why is the inexpensive production of levulinic acid important commercially?

6.4a [http://www.earthscape.org/t3/acs01/acs01aa.html](http://www.earthscape.org/t3/acs01/acs01aa.html)


What is biodiesel?


**Literature Assignment #7:**

**Begins May 12, 2003**

What is microwave-assisted synthesis? What are the advantages over traditional reaction methods?


Additional references:
- [http://www-ang.kfunigraz.ac.at/~kappeco/microlibrary.htm](http://www-ang.kfunigraz.ac.at/~kappeco/microlibrary.htm)


How can electrochemical methods be applied to synthesis?


Additional references:
- [http://www.buscom.com/chem/C175.html](http://www.buscom.com/chem/C175.html)

What is sonochemistry? How can sonochemistry be applied to synthesis?

7.3 [http://www.scs.uiuc.edu/suslick/britannica.html](http://www.scs.uiuc.edu/suslick/britannica.html) and links therein.

Additional references:
- [http://www.fb-chemie.uni-rostock.de/ess/sonochem_intro.htm](http://www.fb-chemie.uni-rostock.de/ess/sonochem_intro.htm) and links therein.

How can reactions incorporate photochemical methods as an alternative energy source?


What is process intensification?


**Literature Assignment #8:**

**Begins May 19, 2003**

**Industrial Case Study #1**


**Industrial Case Study #2**


**Industrial Case Study #3**


**Industrial Case Study #4**


**Industrial Case Study #5**