10.492 – Integrated Chemical Engineering Topics I

Introduction to Biocatalysis

Fall 2004

Guidelines for Design Report

The design report is due on the last day of class, Thursday, Dec 9th. It will be worth 55% of the final course grade, and is an INDEPENDENT assignment.

The report will be based on an example of a biocatalytic process developed and/or implemented commercially in industry. You will be assigned a bioconversion and given the appropriate journal reference(s) to obtain information about that reaction. You are to retrieve and read the reference(s), and write a report that answers the following questions:

- What is the product?
- What is the usefulness/commercial relevance of the product (eg, pharmaceutical intermediate, specialty chemical, fragrance, flavor, etc)?
- What is the bio/chemical reaction by which the product is made?
- What enzyme/organism was used as the biocatalyst and how was it selected? For a purified enzyme process, include the source organism for the enzyme.
- Draw a flow diagram of the process employed, with a brief description of the operating protocol. All diagrams should include the reaction stage, indicating all flow streams. If a description of the isolation methods is given, this should be included in the diagram.
- What was the final titer (product concentration), yield, enantiomeric excess, selectivity, etc. of the process?
- What were the particular biological issues faced in developing the process (eg, narrow pH window, low activity/turnover, protein instability, etc)?
- What were the engineering issues faced in developing the process (eg, low substrate aqueous solubility, low product aqueous solubility)?
- What were the engineering and/or biological solutions employed to address these issues?
- If there were no biological solutions employed, describe how one problem faced could be/have been solved by enzyme engineering. Provide a brief description of how this solution could be implemented.

The report should be 5-7 pages of text in total, with 12-pt double-spaced font (similar to Times as given here), and 1 inch margins all around. The flow diagram should encompass an additional page. You will need to submit TWO copies of your final report.

IN ADDITION, you should prepare 5 PowerPoint slides summarizing your report. An electronic copy should be sent by 9 am on Dec 9th, and paper copies should be submitted with your report (two copies). *Several students will be selected at random to give a presentation in class on Dec 9th.* ALL students will be graded on the quality of the summary slides; however, the oral presentation will not be taken into account for the final grade. The five slides should cover: (1) summary of the chemistry and enzyme employed, (2) process flow diagram, (3) performance specs [titer, yield, conversion, EE, etc.], (4) biological problems and solutions, (5) engineering problems and solutions.