

FY 2008 Project Proposal**Project No. BUSC-08****ENZYMATIC POLYMERIZATION**

Project Team: Gisela Buschle-Diller (PI), Shuying Long
Polymer and Fiber Eng. Department, Auburn University
Email: buschgi@auburn.edu, 334 844-5468

Objective:

Polymers play an enormously important role in today's life. Conventional synthesis of polymers is generally based on petroleum derived raw materials. The supply of fossil fuels, however, is dwindling while prices rise, thus the cost of polymeric materials simultaneously increases. It is therefore essential to develop alternative methods of synthesis as well as alternative raw material resources in order to keep the demand and supply of common polymers at an affordable level for the future. Enzymatic biocatalysts have been discerned to offer such alternative routes to conventional processes, replacing conventional chemical catalysts. For polymerizations this signifies a major step forward. The objective of this project is to investigate the use of oxidoreductases enzymes for polymerization of small substituted aromatic alcohols and amines under milder conditions and with less environmental impact.

Relevance to the Mission of the Polymer and Fiber Engineering Department at Auburn University:

Green chemistry and sustainable methods are an integral part of various research efforts at Auburn University. This project investigates the potential use of biocatalysts for polymerization reactions as an alternative to conventional processes. Previous research results showed that substituted aromatic alcohols could be oligomerized or polymerized with laccase from different organisms. Some of the products were colored and could be used as dyes or pigments; others formed smooth films providing increased surface hydrophobicity. The current focus of this project is to enzymatically synthesize inherently conducting polymers, such as polyaniline, from simple monomers by enzymatic means via micelle-assisted polymerization. The U.S. industry has theoretically all necessary intellectual and technological tools to hold a leadership position in the area of green chemistry and engineering in the 21st Century. With petroleum resources becoming increasingly scarce and expensive, the traditional polymer manufacturing industry must start thinking outside the box. The proposed approach offers an alternative route to create materials for an array of applications. This project has attracted the interest of both polymer manufacturing as well as enzyme producing industry. Students involved in this project receive valuable training in enzymology and synthetic polymeric methods as well as acquire analytical skills for their future careers in industry or academia.