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U.S. Department of
Transportation



Project Title: ***Cellulase Immobilization on Nano-Carriers for Reuse in Cellulose Hydrolysis***

DR. YU “JESSIE” MAO

Project Goal

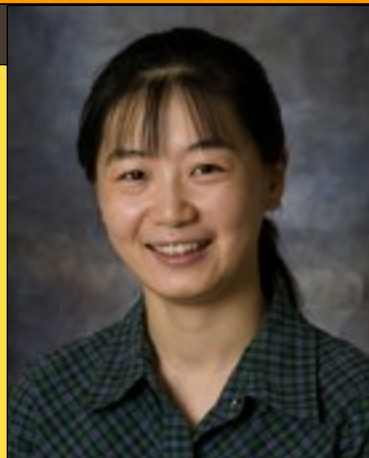
The project goal was to investigate immobilization of both cellobiohydrolase and β -glucosidase on custom-synthesized magnetic nanoparticles in order to reduce enzyme cost during cellulose hydrolysis.

The objectives were:

1. Develop methods to immobilize cellulases on magnetic nanoparticles.
2. Investigate the activities of immobilized cellulases in cellulose hydrolysis.
3. Evaluate the reusability of immobilized cellulases in cellulose hydrolysis.

Project Outcome(s)

- 1) The nanoparticles demonstrated strong magnetization per particle that allows fast separation using a medium magnetic field.
- 2) Immobilized cellobiohydrolase and β -glucosidase retained 44.4% and 67.6% of the enzyme activity of their non-immobilized counterparts, respectively.
- 3) The immobilized cellobiohydrolase and β -glucosidase showed improved thermal stability and similar pH stability compared with their non-immobilized counterparts.
- 4) We demonstrated the reuse of the immobilized β -glucosidase and cellobiohydrolase with the retention of enzyme activity to 43.9% and 46.1% of the corresponding initial enzyme activity after being reused for 10 times.
- 5) Reuse of cellulases is expected to significantly reduce enzyme cost during the process of cellulose hydrolysis for cellulosic ethanol production and facilitate biofuel product purification. This benefits starting cellulosic ethanol plants and the industrial conversion of cellulosic biomass to fuels.



PI: Dr. Yu “Jessie” Mao

Oklahoma State University
Biosystems & Ag Engineering

Co-PI: Dr. Mark Wilkins

Oklahoma State University
Biosystems & Ag Engineering

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End Date: 11/30/2012

Other Sources of Funding:

Oklahoma State University: A portion of Dr. Mao’s salary for each year, fringe benefits on that salary, and waived indirect costs at a rate of 47.7% of total direct costs.