Mechanisms of Surfactant Effects on Biomass Conversion

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Project Location: Blacksburg, VA

Reporting Period: April 1, 2009 to June 30, 2009
Date of Report: July 31, 2009
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1. **Planned Activities**: During the previous quarter (1/1-3/31/09), we investigated two methods for the preparation of cellulose nanocrystals with different amounts of surface charge. The planned activities for this quarter (4/1-6/30/09) were to continue the studies of the effect of surface charge on enzyme activity.

2. **Actual Accomplishments**: Model cellulose surfaces with different amounts of negative charge were prepared by spin coating suspensions of partially and fully desulfated cellulose nanocrystals. The hydrolysis of these model surfaces by cellulolytic enzymes was studied by quartz crystal microbalance with dissipation monitoring and surface plasmon resonance spectroscopy. The hydrolysis rate was found to increase with decreasing amounts of charge on the model surface. This finding has relevance for the enzymatic conversion of sulfuric acid-pretreated biomass. Cellulolytic enzymes consist of two parts: the core protein with the catalytic site and the cellulose binding domain (CBD), which anchors the enzyme to the cellulose surface. To analyze in more detail the effect of negatively charged surface groups on enzyme adsorption onto biomass surfaces, we isolated the CBD from a commercial enzyme cocktail by proteolysis.

3. **Explanation of Variance**: The planned activities for this reporting period have been accomplished.

4. **Plans for Next Quarter**: During the next quarter (7/1-9/30/09), we will analyze the effect of negatively charged surface groups on CBD adsorption onto model cellulose surfaces.

Patents: None, as of yet

Publications / Presentations: None, as of yet

Financial:

3. *Cummulative Expenditures to Date: $88,527.40*
4. *Remaining Balance: $211,376.60*