279a Characterization of Cellulases Using Pure Cellulosic Substrates

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Enzymatic hydrolysis of lignocellulosic cellulosic biomass depends upon its lignocellulosic structure, composition, and other physical/chemical factors. The presence of non-cellulosic components including lignin and hemicellulose is one of the major factors influencing the enzymatic hydrolysis of the cellulosic component of biomass.

The objective of this study is to investigate the cellulase reaction without the interference of non-cellulosic components. For this purpose, various forms of pure cellulosic substrates were used including Avicel, alpha-cellulose, filter paper, non-crystalline cellulose (NCC), and oligomers (cello-dextrins). The latter two are products of our laboratory. The reaction profiles in terms of glucose, cellobiose, and oligomers were substantially different for each substrate. In the case of the NCC, the formation of oligomers and cellobiose were significant. In this study, we used the information of these intermediates to determine the relative activities of the various cellulase components, namely, endo-glucanase, exo-glucansae, and beta-glucosidase. Additionally the inhibition effects of cellobiose and oligomers on the activities of both endo and exo-glucanases were studied. We have also studied the feasibility of using the initial data on glucose and the intermediates collectively to determine the global cellulase activity equivalent to the conventional filter paper units (FPU). The enzymes used in this study are Spezyme CP (from two separate production lots) and GC 220 provided by Genencor.