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Synergy between cellulolytic enzymes during the biodegradation of cellulose microfibrils measured using angle-scanning surface plasmon resonance (SPR) imaging ADAM RAEGEN, ALEXANDER DION, KYLE REITER, University of Guelph Department of Physics, ANTHONY CLARKE, University of Guelph Department of Molecular and Cellular Biology, JACEK LIPKOWSKI, University of Guelph Department of Chemistry, JOHN DUTCHER, University of Guelph Department of Physics — The use of cellulosic ethanol, a promising emerging energy source, is limited by the energy intensive and costly step of first converting the cellulose fibers into their constituent glucose monomers. Industrial processes mimic those that occur in nature, using mixtures or "cocktails" of different classes of cellulolytic enzymes derived from fungi. Despite several decades of investigation, the molecular mechanisms for enzyme synergy remain poorly understood. To gain additional insight, we have used a custom angle-scanning surface plasmon resonance (SPR) imaging apparatus to obtain a sensitive measure of enzymatic degradation. By implementing a novel SPR data analysis procedure, we have been able to track the thickness and roughness of laterally heterogeneous cellulose microfibril-coated substrates as enzymatic degradation proceeds. This has allowed us to measure the synergistic actions of the different enzymes, providing data that are directly relevant to the cellulosic ethanol industry.

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