A Microscale Platform for Integrated Cell-Free Expression and Screening of Cellulase Activity

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A critical step in the efficient conversion of lignocellulosic biomass to fuel is the deconstruction of the biomass to fermentable sugars. Several efforts are therefore focused on identification, expression and characterization of novel enzymes that hydrolyze lignocellulosic biomass. High-throughput enzyme assays that enable rapid screening of these enzymes can greatly accelerate the current enzyme engineering efforts for biofuels development. In this study, we have developed a miniaturized high-throughput, fluorescence-based screening platform for rapid activity profiling of thermophilic cellulases at elevated temperatures (>80°C). This platform integrates cell-free expression and functional characterization of the cellulases in microwell arrays with volumes as low as two microliters. Herein, we demonstrate the use of this approach to express and screen a panel of thermophilic β-glucosidases and cellobiohydrolases.

This work was part of the DOE Joint BioEnergy Institute (http://www.jbei.org) supported by the U.S. Department of Energy, Office of Science, Office of Biological and Environmental Research, through contract DE-AC02-05CH11231 between Lawrence Berkeley National Laboratory and the U.S. Department of Energy.

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