Assemble Supramolecular Enzyme Complexes on Yeast Cell Surface for Direct Conversion of Biomass to Ethanol

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Breaking down cellulosic biomass into fermentable sugar is a key limiting step in the production of bioethanol from lignocellulose. Engineering baker’s yeast Saccharomyces cerevisiae represents a promising strategy to overcome this bottleneck. However, current engineered yeast stains still have low cellulose degradation efficiency resulting in low ethanol production titers. In this study, I assembled and displayed designer tetrafunctional enzyme complexes on the yeast cell surface to enable the direct conversion of cellulose (the most abundant component of lignocellulosic biomass) to ethanol. I also performed fermentation experiments to demonstrate that efficient conversion of cellulose into ethanol can be achieved by engineered yeast cells, and the ethanol production yield was compared to results reported in the literature. In the future, these surface engineered yeast cells can be applied in the consolidated bioprocessing (CBP) to achieve the biomass degradation and ethanol production in a single step, which is critical for developing sustainable biomass-based refinery.

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