

Substrate and product inhibition of anaerobic ethanol fermentation

Qi ZHANG¹, Yan LIN¹, Xudong ZHAO², Xinze WANG¹ and Yahong LI¹

¹Shanghai Jiao Tong University, China

²Dali Environmental Protection Agency, China

Ethanol fermentation is the key procedure in the whole process of the conversion of lignocellulose into fuel ethanol. However, the high concentration of substrate and product shows adverse effects on the performance of *Saccharomyces cerevisiae*. The inhibition concentration was confirmed through the analysis and comparison of yeast growth and fermentation performance under different substrate and ethanol concentrations in the fermentation process, with other parameters controlled. The 12h-averaged yeast specific growth rate and ethanol fermentation rate were tested under the same concentration of endogenous and exogenous ethanol to examine the difference between their inhibitions on yeast. *Saccharomyces cerevisiae* BY4742 and glucose were used as experiment strains and substrate, respectively. The yeast tolerance to ethanol was enhanced after five cycles of acclimatization with continuously increased ethanol concentration in culture medium. From the results of the experiments, we can conclude: 1) the critical substrate concentration is 160g/L and the final product and biomass concentration will not increase with increased initial substrate concentration. 2) The end product-ethanol is the main factor inhibiting the process. Yeast will completely stop growing and fermenting if the initial ethanol concentration was higher than 70g/L. 3) Endogenous ethanol shows more impacts on yeast performance in anaerobic fermentation than exogenous ethanol, which indicates in practical fermentation process, yeast suffers more severe inhibitions from ethanol produced itself. 4) Through acclimatization, yeast density, cell morphology and ethanol production can be significantly improved. For instance, ethanol yield increases from 7% to 30% under the initial ethanol of 50g/L.

Biography

ZHANG Qi is a postgraduate student in Shanghai Jiao Tong University (SJTU), China. He's now a student of Prof. LIN, and devoted to the research on biomass energy.

jameszhang19881114@gmail.com