ABSTRACTS (MASTER THESIS)

Bioethanol production from fast-growing wood by simultaneous saccharification and co-fermentation

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In bioethanol production, pretreatments separating plant cell wall components produces fermentation inhibitors such as furfural, 5-hydroxymethylfurfural (5-HMF), vanillin, vanillic acid, syringaldehyde, syringic acid, acetic acid and other organic compounds from the cell wall polysaccharides and lignin. Molecular breeding of inhibitor-resistant ethanologenic microorganisms and process engineering to remove fermentation inhibitors have been studied for the production of bioethanol. Higher substrate concentration is needed to produce bioethanol at a lower cost. However, this demand, like the harsh pretreatment conditions, requires a concomitantly high level of technology to suppress the fermentation inhibition. So far, a number of technologies have been employed for removing inhibitors. However, the cost of bioethanol production is increased by additional processes, and the use of purchased adsorbent for fermentation inhibition is impractical for the production of biofuels, with a low cost that is competitive in the market. To overcome problems caused by fermentation inhibitors, bioethanol production process using residual lignin as an adsorbent for fermentation inhibitors was analyzed. *Eucalyptus globulus* wood was pretreated by microwave-assisted hydrothermolysis and separated into soluble and insoluble fractions by engineered *Zymomonas mobilis*. The two fractions were subjected to simultaneous saccharification and co-fermentation (SSCF) in combination with enzymatic pre-hydrolysis. After fermentation, the residual lignin was separated, and thermally processed to increase the adsorptivity for the inhibitory compounds. Effects of the adsorbent on reduction of inhibitors and bioethanol production by SSCF were analyzed.