

Subject of research = Development of Converge Mill Continuous Grinding Technology for Bioethanol Production from Woody Biomass

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Abstract=

The enzymatic saccharification is inefficient as a method of cellulosic bioethanol production. A wood biomass material, if raw and unprocessed, shows very low enzyme reactivity. For efficient enzymatic saccharification, it is of critical importance to establish a reliable preprocessing technique. The present study took particular note of the efficient mechanochemical milling of wood raw materials, and a variety of different woody samples (hard biomass) were used as raw materials, which finally led to the development of the converge mill capable of continuous operation. The findings were as follows: (1) One-minute preliminary hammer milling, followed by as short as only 10-minute continuous operation of the 6-liter converge mill, could achieve 80% or higher saccharification and 10 kg per day raw material processing capacity. (2) A small amount of beta-glucosidase added to cellulase enzymes significantly increased the glucose production rate. (3) The instrumental analysis (solid NMR and IR) of the milled products suggested that converge milling caused weakened hydrogen bonds in cellulose microfibrils and thus crystalline structure destruction.

Key Words = Woody biomass, Bioethanol, Grinding, Mechano-chemical effect, Enzymatic saccharification