Sakan Luangkriangkrai 2012: Design and Construction of Fermentor for Ethanol Fermentation by Controlling Oxidation Reduction Potential Value. Master of Engineering (Food Engineering), Major Field: Food Engineering, Department of Food Engineering. Thesis Advisor: Assistant Professor Chouw Inprasit, D.Eng. 283 pages.

The aim of this research was to design and construct the fermentor for ethanol fermentation by controlling Oxidation Reduction Potential value (ORP). Moreover, the fermentation of ethanol from ground cassava chips by Simultaneous Saccharification and Fermentation (SSF) by Pre-Saccharification of enzyme type GC147 (Conventional Fermentation), aeration in the fermentation, and controlled ORP in the fermentation were studied.

The fermentor was designed for ethanol fermentation by controlling ORP with aeration by jet air Ring Sparger and Open Turbine to mix the materials and the distribution of temperature and air in the fermentor.

The optimum time of liquefaction of enzyme type GC358 was 2 hrs providing content of reducing sugar of 3.91 ± 0.08% and Dextrose Equivalent (DE) 21.46 ± 0.37. The optimum time of Pre-Saccharification of enzyme type GC147 was 1 hr with content of reducing sugar 10.40 ± 0.22% suitable for growth of yeast cells. Thereafter, fermented by *Saccharomyces cerevisiae* or Fali Green instant dry yeast, the process was called a Conventional Fermentation (no aeration). It was found that ORP was inversely with the amount of ethanol production but varied directly with the amount of reducing sugar. Therefore, the ORP was useful for monitoring the activities of the ethanol fermentation process. The optimum time of conventional process was 60 hrs. The results found that the content of ethanol, remaining content of reducing sugar, yield of ethanol per starch, and theoretical yield were 75.73 g/L, 0.56%, 0.46 g ethanol/g starch, and 82.14% respectively.

Fermentation the ground cassava chips by controlling ORP, the result showed that controlling ORP at -5 ± 5 mV was the best methods. The optimum time was faster than that of conventional methods or 54 hrs with the content of ethanol, remaining content of reducing sugar, yield of ethanol per starch, and theoretical yield were 75.76 g/L, 0.44%, 0.46 g ethanol/g starch, and 82.18% respectively.

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