



HYDROLYSIS OF FURFURAL FROM SUGARCANE BAGASSE USING ACETIC ACID AS CATALYST BY STEAM STRIPPING PROCESS



Nita LISTIANI, Mega PRISTIANI, Dewi Agustina IRYANI, and Heri RUSTAMAJI

Departement of Chemical Engineering, University of Lampung, Indonesia

dewi.agustina@eng.unila.ac.id

Abstract

The aimed of this research is to evaluated the effect of furfural acquisition and indicate whether steam stripping process using acetic acid as catalyst is more efficient that the conventional processes. The hydrolysis experiments of sugarcane bagasse were performed in *steam stripping distillation* at variable concentration (2-6%), reaction time (1-3hr), and temperature (110-120°C). Based on the method RSM, best conditions are obtained in 3 hours, temperature of hydrolysis 120 ° C, and a catalyst concentration of 6%, with concentration of furfural is 6.038 mg / ml and the most influence variable for the acquisition of furfural is time and temperature.

Material and Experimental Method



Sugarcane bagasse

Drying, Cutting, & Sifting

Steam Stripping Process
50g baggase + aquades + catalyst acetic acid (2-6%), (110-120°C), & (1-3 hours)

Results and Discussions

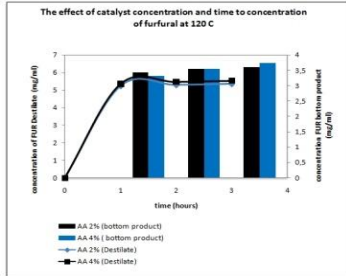
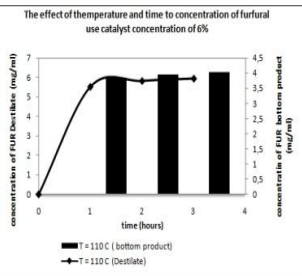


Figure 1. The effect of catalyst's concentration and time to concentrations of furfural at different temperatures.

Variations of catalyst concentration have influence to the acquisition of furfural . The greater concentration of the catalyst that used, the greater concentration of furfural obtained in both the distillate and bottom product . The most significant improvement occurred at a concentration of 6 % acetic acid catalyst

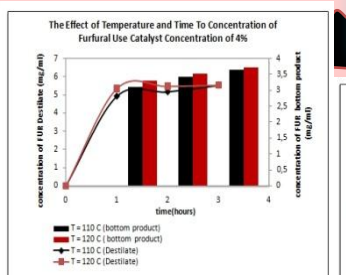
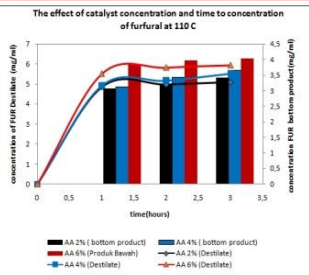


Figure 2. The effect of temperature and time to concentrations of furfural use different concentrations of catalyst

Concentrations of furfural in the distillate and bottom product to increase as temperature and operating time of distillation . This indicates that the temperature and time influence on the acquisition of furfural .

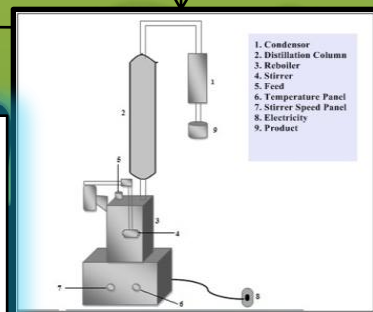
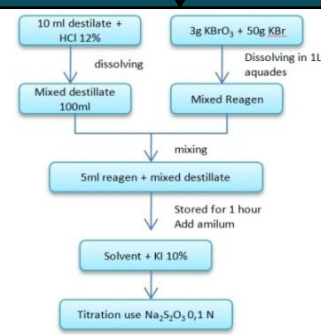
Conclusion

Based on the method RSM, best conditions are obtained in 3 hours, temperature of hydrolysis 120 ° C, and a catalyst concentration of 6%, with concentration of furfural is 6.038 mg / ml and the most influence variable for the acquisition of furfural is time and temperature. According to the mass balance calculations, as much as 55.7% of furfural derived either from the distillate and bottom product. It's mean that the method of steam stripping effective for use as a result of the acquisition of furfural with this method is huge.

Reference

Buijtenen, Jeroen V. et al. 2013. "Furfural Production by 'Acidic Steam Stripping' of Lignocellulose". Chemsuschem Full Paper. Europe.
Dunlop, A. P. 1948. "Furfural Formation and Behavior, Ind. Eng. Chem". Vol. 40. pp. 204 – 209. The Quaker Oats Company. Chicago.
Iryani, 2007. "Penentuan Kondisi Optimum Reaksi Hidrolisis Bagasse (Ampas Tebu) Menjadi Furfural". Universitas Lampung. Bandar Lampung.
Mc. Ketta, John, 1983, "Encyclopedia Chemical Process and Design", Marchell Dekker Inc., New York.

Distillate and Bottom Product



RSM Method

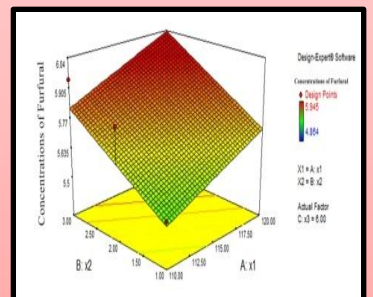


Figure 3. Response of furfural concentration to the temperature, time of hydrolysis, and Concentration of catalyst Acetic Acid (3D Plot)