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CHEMICAL ENGINEERING (CHE)

CHE 8101 . **David, Renato M. (MS Chem. Eng'g.)**
Pyrolytic conversion of coconut oil fatty acids into industrial solvents.
1981.

Using a factorial experimental design, the effects of catalyst type and catalyst concentration on the pyrolytic conversion of coconut oil fatty acids into industrial solvents were studied. Results of the pyrolysis of fatty acids at 345½C and 200 psig for 21 hours using each of the following compounds as catalysts in quantities amounting to 1%, 5% and 10% of the total charge: $FeCl_3$, lava, $AlCl_3$ and Al_2O_3, indicated that the type of catalyst that was used affected the solvent yield significantly while the catalyst concentrations that were used did not. Further statistical analysis using Duncan's multiple range test revealed that $FeCl_3$ was the best catalyst, being significantly different form Al_2O_3, lava and $AlCl_3$ which were not significantly different from one another. Duncan's test likewise confirmed the result that the catalyst concentration that were used had no significant effect on the solvent yields. The mechanism for converting coconut oil fatty acids into industrial solvents has been postulated to involved the conversion of fatty acids to hydrocarbons followed by the latter's subsequent cracking. This mechanism satisfactorily accounts for the gases and distillate products that were obtained during the study.

CHE 8502 **Yao Ka Gue, Alexander (MS Chem. Eng'g.)**
Gas holdup in bubble column with suspended low density particles.
1985.

The fractional gas holdup in an air-water-solid suspension-bubble column was measured for the variable ranges listed below. The column used has an internal diameter of 9.4 cm while the solid particle have a density of 0.948 g/ml.

a. Superficial gas velocity ranges from 0 to 0.37 m/s.

b. Water flow rate ranges from 0 to 21.1 kg/min which corresponds to a superficial velocity of 0.0507 m/s.

c. Fractional solid holdup ranges from 0 to 0.076 for 90 cm column and up to 0.228 for 30 cm column.

d. Column height was set at 30, 60, and 90 cm.

e. Particle diameter ranges from 2.98 to 4.17 mm.

Gas holdup was found to increase with increased gas low and also with increased liquid flow. On the other hand, gas holdup was found to decrease with increased column height and also with increased amount of solids. Particle diameter was found to have no significant effect on the gas holdup in the range studied.

CHE 8603 **David, Elsie M. (MS Chem. Eng'g.)**
Computer simulation of pyrolysis of rice hulls.
1986.

An attempt to use time series analysis on rice hulls pyrolysis data previously obtained by FESTIN, et.al. using semi-continuous vertical converter failed. Product yields and experimental variables were not pregularly monitored and runs were not long enough.

Nevertheless, a time series model-identification program was developed for the only long run. Using linear regression instead, the effects of process temperature, air flow rate, amount of charge and run length on product yields and heating values were analyzed. A computer program, in which the developed models were incorporated, was used to

simulate seven runs. Results showed that the simulated values for the total oil and gas yields were within 30% of the actual values. Failure of the models to account for the total char yield within this range was attributed to the fact that the char yield values were obtained by difference from the mass balance equation:

char = feed + air - oil - gas,

so that errors incurred in the computation of the total oil and gas were reflected on the char value. No statistically significant model was developed for char and oil heating values due to lack of data points. Optimum conditions for the production of gas, char and dry condenser oil were established for the data range of the investigation.

CHE 8704 **Creencia, Eulalio C. (Ms Chem. Eng'g.)**
The physical pretreatment of coir dust using autohydrolysis and rapid steam hydrolysis/continuous extraction process (RASH).
1987.

Autohydrolysis and rapid steam hydrolysis (RASH) were investigated as a coir dust pretreatment for the production of microbial proteins. In autohydrolysis, lignin content increased as the reaction time and temperature were increased. The cellulose was partially degraded in a number of runs. The RASH pretreatment fractioned the lignin leaving a cellulose-rich mass and the reactor in all isothermal runs form 140½C to 215½C. Fermentation studies using candida utilis var. thermophila UPCC 2002 increased the protein content of the subtracted. The results show that the autohydrolysis pretreatment is not suitable for coir dust. However, the RASH process disrupts the lignin polymer enhancing the bioconversion of cellulose to protein.

CHE 8905 **Salvacion, Jonathan W. dL. (MS Chem. Eng'g.)**
Production of ethanol form sugarcane molasses using a multistage continuous fermentor.
1989.

The performance of a multi-stage continuous fermentor was investigated on the basis of product concentration,

sugar utilization and productivity. Ethanol concentration and sugar utilization was found to increase with feed molasses concentration. Overall productivity was limited by cell wash out. Ethanol concentration in the effluent increased while residual sugar decreased as the number of stages used was increased. However, only three stages were generally required for effective performance of the reactor. Cell wash out found to be the main problem, causing instability and reduced production of ethanol at high flow rates. Maximum ethanol concentration was obtained at .562 L/h from a feed concentration of 30 Brix.

CHE 9107 **Li Ming Wai (MS Chem. Eng'g.)**
Increased biogas production from swine waste by using microbial additive.
1991.

This thesis deals with the investigation of the effect of physical and bacterial pretreatment on the batch digestion of swine waste for biogas production. The swine slurry shows a number of peaks in gas production rate occurring at different time during the digestion.

The physical pretreatment of swine waste was done by blending the slurry having total solids (TTS), concentration of 23.94 g/liter. The results show a 16 to 23% increase in gas production and a shorter digestion period of 25 days compared to 40 days for non-blended slurry. The cumulative biogas yield was 17.445 ml with an average of 73% methane per kilo substrate introduced into the digester.

Treatments using four gram-positive, spore-forming bacteria (three non-methane producing and one methane producing bacteria), individual and in combined form show significant increase in gas production, which was from 25-135%. Among the bacteria used, Bacillus megatherium which is a non-methane producing bacteria and Bacillus cellulose methanicus, a methane producing bacteria, gave the best results. At a higher temperature of ½C, the gas yield was 53.29% more as compared to gas yield at ambient temperature. Bacterial pretreatment of the slurry for 24 hours before introducing them into the digester further increased the gas production rate.

CHE 9106 **Tio, Jacob Sy (MS Chem. Eng'g.)**
Proposed classification scheme for the waste utilization value.
1991.

Discriminant Analysis was used as a classificatory scheme for the (positive) waste utilization value of different wastes. A total of thirty (30) wastes was surveyed in Metro Manila. Sixteen (16) of these wastes were considered for study using the Discriminant Analysis module of the Statistical Package for Social Sciences (SPSS) program. Eight (8) variables or factors were identified and measured for each of the waste: Availability, Separation, Handling, Product, Demand, Cost, Technology and Profile.

Stepwise discriminant analysis resulted in the rejection of two (2) variables: Availability and Product factors. Three (3) variables: Separation, Handling and Demand factors has significant contributions in the classification of WUV. The overall classification rate is 93.75%.

The profile of a marketable waste: high density (not bulky not expensive to transport), relatively pure (needs no or little separation process) and high substitutability (has a high content of the material to be recycled).