Abstracts of Papers in English

CATALYST SYNTHESIS, CONSTRUCTION AND MODELING OF FLUIDIZED BED REACTORS FOR OXIDIZING METHANOL TO FORMALDEHYDE

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Abstract

In the present study, the partial oxidation of methanol to formaldehyde in a continuous fluidized bed reactor, within the temperature range of 270 – 410 °C, has been studied, using a mixture of ferric and molybdenum oxides as the reaction catalyst. The catalyst has been prepared by the precipitation method, applying an aqueous solution of ammonium hepta molybdate and ferric nitrate. In order to improve the mechanical strength of the catalyst, the latter was impregnated with bismuth nitrate. The effects of some pertinent parameters, such as temperature, superficial gas velocity and feed flow rates, on the extent of reaction and performance capability of the reactor, have been investigated. The experimental data have been correlated with some models presented for fluidized bed reactors.

SUGAR BEET PULP, DETERMINATION AND DRYING

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Abstract

Sugar beet pulp is a rich source of polysaccharide. Sugar beet pulp is produced from the industrial waste of sugar beet factories. Dry and wet leaf-type pulp were prepared from the Shahrood sugar industries. Wet samples were preserved at -20°C and were studied for drying at 50-

100°C in a tray drier with hot air. The results indicate that 80°C was the optimal temperature for drying wet pulp and the quality of dry samples under these conditions were better than other samples. Statistical analysis indicated the significant differences between the samples at various temperatures.

DETERMINATION OF SORPTION ISOTHERM CURVES AND HEAT OF ISOSTRIC FOR WHEAT FLOUR

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Abstract

One of the most important and essential parameters in studying the behavior of material drying and industrial dryer design is the materials moisture sorption isotherm curves. These curves show the relation between the equilibrium relative humidity of the surrounding of the material, which is called water activity and moisture content. Determination of the material moisture sorption isotherm is possible by static or dynamic systems. It could take many days, even weeks, to reach equilibrium in the static system. For this reason, a laboratory device, developed for / determining moisture sorption, using the dynamic method, was designed and constructed.

Moisture sorption tests of wheat flour in the dynamic device were undertaken at 25, 35, and 50°C, at different water activities. The BET, GAB, Oswin, Smith, Iglesias-Shirife, Chung-Pfost, Halsey and Henderson sorption models were used for fitting the experimental data that resulted from the absorption process. The GAB, Chung-Pfost and Henderson models fitted the experimental data well. The net isosteric heat of sorption was determined by using the Henderson model and the Clausius-Clapeyron equation. This amount decreased from 33.34 to 2.98 (KJ/mole), with increasing moisture content from 0.02 to 0.20 (Kg water/Kg d.b) for wheat flour.

COMPARISON AND SUGGESTION OF BEST EOS'S TO PREDICT PHYSICAL PROPERTIES IN WAX/CATALYST SEPARATION BY SUPERCTITICAL HEXANE

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Abstract

Separation of a Fischer-Tropsch catalyst from its liquid products (wax) is one of the major challenges of slurry-bubble-column reactors. This problem, in fact, stems from the high viscosity and, therefore, the low catalyst separation rate of the reactor outlet wax. Supercritical Fluid Extraction is one of the best techniques to solve this problem, because of its excellent characteristics and also its high ability to modify the physical properties of the wax, such as viscosity and density.

It should be noted that modeling and studying this separation process requirees the mentioned physical property Datum for the supercritical fluid. But, calculation of them cannot avoid mistakes in the near critical/supercritical region.

In this work, after studying some theoretical correlations, the best equations-of-state are proposed to predict the density, viscosity and thermal conductivity of light/heavy hydrocarbons and their mixtures. Then, the calculation of these physical properties is carried out for near-critical hexane and its mixture with wax by proposed EOS's. Results indicate that an increase of hexane in its near-critical operating condition has more influence on the physical properties improvement of wax when using the supercritical phase of the hexane (in comparison with gas and liquid states).

FRUCTOSE PRODUCTION FROM GLUCOSE BY ENZYMATIC METHOD

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Abstract

Glucose syrup containing glucose and fructose was converted to fructose using glucose isomerase under optimized conditions, such as pH and temperature. Date syrup has sucrose, glucose and fructose. The main purpose of this research work is to convert the glucose of date syrup to fructose by enzymatic process and to obtain the optimum conditions for the best activity of the enzyme (IGI). This operation has been done in the same way as the process for producing HFCS. The process has been done in a batch system with immobilized glucose isomerase in specified ranges of pH: 6-8.5 and temp. (30-90)°C.

The best optimum temp. and pH were (50-60)°C and 7-7.7, respectively, the required time would be 30 minutes.

MATHEMATICAL MODELING OF Co_2 SOLUBILITY IN MIXTURE OF AMINS SOLVENT

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Abstract

The separating of carbon dioxide gas is the main processes in gas treatment. Often, in order to separate carbon dioxide from the natural gas flow, a method of absorption, along with the chemical reaction, by Alkanolamine solutions, is used. In this research, the thermodynamic model of carbon dioxide gas solubility in an aqueous mixture of MEA and MDEA has been studied and the model parameters are given. In this model, for the calculation of a short range term, the UNIQUAC-NRF model is used as a Non-electrolyte model and, for stating a long range term, the model of Pitzer-Debye-Huckel has been used. This model is extended at different temperatures and the interaction parameters for the mixture of MDEA-MEA-H2O-CO2 were optimized. The results obtained from this model, in comparison with the work of Li-Mather, are more accurate.

SIMULATION OF DETERGENT SPRAY DRYING

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Abstract

Nowadays, most chemical and food products are offered in powder or granular form, such as detergent powders, and, for this, factories use a spray dryer tower in their processes. For spray drying, a hot gas contacts with droplets and, during this contact, momentum, heat and mass transfer are carried out simultaneously. In this simulation, a model has been presented to predict operational conditions, including drying time and the height of the tower and the effect of various parameters has been studied. For this purpose, equations of momentum, heat and mass balance have been derived and dimensionless numbers and heat and mass transfer coefficients are calculated. Then, all the equations are composed in a computer spreadsheet program. For solving the driven differential equations, a time step was considered and solved using a finite-difference method. The model was verified using industrial data and good agreement between them was achieved. The results of this simulation are useful for new dryer designs, the optimization of existing units and for evaluation of the changes in their operating conditions.

TURBIDITY REMOVAL IN PRODUCTION OF CLARIFIED POMEGRANATE JUICE WITH GOOD QUALITY

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Abstract

Living in industrial centuries has changed the food pattern of different societies. Very high fruit juice consumption has related the quality of this product to consumer need. Turbidity is an old problem in this industry and, in this way, clarification is very significant. Pomegranate is an important fruit in Iran, which is a big producer of it, with good quality, whilst a considerable amount of this concentrate is damaged because of lack of consideration to the clarification processes.

In this research, pomegranate juice is analyzed and the effect of clarification methods on its quality is studied. Some materials, such as Gelatin, Kieselsol and Enzyme are tested and, in each case, optimum consumption and their advantages for clarification are studied.

BIOTREATMENT OF WASTEWATER FROM DAIRY PROCESSING PLANTS

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Abstract

Micro flora of the effluents from a dairy factory in Tehran (Pegah Dairy Processing Plant) were isolated and screened for their ability to reduce the organic matter content and COD of the effluents. 10 bacteria were selected, due to a reduction in COD content from the 4th to 6th day of incubation at 30° and pH=11. The highest COD reduction was obtained by two isolates, BP_3 and BP_4, 70.7% and 69.5%, respectively (The initial COD concentration was 3000 mg/l and reduced to 880 and 920 mg/l).After optimization of the condition for test organisms, big reductions in the COD, carbohydrate, fat and protein content of the effluents were observed by BP_3 of up to 84.70%, 98%, 45.30% and 53%, respectively.The mixture of BP_3 and BP_4 did not show as good a result as the BP_3 alone. Therefore, BP_3 has been selected as the most efficient microorganism for the system.The overall efficiency of the system will be increased if it is added to an anaerobic activated sludge tank.

MODELING DISSOLVED CONTAMINATION DISPERSION IN GROUNDWATER RESULTING FROM A CONTAMINANT SOURCE HAVING NON-CONSTANT LEAKAGE

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Abstract

Clean water is an essential requirement for human beings. In areas having limited source of water, it is possible to dig wells to reach and supply groundwater. As water consumption is increasing by the population growth, it is essential to study and investigate the groundwater contamination. As it is somehow impossible to have many boreholes in an area it is required to use contamination dispersion modeling to predict and estimate the groundwater contamination at various points and time. Applying modeling will lead to a great deal of savings both in time and investment. Mathematical modeling of dissolved contamination un-steady dispersion in groundwater for the case in which the contaminant source leaks (5000 ppm) only for 6 months and then the leakage has been ceased. The base equation includes contamination transfer via both dispersion and advection; it has also been solved using the finite difference method. In case of having continuous leakage, the maximum contamination concentration occurs beneath the leakage point. After 2 months of leakage cessation, maximum leakage concentration and distance from the source are respectively 3200 ppm and 50 m while after 7 months of leakage cessation, the contamination concentration will be 370 ppm at a distance of 50 m from the point source. Contamination concentration will be 50 ppm at a half of kilometer distance from the point source after 7 months of leakage cessation.