Microwave Applications in Demulsification of Crude Oil

M. Hamekhani[1], M. T. Sadeghi[2*]
1- M. Sc. in Chemical Engineering, Iran University of Science & Technology
2- Assosiate Professor in Chemical Engineering, Iran University of Science & Technology
Email: sadeghi@iust.ac.ir

Abstract

A method for transferring heavy oil emulsion with high viscosity heavy crude oil through the pipeline. Despite the substantial reduction in pressure and viscosity of the emulsion water/ oil, water must be removed before entering the refining process. Several methods have been proposed for the separation of water from the emulsion. The most common method demulsification oil is heating the emulsion. In addition, other methods have been introduced for deemulsification, despite the benefits, limitations, and problems such as low efficiency, high equipment costs and environmental problems are substantial. Therefore, due to the problems mentioned research has been directed toward new technologies. Among the methods of the past decade, most attention has been the use of microwave energy for heating instead of conventional demulsification. The advantage of this method is selected and volumetric heating, which causes the aqueous phase is further influenced by the type of heating and water separation efficiency increases. The microwave will cause the rotation of water molecules thereby neutralizing zeta potential leads to the breakdown of hydrogen bonds between water and the surfactant.

Keywords: Heavy Crude Oil, Demulsification, Heating, Microwave

❐❐❐❐

Simulation of Partial Oxidation of Methane in an Oxygen Permeable Membrane Reactor

F. Akhlaghian[1*], S. Esmaeilzadeh Anzabi[2]
1- Assistant Professor of Chemical Engineerign, University of Kordestan
2- M. Sc. in Chemical Engineering, Universtiy of Kordestan
Email: Fr.Akhlaghian@uok.ac.ir

Abstract

Recently partial oxidation of methane to hydrogen has been the subject of many researches because of the importance of hydrogen in chemical, and petrochemical industries. Membrane reactor can be a suitable choice for partial oxidation of methane to hydrogen, and synthesis gas. In this work, a one dimensional, isobaric, adiabatiac, steady state model for partial oxidation of methane in an oxygen permeable membrane reactor was investigated. The results show that inlet temperature, operating pressure, methane flow rate, and steam to methane ratio of feed affect hydrogen yield. In the similar operating condition, membrane reactor has hydrogen yield as high as fixed bed reactor without hot spots formations and catalyst deactivation.

Keywords: Simulation, Partial Oxidation of Methane, Hydrogen Yield, Membrane Reactor, Methane Conversion, Synthesis Gas

Developing a Thermodynamic Model to Prediction of Cloud Point Temperature in Waxy Hydrocarbon Fluids

A. Shahrabadi[1*], M. GhorbaniNaddaf[2], S. Abbasi[3]
1- Associate Professor of Chemical Engineering, Research Institute of Petroleum Industry
2- M. Sc. in Chemical Engineering, Research Institute of Petroleum Industry
3- Instructor of Petroleum Engineering, Research Institute of Petroleum Industry
Email: shahrabadia@ripi.ir

Abstract
In this paper, a thermodynamic model for prediction of cloud point temperature in hydrocarbon waxy fluids is presented. In this study the solid model is used and the activity coefficients are calculated using modified regular solution theory. To calculate these coefficients, some other parameters such as the melting enthalpy, heat capacity difference should be calculated. In order to improve the outputs of the model, some tuning parameters are entered in the model and then these parameters are tuned using experimental data in liturature. The results of the present model were compared with experimental data collected from literature and the other models. Comparisons showed a good match between the results and the maen error of less than 0.5% was calculated.

Keywords: Solid Model, Cloud Point, Wax Precipitation, Crude Oil, Activity Coefficient

❐❐❐❐

Model and Control of a Multi Input-Multi Output Nonlinear System Using Soft Computing

H. Sahraie
M. Sc. in Mechanical Engineering, National Iranian South Oil Company
Email: Sahraie.h@nisoc.ir

Abstract
Soft computing researches focus on using artificial intelligence tools (Artificial Neural Networks, Fuzzy Technology and Genetic Algorithms…) simultaneously in a hybrid-supplementary frame to solve real problems. In this paper, two soft computing powerful tools (Artificial Neural Networks and Fuzzy Logic) have been implemented for modeling and controlling of a nonlinear system. The studied system is a multi component distillation column that is located in Tehran refinery. At first, the system is modeled with recurrent neural network using obtained data from column, then, optimum network is selected based on root mean square error (RMSE) criterion. Five fuzzy controllers are designed for handling system requirements. Results show that soft computing methods can be utilized for modeling and controlling nonlinear systems with high flexibility and accuracy.

Keywords: Distillation Column, Soft Computing, Modeling, Fuzzy Control, Nonlinear System

Hydrodynamic Modeling and Simulation of Kuhni Extraction Column Using Population Balance Model

A. H. Tahershamsi[1], A. Ghaemi[2*], M. Shirvani[3], M. Torab-Mostaedi[4]

1- M. Sc. in Chemical Engineering, Iran University of Science & Technology

2- Assistant Professor of Chemical Engineering, Iran University of Science & Technology

3- Associate professof of Chemical Engineering, Iran Universityof Science & Technology

4- Associate Professor of Chemical Engineering, Nuclear Science & Technology Institute

Email: aghaemi@iust.ac.ir

Abstract

In this research, the liquid-liquid extraction process in a Kuhni column was modeled and simulated using a non-equilibrium dynamic model. Model Equations including partial differential equations and population balance equation were discretized along the column height. The equations were solved using finite difference method and the method of lines. In order to assess and compare the results of this research with experimental results, a Bench scale Kuhni extraction column was used with the following two chemical systems: water-butyl acetate and water-toluene. The effect of operating parameters including electric motor frequency, holdup, droplet size distribution, phases flow rate and type of chemical system on column performance was presented. The deviation of droplets mean diameter and dispersed phase holdup is 2 % and 4 %, respectively.

Keywords: Liquid-Liquid Extraction, Kuhni Column, Modeling, Population Balance

❐❐❐❐

Optimization of Biodiesel Production from Mutton Fats Using Alkaline Catalysts

R. Foroutan[1], H. Esmaeili[2*], M. Kosari fard[3], S. Ghodrati[4]

1- B. S. in Polymer Engineering, Islamic Azad University-Bushehr Branch

2- Assistant Professor of Chemical Engineering, Islamic Azad University-Bushehr Branch

3- M. Sc. in Organic Chemistry, Medical Science University of Bushehr

4- B. S. in Loboratory Sciences, Medical Science University of Bushehr

Email: esmaeili.hossein@iaubushehr.ac.ir

Abstract

In this research, biodiesel is produced from mutton fats using alkalyne catalysts (such as potassium methoxide and potassium hydroxide) by trans-estrification process. For this purpose, the effect of several parameters was studied on biodiesel production. The results showed that the maximum efficiency of biodiesel production using potassium hydroxide was obtained at temperature 70℃, methanol to oil ratio 1:12, 1 wt. % catalyst, 60 min, and mixing rate of 1250 rpm. Also, optimal conditions for biodiesel production by using potassium methoxide were 70 ℃, 1:9, 1.75 wt. %, 80 min, and 1250 rpm, respectively. Additionally, the maximum efficiency of biodiesel production using potassium methoxide and potassium hydroxide were obtained 87 and 90 %, respectively. After preparation of biodiesel, its properties such as viscosity, density, cetane number, pour point, flash point and cloud point were analyzed according to the ASTM D 6751 and EN 14214.

Keywords: Biodiesel, Alkalyne Catalysts, Mutton Fat, Trans-Estrification Process

Investigation of New Methods to Improve the Photocatalytic Activity of TiO_2 Nanoparticles

M. Rezaei[1], S. Salem[2*]
1- M. Sc. Student in Chemical Engineering, Urmia University of Technology
2- Assistant Professor in Chemical Engineering, Urima University of Technology
Email: s.salem@che.uut.ac.ir

Abstract

The wide band gap, high recombination ratio of photo-induced hole–electron pairs and thermal instability of anatase, reduced the photocatalytic activity of TiO_2 nanoparticles. In this review study in addition to introducing the characteristics and limitations of TiO_2, some of the new methods to improve the performance of photocatalytic TiO_2 are presented. Cation or anion doping, semiconductor composites and semiconductor alloys has been extensively investigated for enhancing the visible-light response of wide band-gap TiO_2. The photocatalytic activity and thermal stability of SiO_2 coated TiO_2 nanoparticles can be enhanced efficiently than pure TiO_2 powder. Recently, addition of graphene can narrow the band gap of TiO_2, lower the electron– hole recombination rate, and enhances electron transport between TiO_2 and graphene.

Keywords: **Photocatalyst, Titanium Dioxide, Energy Gap, Silicon Dioxide, Graphene**

❐❐❐❐

Dimensional Analysis of a Corn Grains Drying Process in a Continuous Dryer Including Inert Particles

M. Moradi[1*], S. H. Karparvarfard[2]
1- Assistant Professor of Biosystems Engineering, Shiraz University
2- Associate Professor of Biosystems Engineering, Shiraz University
Email: moradih@shirazu.ac.ir

Abstract

A dimensionless model was developed and evaluated for drying of corn grain in a continuous countercurrent dryer based on dimensional analysis technique. Parameters of drying air temperature, drying air velocity, velocity of drying products through the drying bin, application ratio of inert particles to the grains at input of bin, each of them at three levels, sampling depth of grains (at five levels) and sampling time (at four levels) were applied to evaluate this dryer. For developing a dimensionless model, five independent pi terms were identified and then the best model that include the effect of all the independent pi terms on the dependent pi terms was derived and evaluated. Determination of coefficient of modeling, mean bias error and root mean square of error were 0.85, 0.0648 and 0.018 respectively.

Keywords: **Continuous Dryer, Corn Grain, Inert Particles, Dimensionless Model**

Review of the Application of Octadecyl Silane-Modified Magnetic Nanoparticle to the Separation of Pollutants in Water Samples

M. Abbasghorbani[1*], A. Mashhadi[2]

1- Assistant Professor of Analytical Chemistry, Gas Division, Research Institute of Petroleum Industry

2- M.S. of Analytical Chemistry, Department of Polymerization Engineering, Iran Polymer and Petrochemical Institute

Email: Abbasghorbanim@ripi.ir

Abstract

Separation technology based on magnetic materials has received considerable attention in recent years and a lot of articles reviewed the use of magnetic solids in analytical chemistry. Among the magnetic materials, iron oxides play a major role in many areas. Some advantages of magnetites are simplicity of extraction process, low volume of extraction solvent, short extraction time, high recovery and being economical. Surface modification stabilizes the nanoparticles and prevents their oxidation and improve their selectivity. In this work, the application of octadecyl silane- modified magnetic nanoparticle to the separation, and the preconcentration of pollutants in water samples, was explained. Octadecyl silane materials have been widely used for preconcentration of environmental pollutants because of their favorable separation ability, excellent stability and long lifetime.

Keywords: Separation, Extraction, Octadecyl Silane, Magnetic Nanoparticle, Pollutant, Magnetite