The Effect of Impurities on the Gypsum Crystallization in Phosphoric Acid Production Process

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Abstract
Gypsum crystallization in the dehydrate process of phosphoric acid production was studied. The main part of impurities existing in the phosphate rock enters the liquid phase during chemical reaction. These impurities can affect the chemical reaction and gypsum crystallization. The study was done in a glass reactor acts as a MSMPR crystallizer. The method employed here is the study of impurities effects on the filterability of crystals (specific resistance of filter cake) with help of crystal size distribution obtained in the presence of impurity. The impurity effects can be classified as direct and indirect effects. This results shows that type and presence of impurities can affect the crystal properties such as density, shape, size and size distribution, filterability and washing properties. These effects are not similar for different impurity concentrations and are function of impurity type and its concentration.

Keywords: Crystallization, Gypsum, Phosphoric Acid, Inorganic Impurities, Filtration

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Survey of CFD Simulation for Ultraviolet Water Disinfection Reactors

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Abstract
This article discusses the importance of ultraviolet for water disinfection and investigates benefits of Ultraviolet (UV) light relative to other disinfection methods. There are many parameters for design of UV reactors but there isn't suitable method for their design. Recently many Computational Fluid Dynamics (CFD) simulations have been reported for this aim. To simulate UV reactors, three sets of equations, including hydrodynamics, radiation, kinetic and performance approach were solved simultaneously to obtain the velocity profile, fluence rate and mass fraction or path of microorganisms and the reactor design can be optimized. In this article, different approaches have been studied for hydrodynamic, radiation and kinetic in UV disinfection reactors and their advantages and disadvantages have been investigated.

Keywords: Ultarviolet, Water Disinfection, Fluence Rate, CFD Simulation, Optimum Design

Uptake of Cd (II) from Aqueous Solution by Bacillus Biomass

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Abstract
Industrial and agricultural activities cause release of heavy metal and toxic metals in the environmental that is life and ecosystem health risks for humans. Unfortunately due to heavy metals in solution in water into the ecosystem and causing water damage to these ecosystems are easily displaced in food chain and cause human and animals are threatened. The aim of this work is to investigate Bacillus sp. strain MGL-75 as biosorbent, for the fixation of Cd ion in batch reactor. In the first experiment, biosorption kinetics and isotherms have been performed at pH 6.5.The equilibrium time was about 5 min and the adsorption equilibrium data were well described by the Langmuir`s equation. The maximum capacity has been extrapolated to 0/75 mmol/g. In the second part of the work, the release of Cd ions, by bacteria release factors include: Ethylene Diamine Tetra Acetic Acid, potassium chloride, calcium chloride, hydrochloric acid, acetic acid and nitric acid is investigated. In the final section, the effect of autoclave, 2, 4 Dinitrophenol and Na-Azid, has been investigated. Optimum pH for the biosorption of cadmium was about 6.5.

Keywords: Cadmium, Toxic Metals, Biosorption, Bacillus

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Effects of Promoters in Hydrogen Hydrates Formation

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Abstract
Hydrogen storage in large quantities is a main factor to produce ''Hydrogen Economy''. Recently, with the development of the hydrogen economy and fuel cell vehicles, the manner of storing and delivering large quantities of hydrogen arises as a major problem. Nowadays several hydrogen storage methods are available. Technologies are being developed and/or engineered other than the classical compression and liquefaction of hydrogen, which are based on the chemical (e.g., ammonia) and physical (e.g., carbon nanotubes) adsorption of H2. Also, a novel technology is in progress, which is based on clathrate hydrates of hydrogen. In this article has been tried to discuss at length the possibility of hydrogen storage in hydrate and thermodynamic models.

Keywords: Hydrate, Hydrogen, Tetrahydrofuran, Hydrogen Storage, Thermodynamic Model

Performance Investigation of Artificial Neural Networks in Estimation of Second Virial Coefficient

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Abstract

Artificial neural networks are one of the new mathematical methods which have found many applications in chemical engineering in recent years. This method usually gives acceptable results when there is a lack of certain data.

In this paper two different kinds of neural networks, multilayer perceptron (MLP) and radial basis function (RBF) are used to predict and estimate the second virial coefficient. Structural parameters and different methods for improving the training step and generality of these two neural networks have been investigated. Finally the behaviors of these two networks to give quick and accurate final results are compared with each other and the weak and strong points of each are discussed. In this paper we have used the experimental data of over 100 different hydrocarbons.

Keywords: Artificial Neural Network, RBF, MLP, Second Virial Coefficient, Hydrocarbon

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The Study about the Magnetic Field Applying Effects on Heat Transfer Performance in Systems

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Abstract

Magnetic field applying is one of the novelist methods for heat transfer enhancement. In the present study the most recent studies about the effects of magnetic field on the heat transfer performance of different systems is studied and the results of them are evaluated and compared with other heat transfer improving techniques. The results of studies indicated the completely different results of magnetic field effects at different condition. Applying the magnetic field on systems with respect to the kind of fluid, heat transfer condition (natural, forced convection and thermosyphon), the kind and side of magnetic field and the equipment may cause to increment, decrement or stopping the heat transfer and also in some cases maybe have not any considerable effect on the heat transfer rate of the system.

Keywords: Magnetic Field, Heat Transfer Enhancement, Natural Convection, Therosyphon, Forced Convection

Study of Caustification from Produced Red Mud in Alumina Production Process by Bayer Method

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Abstract
Sodium hydroxide reacts with silica and other components in bouxite to form hydro aluminum silicate sodium which is in the form of red mud in alumina production process. The objective of caustification process is recovery of Na2O in the form of caustic from sodium salts because of reduction in alkali losses within alumina production process.
One of the methods for Na2O recovery is to use $Ca(OH)_2$ in process of red mud washing where Ca is replaced with Na in solution. The chosen red mud is selected from the red mud washing unit in Jajarm Alumina Plant to study effectiveness of different parameters in caustification process.
In this study, at first caustification reaction is considered then the effect of some parameters such as time, amount of added lime and its' type in caustification process are investigated. Experiments are carried out at atmospheric pressure. Experiences have shown that experiments should be conducted at a temperature above 90 ºC, to have a successful reaction. It this study, it is found that a contact or reaction time of 4-6 hrs is optimum. According the results, 2.5~3.5 time period are the best for different ratios of lime to caustic.

Keywords: Caustification, Caustic, Alumina, Red Mud, Bayer Process

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Review of Kinetic Models of Supercritical CO_2 Extraction of Oilseeds

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Abstract
In this review, mass transfer models on supercritical carbon dioxide ($SC\text{-}CO_2$) extraction of vegetable oil seeds are investigateded. Reviewed mechanisms of oil transport within the solid matrix include the desorption from the solid, the formation of a shrinking core of condensed oil in a non adsorbing porous matrix, and diffusion in a homogenous medium. Analyzed simplifications of a general mass transfer model include external control of mass transfer rates, internal control of mass transfer rates, consideration of a linear driving force, and steady state approximations, among others. More complex two stage models, and critical comparisons of some of the proposed models are also included.

Keywords: Supercritical Fluid Extraction, Oilseed, Mass Transfer, Modeling

Design and Fabrication of a Solar Evaporator with Light Focusing Mirrors

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Abstract

Today, solar evaporators have been attracted researchers attentions due to their low cost, application facility and environmental considerations. They can be an appropriate alternative for thermal heaters, which use the fossil fuels. In this study, firstly a review on solar energy absorption systems has been presented and then manufacture and design procedure for a homemade solar evaporator, which can be used in buildings. This produced evaporator consumes 100 W electric current and 800 W.hr during a day and it can provide 48 liters distilled water in a day. Total cost has been calculated in three cases: 1-80% evaporation of input water with solar energy absorption efficiency of 100% or 50%, 2-100% evaporation of input water with solar energy absorption efficiency of 50%, 3-100% evaporation of input water with solar energy absorption efficiency of 50% with energy recovery in two cases of 50% and 75%.

Keywords: Solar Evaporator, Environment, Solar Energy, Desalination, Thermal Energy