Kinetic Analysis of Hydrazine Hydrate Production Based on Peroxide Method and Preparing a Mathematical Model for Rate of Reaction Constant

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Abstract

In view of N-N bounding, Hydrazine (N_2H_4) is one of the simple Diamines and has special properties. Nowadays with technology development, it is attempt to obtain the best conditions and more efficiency method among Oline-Raschig, Urea, Ketazine, Bayer-Ketazine, Fyzones and Peroxide Processes to produce the very valuable product called Hydrazine-Hydrate. Peroxide process has some advantages comparing other methods, like high-yield and more environmental friendly. Peroxide process is studied in this article and kinetics of various steps of Hydrazine-Hydrate production like Dimethyl Ketazine Generation, Dimethyl Ketazine Hydrolysis and Catalytic Dehydrogenation are discussed. The extracted experimental values of the rate constant of reaction (k) are studied in different temperatures. The results show that the experimental data are adapted to first order kinetic reaction. Finally it is tried to fit the reaction constant rate of the main reactions to the mathematical model. The models show the main reaction constant rate adjusts with a logarithmic model and confirm the experimental results and initial assumption. Using this information help us to achieve better situations and semi-ideal conditions to produce a useful Hydrazine-Hydrate product with less energy and raw material loses. Also with comparing of equilibrium equations in process, the optimum operating point is obtained.

Keywords: Hydrazine Hydrate, Peroxide Process Reaction, Kinetics, Mathematical Model

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Influence of Nozzle Orifice Pressure and Diameter on Droplet Size and Particle Porosity in an Industrial Spray Drier

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Abstract

In this paper, impacts of nozzle pressure and diameter on spray drier efficiency in synthetic detergent are investigated. The results show that nozzle pressure variation can change the diameter of atommized droplets in spray dryer and consequently causes the improvement of powder porosity and increases the quality of product in detergent industry, such as powder solubility and bulk density of powder. Nozzle pressure augmentation in ronge of 70-80 decreases of droplet diameter and in creased powdes prosity. Also, augmentation of nozzle diameter improves spray drier efficiency and produces powder with proper prosity.

Keywords: spray drier, detergent, nozzle, porosity, pressure

Application of Gibbs Minimization Energy to Prediction of 2-chlorophenol Degradation's Products by Advanced Oxidation Method

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Abstract

Organic components especially the pigments with high stability cause significant environmental problems in industrial or urban water treatment processes. Advanced oxidation processes (AOP) by using UV, TiO_2 and strong oxidative agents such as H_2O_2 are developed for degradation organic pigments and other high stable organic components. An important point in these methods is identification and determination of amounts by products of the process. In this work the Gibbs energy minimization is applied to prediction of by products' mole fractions of degradation of 2-chlorophenol with AOP. The results are compared with experimental data and show in spite of the simplicity, this method has acceptable accuracy.

Keywords: Advanced Oxidation; 2-chlorophenol, Gibbs Energy, Minimization, Degradation, organic Pigments

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Optimization of Processes Variables Using Central Composite Design

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Abstract

Response Surface Methodology (RSM) and Central Composite Design (CCD) are collection of statistical and mathematical methods for designing experiments to determine the main and interaction effects of variables on the performance of a process, and the optimum conditions for that process. Since, designing the experiment considered as an important step in research works, therefore, RSM and the related procedures are fully described, in this article. For this purpose, literature findings, on "optimization of copper cementation process by iron using central composite design experiments" are used. The optimal conditions to obtain a maximum copper cementation yield (98.9%) are determined, via the contour plots method.

Keywords: response surface methodology, central composite design, optimization, statistical experimental desidn

Effect of Concentration of Peptizer on Pore Volume of Alumina

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Abstract

In the present work,,the effect of four different of mixing procedure on aluminium hydroxide obtained by precipitation of aluminium sulfate with sodium aluminate were compared keeping other identical condition (temperature, pH, aging time):1)injection aluminium sulfate to sodium aluminate 2) injection sodium aluminate to aluminium sulfate 3) mixing of both solutions at the same time 4) mixing of both solutions with speed of 40ml/min. Each procedure led to a specific compound: in the first procedure, bayerite obtained and in the other procedures, boehmite with different crystallinity.
Also, the effect of peptizer on quality of alumina and its structure properties have been studied. For this purpose, nitric acid was used as the peptization agent and the effect of concentration variations of nitric acid on pore volume of alumina has been studied and its concentration was changed in the range 1.5-3 wt.%. The results exhibit that pore volume of alumina raises with increasing concentration of acid from 0-1.5 wt.%, and reduces with increasing concentration of acid from 1.5-3 wt.%. These results show that peptizer has an effective concentration and excess dispersant has a negative effect.

Keywords: mixing procedure, Peptization, pore volume, effective concentration

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Inhibiting and Removing of Heavy Hydrocarbon Deposits Using Biotechnology

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Abstract

Precipitation of heavy organic deposits (especially those in the categories of asphaltenes and waxes) is a persistent problem in the oil industry. Current trends in exploration of heavy crudes made the oil industry to find new solutions to the problem. During the last decade, microbial treatment became an alternative to conventional methods. This review describes the bio-mechanisms responsible for solid precipitation control (i.e., inhibiting and/or removing) and results obtained through applications of such methods. Beside, the advantages and possible limitations are discussed.

Keywords: Heavy hydrocarbon deposition, Wax, Asphaltene, biodegradation, biosurfactants

Productivity Enhancement in Shahid Hasheminejad Gas Refinery through Simulation and Sensitivity Analysis on Parameters Affecting the Absorption Column, Using Hysys

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Abstract

In the gas processing operation; in addition to the water, oil and NGL; carbon dioxide and sulfur must also be the removed from the gas stream. Due to increasing need of the industry for a fast, precise and low cost calculations, the use of computers are inevitable. Up to know, different simulation and optimization of the processes are conducted in our country, however, they have never considered the capacity of the unit and environmental conditions of the site. Therefore, it is the aim of this project to simulate and optimize the gas sweetening process of the Shahid Hasheminejad refinery considering the capacity limits of the units and the environmental conditions of the site. Therefore, the simulation of Shahid Hasheminejad gas refinery sweetening plant with DEA has been performed using HYSYS software. The results of this study are compatible with those of the original manufacture's data. Furthemore, optimization of the process and the effect of different parameters such as temperature, pressure, amine flow rate on the performance of the absorption tower with DEA and MDEA have been investigated. It was concluded that the increase of pressure, the amine flow rate and the increase of amine temperature has no profound effect on the performance of the process. However, an increase of the amine concentration is best way to reduce the corrosion rates and the productivities. Therefore to enhance the productivity, the changes of amine consumption from DEA to MDEA are recommended for the Shahid Hasheminejad Gas Refinery.

Keywords: Simulation, Shahid Hasheminejad Gas Refinery, Absorption tower, Optimization, Hysys software