

Water Vapor Permeability of Edible Films Based on Whey Protein Concentrate and Olive Oil

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Abstract

In this study, water vapor permeability (WVP) of edible films made of whey protein concentrate was investigated. Whey protein films were prepared by dispersing 10% whey protein in distilled water; and plasticized with different levels of glycerol (Gly) (glycerol: protein (Gly: Pr) = 0.5 and 0.6). Olive oil was added at different levels (Oil: pro = 0.0, 0.2, and 0.4). The emulsion films were evaluated for mechanical properties, water vapor permeability and opacity.

Increasing the levels of Gly or olive oil in the films led to decreases in Elastic Modulus (EM) and Tensile Strength (TS). Increasing Gly content of films at oil/pro ratios of 0.2, 0.4 led to slight increases in Elongation (EL). Increasing the oil: pro ratio further resulted in a decrease in Elongation (EL) for all films. No significant difference in WVP and Opacity was observed between films made from mixtures of various proportions Of WPC-Gly with increasing olive oil (addition) at all levels of plasticizer. The WVP values obtained in this study were found to be affected more by the level of glycerol than the levels of olive oil.

The results of this study indicated that by designing of edible films based on whey protein, in addition to improvement of excellent water vapor permeability, application of oil like olive oil can be prepared composite edible films with low permeability to water vapor.

Keywords: Edible Film, Whey Protein Concentrate, Water Vapor Permeability, Olive Oil



Introduction to Calculation of Thermodynamic Properties in Nano Systems by Molecular Dynamic Method

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Abstract

This paper is related to the one of the main aspects in nano technology, which is nano thermodynamics. Nano technology is with no doubt one of the most important sciences in recent century. For progressing in nanotechnology, understanding of thermodynamic laws in small systems is necessary. In this work small systems in nano scale are introduced first. Then, after explanation of the importance of intermolecular forces the methods for measuring them followed by thermodynamics in nano systems are presented. One of the most widely used methods in the calculation of thermodynamic functions is molecular simulation methods. Molecular simulation consists of two different methods which are Monte Carlo and molecular dynamics. Molecular dynamics and calculation of thermodynamic functions with this method is briefly introduced in this work. It is proved that some thermodynamic functions that are intensive in macroscopic scale are related to the amount of system in nano scale; in other words they are related to the number of molecules of the system and as a result they are considered to be extensive. In this work discussion about the non intensity of these properties is presented.

Keywords: Thermodynamics of Nano Systems, Molecular Dynamics, Intermolecular Potential and Forces, Nonextensivity and Nonintensity of Properties

Effect of Spray Drying and Silica Binder on Improvement of Attrition Resistance of Co-Precipitated Iron Catalysts in Fischer-Tropsch Synthesis

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Abstract

Mechanical strength is one of the technical properties of heterogeneous catalysts which strongly depends on their synthesis and forming method. A serious problem with the use of Fe Fischer-Tropsch catalysts in a reactor is their tendency to undergo attrition. In this paper the factors affecting the extent of attrition of catalysts and specially Fe Fischer-Tropsch catalysts in slurry reactors are initially introduced. The effect of spray drying along with silica binder on improvement of attrition resistance of co-precipitated Fe Catalysts are presented afterward. It is shown that by spray drying method, under optimum operational conditions, production of spherical catalysts' granules with suitable density and strength is possible. Furthermore, strength of the granules would be enhanced using proper amount of silica binder.

Keywords: Fischer-Tropsch Synthesis, Attrition, Slurry Bubble Column Reactor, Spray Dryer, Binder



Review of CFD Analysis of Pressure Drop and Mass Transfer in Spinning Cone Columns

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Abstract

Study of SCC columns by CFD analysis has been increased in recent years due to the introduction of advanced computers and CFD soft wares such as CFX. These columns have a complicated geometry. CFD analysis can be used to optimize the design and control of these columns. Researches in the area of CFD analysis of SCC columns have been carried out mainly in Sydney and Sistan and Baluchestan Universities. In this paper a complete review of published works in the area of CFD analysis of SCC columns are presented. The information given could be used to direct the future research in this area.

Keywords: Spinning Cone Column (SCC), CFD, Pressure Drop, Mass-Transfer

Steady State Simulation of the Steam Methane Reforming Reactor in Fanavaran Petrochemical Company

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Abstract

Syngas is the mixture of H₂ and CO by different ratio. According to extensive application of this mixture in various industries such as chemical, petrochemical and converting natural gas to liquid hydrocarbon technology (GTL), it is important to know thermo-kinetic and treatment of the process to produce required mixture of syngas for downstream industries. Steam methane reforming of natural gas is one of the main methods for producing of syngas. In this paper catalytic reaction during the process has been studied by using mass, energy and momentum balance. By the use of this simulation model that designed by visual basic software that involving accurate kinetic model, we can study the effective parameters for cost reduction, surveying the reaction in different thermodynamic and processing conditions and then predict the reaction products to achieve appropriate composition in output of the reactor on changing the operation conditions.

Keywords: Syngas, Steam Methane Reforming, Reactor, Simulation



Study of Energy Losses in Steam Generation Unit and Efficiency Calculation

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Abstract

Steam generation is one of the most important energy consuming parts in the process industries. Approximately one-sixth of energy consumption in industries is used for steam generation. In this research utility unit of a chemical plant has been considered. Then, efficiency of boilers is calculated and major heat loss sources in process are identified. The results of calculation show that we can prevent lost of energy about 843096 sm³ of natural gas in year. This amount plus saving due to reduction of water consumption approximately 21% of fuel consumption price in this unit.

Keywords: Efficiency, Boiler, Energy Saving

Technical and Economical Study on Application of Absorption Solar Chiller in Iran

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Abstract

Energy challenges in recent years, especially in summer and shortage of fossil fuels along with their environmental problems have caused solar energy to become an important source of energy. Solar radiation can be applied as a source of energy for cooling systems in summer. In this article, performance of solar chilling systems is studied. This system has 30 evacuated tube solar collectors and an ammonia-water absorption chiller with maximum cooling capacity of 2.5 tones. Using meteorological data, absorbed heat in different cities were calculated and absorption system was simulated using HYSYS. Finally effects of different parameters and weather conditions are studied and the cost of this system is compared to conventional compression systems.

Keywords: Absorption Chiller, Solar Energy, Refrigeration Cycle, Cooling



Nanorotaxanes of Cyclodextrin with Poly(Ethylene Glycol) and their Applications

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Abstract

Cyclodextrins are a family of cyclic oligosaccharides composed of α -(1,4) linked glucopyranose subunits. Cyclodextrins are useful molecular chelating agents. These compounds having supramolecular structures carry out chemical reactions that involve intramolecular interactions where covalent bonds are not formed between interacting molecules, ions or radicals. The majority of all these reactions are of 'host-guest' type. Because of their inclusion complex forming capability, the properties of the materials with which they complex can be modified significantly cyclodextrins are most important. As a result of molecular complexation phenomena CDs are widely used in many industrial products, technologies and analytical methods. The negligible cytotoxic effects of CDs are an important attribute in applications such as drug carrier, food and flavours, cosmetics, packing, textiles, separation processes, environment protection, fermentation and catalysis.

Poly(ethylene glycol) forms inclusion compounds with α , β and γ -cyclodextrins. The inclusion compounds are in microfibrils, arranged in a columnar microstructures in the crystal lattice. The inclusion compound may form needles, prisms or hexagonal crystals from crystallization in a phosphate buffers under sonic energy.

Keywords: Cyclodextrine, Poly(Ethylene Glycol), Nanocrystals Application, Textile, Chemical Industry, Paint, Drug Delivery

Analysis of the Bio-Environmental Advantages Using Two Types of Activated Carbon at a Petro-Chemical Water Treatment Plant

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Abstract

Use of activated carbon in waste water treatment is not a new idea, therefore since 1935 experience has been gained in its use to increase the coagulation and flocculation of solids, anaerobic digestion of sludge and for removal of water from it. Experience has shown that activated carbon powder as an additive at the time of addition of hydraulic load of waste water, results in the compression of sludge and facilitates the removal of water from it. In these experiments the usefulness of Powered Activated Carbon (PAC) is determined, but due to economical and the fact that high degree of treatment was not required, this was not fully accepted. In the past use of Granular Activated Carbon (GAC) was more popular compared to its powered type, and it also had higher efficiency. In this article, initially a literature review of work done on the use of Activated Carbon Powder and the trend of growth in its use and the modifications made during last few years in the world and Iran and finally various experiments performed on activated carbon pilot unit at one of the petro-chemical units in Iran, in order to analyze the usefulness of this material in waste water treatment. In addition, two type of commercial activated carbon powder were used from two different suppliers giving different results, the reason for these different results was also analyzed and this difference in result was attributed to different constituents. For every experiment 4kg of activated carbon was used in the pilot plant column. The samples for experiment were taken from the exit stream from the clarifier. Results were obtained for effect of parameters such as inlet volumetric flow rate of waste water and activated carbon structure on its performance.

Keywords: Activated Carbon, WasteWater Treatment, Shahid Tondgoyan, Petro-Chemical Complex