Synthesis of Organic Aerogels and Factors Affecting on their Structure

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Abstract
Organic polymer aerogels have received much attention due to the recent development in industrial application of aerogels. A lot of researches have been done about the synthesis of various organic polymer aerogels and carbon aerogels. This paper presents a brief review of the literature on synthesis methods of resorcinol-formaldehyde, polyurethane, cellulose and carbon aerogels. Since structure and properties of organic aerogels are influenced by synthetic conditions, the effect of temperature, PH of solutions, catalysts and monomer concentrations are discussed.

Keywords: **Organic Aerogel, Sol-Gel Process, Organic Polymer Aerogel, Carbon Aerogel**

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Riview of Determination Para Hydrogen Content during Liquefaction Process

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Abstract
Hydrogen molecule consists of two states: ortho and para hydrogen which are in equilibrium at a certain ratio in any temperature. The conversion process in the catalytic beds takes place in order to prevent a slow exothermic conversion of ortho to para hydrogen in the liquid hydrogen storage tanks and to avoid evaporation of liquid hydrogen. Ortho and para hydrogen differs in physical properties such as thermal conductivity, vapor pressure, enthalpy, as well as Raman spectroscopy, nuclear magnetic resonance and gas chromatography. The percentages of para hydrogen content can be determined in each stage of hydrogen liquefaction process using such differences in these properties. Given the importance of determining the amount of para hydrogen in the quality control test of produced liquefied hydrogen, various percentage measurement methods based on differences in the physical properties of para hydrogen content has been expressed in this paper. As the surveys shows, the thermal conductivity is the most applicable method to determine the percentage of para hydrogen.

Keywords: **Ortho-Para Hydrogen, Spin, Thermal Conductivity, Enthalpy, Vapor Pressure, Raman Spectroscopy, Nuclear Magnetic Resonance, Gas Chromatography**

Study on Batch Foaming Processes of Poly Styrene and Poly Methyl Methacrylate

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Abstract

In this study at the first, the foaming process states and related theoretical background were explained. Then the literature survey according to foaming of poly styrene and poly methyl methacrylate with different blowing agents was conducted. Using scanning electron microscopy is one of the common methods for investigating of foams morphology. But this method did not give any exact information about foaming process states. Therefore a new tool is necessary to gain information about nucleation, growth and coalescence of cells. In this work a new visual technology was introduced for investigating of batch foaming dynamics and also related studies considering various operation parameters were investigated. In the following it was concluded that some parameters like temperature, pressure and foaming time had important effects on the foaming process and the produced foam quality.

Keywords: Poly Styrene, Poly Methyl Methacrylate, Foaming Process, Visual Technology

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Study of Sucrose Fatty Acid Ester Applications in Different Industries

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Abstract

Sucrose fatty acid ester is a nonionic surfactant, which is nonaggressive with skin, biocampatible and biodegradable. Thus this surfactant has extensive applications in several industries including the food, cosmetics, pharmacy, anti-microbial detergents, insecticides and pesticides in agriculture. It has been also applied in the production and stabilization of nanostructured particles. Sucrose esters are produced from sugar and fatty acids, which are cheap, accessible and renewable sources of material. Due to the eight positions of esterification in sucrose, a wide range of physical, chemical and biological properties could be created. These differences are mainly possible through changing the degree of substitution and chain length of fatty acids.

Keywords: Sucrose Ester, Nonionic Surfactant, Applications

Modelling of Pollutant Distribution around Tabriz Thermal Power Station with Using ISCST3 Model

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Abstract

Air pollution modeling is an essential tool for air pollution studies. Also, considering that observations are often sparse, models can be used to make inferences on concentrations where there is no information. Due to switching fuel of Tabriz thermal power station from natural gas to mazut in the winters and increasing amount of pollutants emission, also considerable decrease in temperature, pollutants are not distributed well at the region around the emission sources which leads to increasing of pollutants concentration. The current study aimed to consideration of pollutants (NO_x and SO_2) concentration in areas adjacent to Tabriz power station during winter and comparison of concentration with clean air standards of Environmental Organization of Iran as well as National Ambient Air Quality Standards (NAAQS). Therefore, this study used the ISCST3 (Industrial Source Complex-Short Term) model to simulate pollutant distributions on 3 months period in order to assess the ground level concentration of pollutant in the study area. The results show that SO2 concentration on 24 hours period is more than air pollution standards but NOx concentration is lower than National and International air pollution standards.

Keywords: Air Pollution, Modelling, ISCST3, Tabriz Thermal Power Station

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Elimination of Bayer Process Carbonates Pollutant Using Chemical Methods

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Abstract

In this work, the removal efficiency of carbonate pollutants of sodium aluminate solution has been increased using chemical techniques. In the experiments barium aluminate with structures of Ba2Al2O5, calcium aluminate ($Ca_3Al_2(OH)_{12}$), sodium phosphate (Na_3PO_4) - lime with lime were used. The results showed that barium aluminate with the structure of $Ba_2Al_2O_5$ have 74% efficiency in carbonate removal, whereas calcium aluminate method has 34.6 % separation efficiency. The results also indicate that concentration of alumina increases in the existence of barium and calcium aluminate and it decreases in the existence of sodium phosphate-lime. In addition, better removal efficiency of carbonate was obtained on the experiment with the output solution of stages of wet grinding and alumina hydrate precipitation and filtration in Jajarm Company.

Keywords: Bayer Process, Carbonate Pollution, Sodium Aluminate, Chemical Elimination

A Review Study on the Migration of Substances from Packaging Material into Foodstuffs

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Abstract

In the terminology of food packaging, the term "migration" commonly describes the transfer of materials from package into food product. In terms of packaging materials safety, it is of paramount importance to investigate the migration of substances from plastics, papers, cardboards or lacquered materials. The materials called "migrants" transfer into food as a result of food and packaging interactions. Migration of substances from packaging material into foodstuffs obeys the general laws of mass transfer and occurs based on "diffusion" phenomenon. This phenomenon may strongly influenced by the intrinsic reactivity of food ingredients and packaging materials. These reactions may alter the properties of the package. The type of chemical migrated into food is strongly depend on the type of food container. Food packaging materials are generally in close contact with food products for a long time. Because of such favorable conditions leads to transfer of materials from packaging into food; many countries have enacted regulations for the control of packaging materials to decrease their risks for human health.

Keywords: Migration, Packaging, Diffusion, Food Products, Mass Transfer

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A Study on Factors Affecting Photocatalytic Degradation of Azo Dyes Using Titanium Dioxide Nanoparticles in Aqueous Solution

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Abstract

Between semiconductor oxides, titanium dioxide has been used as the most suitable material for environmental photocatalytic applications has been applied due to the high chemical stability, reasonable prices and lack of toxicity. Extensive research has shown that the anatase crystalline form shows more photocatalytic activity in comparison with the rutile form. Photocatalytic destruction efficiency can vary depending on the used light that is ultraviolet light or sunlight. Also other parameters, such as pH, the amount of photocatalyst, initial dye concentrations, presence of oxidant, light intensity, time of radiation, presence of mineral ions and solvent can be effective on the destruction of azo dyes that will be investigated in this study. Results show that in the process of degradation of azo dyes, main intermediate compounds include hydroxylate derivatives, aromatic amines, phenolic compounds and organic acids. In this article the factors affecting the degradation of different azo dyes using titanium dioxide nanoparticles as a photocatalyst in aqueous solution under ultraviolet radiation and sunlight will be investigated.

Keywords: Nanoparticles, Titanium Dioxide, Photocatalytic Degradation, Azo Dyes

Non-Intrusive Concentration Measurements of Chemical Processes Using Laser Induced Fluorescence

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Abstract

One of the best non-intrusive methods for concentration measurement in fluid flow is Laser Induced Fluorescence (LIF). In this technique, a laser used to excite the fluorescent component. Usually, fluorescent dyes such as Rhodamine B and fluoerscein are used as flow tracers. These tracers absorb the laser's energy and then emit a portion of the absorbed energy at the different wavelength. The emitted energy, after passing an optic filter reaches to a CCD sensor which could be quantified for dye concentration measurement. Additionally, this technique is used to whole field temperature measurement.

In this article, the fluorescence phenomena, equipments for LIF system, basic theory and some literatures about concentration measurement in fluids have been reviewed.

Keywords: Laser-Induced Fluorescence, Images, Concentration Field