Methylene Blue Adsorption from Aqueous Solution Using Rak Waste Adsorbent

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Abstract
Methylene blue dye in the wastewater must be completely removed because it causes problems for the environment. The aim of this study is to evaluate and determine the possibility of using absorbent obtained from the oak as a low-cost adsorbent for the removal of methylene blue from aqueous solution. In these tests, a batch system was used for the absorption process. The effect of pH, adsorbent dosage, and initial concentration of methylene blue, time and temperature as key parameters were evaluated. The Langmuir and Freundlich isotherm models were used to evaluate experimental data. The results that increasing pH increases the removal rate and the highest adsorption was obtained at pH 9. Also the Langmuir isotherm model is better than Freundlich model with data obtained. The thermodynamic study showed that the adsorption process was endothermic and spontaneous (high temperature) in nature. Finally, the results of this study indicate that used absorbent have high efficiency for removal of methylene blue.

Keywords: Methylene Blue Dye, Adsorbent, Oak.

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Novel Paper-Based Cholesterol Biosensor Using Graphene/ Polyvinylpyrrolidone/ Polyaniline Nanocomposite

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Abstract
A novel nanocomposite of graphene (G), Polyvinylpyrrolidone (PVP) and Polyaniline (PANI) has been prepared and this nanocomposite used for the modification of paper – based biosensors for determination of cholesterol. The droplet–like nanostructures of G/PVP/PANI-modified electrodes were obtained with an average size of 160±1.02 nm. Presence of Polyvinyl pyrrolidone (~ 2mg/ml) in this nanocomposite can be improving the dispersibility of graphene, furthermore increase the electrochemical conductivity of electrodes that leading to enhanced sensitivity of the biosensor. This modified electrode also shows high electrocatalytic activity towards the oxidation of hydrogen peroxide. Moreover, cholesterol oxidase (ChOx) Connected to graphene/ Polyvinyl pyrrolidone/ Polyaniline (G/PVP/PANI) - modified electrode for the amperometric determination of cholesterol. Under favorable conditions, a linear range of 50 µM to 10 mM of cholesterol is achieved and the limit of detection designated to be 1 µM for cholesterol. Eventually, the recommended system can be applied for the determination of cholesterol in a complex biological fluid.

Keywords: Paper-Based Biosensor, Cholesterol, Graphene, Polyvinylpyrrolidone, Polyaniline.

Comparison of Thermodynamic Modeling of Binary System (Carbon Dioxide-Dimethyl sulfoxide) and Ternary System (Carbon Dioxide-Dimethyl sulfoxide- Ampicillin) via Different Equation of State

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Abstract

The bioavailability and solubility of pharmaceutical compounds are increased via size reduction. One of the new method of size reduction is using of supercritical carbon dioxide. This method has some advantage. The process temperature is not high. Therefore, the nature of pharmaceutical compounds is not damage. The supercritical gas antisolvent (GAS) process not occur at arbitrary operating conditions. Thus, the thermodynamic models are necessary to evaluate the suitable operating condition. In the GAS process, the miscibility of antisolvent and solvent is important factor. In this study, the thermodynamic modeling of binary system carbon dioxide-dimethyl sulfoxide and ternary system carbon dioxide- dimethyl sulfoxide- ampicillin was investigated. The Redlich-Kwong equation of state, the Soave equation of state and the Soave-Redlich-Kwong equation of state was used to model.

Keywords: Thermodynamic Modeling, Carbon Dioxide, Dimethyl Sulfoxide, Ampicillin, Gas Antisolvent, Redlich-Kwong equation of State, Soave, Soave-Redlich-Kwong.

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Investigation of Conditions in the Simultaneous Removal of Heavy Metals from Industrial Wastewater Using Adsorption Process

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Abstract

The removal of heavy metals from industrial wastewaters is an important issue due to their high toxicity. In this research, the conditions of simultaneous removal of heavy metals from industrial wastewater (Khark Island petrochemical wastewater as a case study) have been investigated. By testing of some samples, the quality of wastewater was analyzed. The results showed a high amount of organic matters in wastewater which even after the treatment processes are not removed completely. Then, to reduce the heavy metals in the wastewater, a method based on adsorption using activated carbon was investigated. The activated carbon was made from walnut shell. After the synthesis of activated carbon and evaluation of its adsorption characteristics, some tests were carried out of using samples of petrochemical wastewater. The considered absorption parameters were temperature, pH, the amount of absorbent and the adsorption time. The results showed that pH = 6 has the best performance on heavy metals removal. Based on the results, the equilibrium time for lead, copper, chrome was obtained 60 minutes while this value for nickel was equal to 300 minutes. The results also showed that the increase in temperature had an increase in the adsorption efficiency. Finally, the result showed that the activated carbon concentration equal 18g/L wastewater caused the best in heavy metals removal.

Keywords: Industrial Wastewater, Heavy Metals, Adsorption, Activated Carbon.

The influence of Rotational Speed of Screw Press on the Phenolic Compounds, Oxidative Stability and the Chemical Characteristics of Peanut Oil

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Abstract
Generally the mechanical press is one of the most favorite methods for extracting oil from plant oil seeds all over the world. In this research, the effect of screw press rotation speed on phenolic compounds, oxidative stability and some physicochemical properties of peanut oil, including oil extraction efficiency, color index, acidity and DPPH Scavenging Activity with using a completely randomized design with screw press and with three rotation speeds (11, 33 and 57 rpm) were investigated in three replications. The results showed that when the screw press rotation speed was 11 rpm, the oil extraction efficiency with 34.07 percent had the highest oil extraction efficiency. Increasing the screw press rotation speed on acidity, total phenolic compounds, color index, and DPPH Scavenging Activity increased. In this study, increasing screw press rotation speed from 11 to 57 rpm, the oxidative stability increased from 8.9 to 8.9 hours. In the end, it can be said that screw presses with a speed of 33 rpm are best suited for peanut oil extraction.

Keywords: Total Phenol, Peanut oil, the Rotational Speed of Press, Chemical Characteristics.

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Mathematical Modeling of Olefin Plant Acetylene Hydrogenation Reactor (Amir Kabir Petrochemical Complex)

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Abstract
In this research, the modeling and simulation of hydrogenation reactor of Amirkabir petrochemical acetylene unit was carried out. The reaction processes are elementary and in this process acetylene was converted to ethylene. The modeling process was happed with introducing mathematical equations of mass transfer. The set of process equations were solved simultaneously using method of lines and finite difference techniques. The results showed that simulation with 80 elements has minimum deviation with experimental data. The results showed that the simulation result has good agreement with experimental data. The maximum relative error of this mathematical model is well under about 1%. After model validation, various variable profiles along the reactor are discussed. Then, the effects of effective parameters such as inlet temperature, total inlet mass flow rate and CO flow rate are investigated in detail. The optimum value of carbon monoxide to get highest selectivity is 700 ppm. Also the results showed that the process has good selectivity at temperature 77^{o}C.

Keywords: Acetylene, Selective, Hydrogenation, Front-End, Mathematical Model, Simulation.

A Review on the Separation Processes by Nanoparticle Stabilized Emulsion Liquid Membrane

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Abstract

Separation processes by emulsion liquid membrane are used in various processes of chemical and industrial wastewater treatment. Due to the importance of the stability of the emulsion during the separation process and the possibility of its easy breakdown in the final stage of the extraction operation, all kinds of emulsion stabilizers, including surfactants and solid emulsion solids, have always been introduced in numerous sources and articles, each of which benefits and has its own disadvantages. The problem of the stability or hardness of breaking the emulsion has made this process not used on an industrial scale. Therefore, in the present paper, the use of emulsion liquid membrane and solids solidified emulsions, which are referred to as emulsion pickering, are investigated.

Keywords: Emulsion Liquid Membrane, Pickering Emulsion, Stability, Nanoparticles.

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Preparation and Characterization of Nanospherical α-Fe_2O_3 Supported on the Surface of an Inorganic Silica Using Solid-State Dispersion (SSD) Method

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Abstract

The effective supportation of nano particles specialty metal oxide on the surface of different catalyst supports including organic, inorganic or organic-inorganic catalyst supports is a suitable method for improvement of nano particle properties and increasing of catalysts yield. In the paper, spherical α-Fe_2O_3 nanoparticles were supported on the surface of inorganic silica as a catalyst support, using solid-state dispersion (SSD) method. All products were characterized by using XRF, FTIR, SEM, XRD and BET surface area. The results indicated that the supported nanocatalyst (α-Fe_2O_3 /Silica) successfully was prepared. By using XRD analysis and Warren-Averbach method average size of spherical α-Fe_2O_3 NPs supported by SSD method were measured 27.50 nm. The nanocatalyst presented in this study can be applied in the different areas such as catalytic and photocatalytic reactions.

Keywords: Ironoxide, Silica, Catalyst, SSD.

Investigation of the Effect of Reaction Media (Dry and Condensed) on Heat Removal and Productivity of Gas Phase Polymerization Reactors

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Abstract

Due to the ever-increasing demand for polyolefins, there is a real economic driving force to increase the productivity and space-time yield in gas phase process in order to expand production. Heat removal is one of the main upper limitations on permissible production rates. In order to improve heat removal, the use of condensed mode cooling operation is proposed. It is observed that the instantaneous rate of ethylene polymerization is promoted in presence of induced condensing agents (ICAs). The presence of different commonly used ICAs has a significant impact on the polymerization rate, heat removal, final polymer properties and bed hydrodynamic. So, for achieve the best result, ICA chosen and its amounts are very important.

Keywords: Heat Removal, Fluidized Bed Reactors, Polymerization, Induced Condensing Agent.