A Review on Carbon Nanotube Membranes Synthesis Methods

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Abstract
In recent years, carbon nanotube (CNT). has become an interesting candidate in membrane synthesis materials due to near-frictionless inner surface and its high mechanical strength and thermal stability. There are five approaches to the synthesis of CNT membranes; disordered CNT membrane, template-synthesized CNT membrane, aligned CNT filter, vertical aligned CNT membrane, and mixed matrix CNT membrane. In the first four methods, CNT is the main membrane material. Development of the defect-free CNT-based membranes would be important in these synthesis methods. In the fifth method, CNT mixed matrix, it is desired to achieve the homogenous dispersion of CNTs in the polymeric matrix. This review discusses the approaches for processing the CNT membranes and evaluates the advantages and drawbacks of these procedures.

Keywords: **Carbon Nanotube, Carbon Nanotube Membrane, Buckypaper, Chemical Vapor Deposition, Carbon Nanotube Mixed Matrix**

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Study Biodegradation of Azo dye Congo Red Exist in Industrial Effluent by Bacillus Thuringiensis

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Abstract
The textile industry is a substantial consumer of water and produces enormous volumes of contaminated water; the most important contaminants are azo dyes. Microbial processes for the treatment of textile wastewater have the advantage of being cost-effective and environmentally friendly and producing less sludge the sample was isolated from the soil. Azo dye Congo red in Bacillus thuringiensis can tolerate different situations and degrade azo dyes. It was found that Bacillus thuringiensis Congo red color within 48 hours, the decomposition rate of 83%. It also found that the optimal conditions for decolorization by Bacillus were: 37ºC, pH neutral, dye concentration of 50 milligrams per liter and is the static condition. The use of microorganisms for the removal of azo dyes is important.

Keywords: **Biodegradation, Azo Dye, Congo Red, Bacillus Thuringiensis**

Experimental Improvement Ways for Hydraulic Performance of Lab-scale Stabilization Pond

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Abstract
In this study, hydraulic operation factors of lab-scale stabilization ponds were investigated. The results have shown that suitable inlets geometry had important effect on delay of short circuiting occurrence. Comparison of three kinds of ponds (single inlet, manifold inlet and baffled ones) showed that short circuiting occurrence in baffled pond has delayed that was more that 65 minute in 3 hours retention time. The results of tracing tests showed that using manifold inlets and its baffling will improve hydraulic performance and close current situation to the ideal flow in the ponds. The amount of effective volume in the baffled pond and pond with manifold inlets were obtained 75-80 and about 60 percent, respectively. Other experiments presented that baffled pond increased about 40 and over 30 percent of hydraulic performance and biological efficiency, respectively. Study of biological efficiency of the ponds in the anaerobic conditions showed that baffled pond and pond with manifold inlets removed 72 & 66 percent of the influent COD, respectively.

Keywords: **Hydraulic Performance, Effective Volume, Dispersion Number, Plug Flow, Tracer Test, COD Removal Efficiency**

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A Review on Diffusion Coefficient and Mass Transfer Coefficients of Nanofluids and its Application in Gas Absorption Processes

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Abstract
Gas absorption is a prevalent and important process in industry for gas component separation of gas mixture. Numerous research have been carried out to increase the efficiency of absorption processes which include mechanical method, adding surfactant, microparticles and nanoparticles to liquid phase and using external fields. This paper, either effect of nanoparticles addition in liquid phase and applying magnetic field on gas-liquid mass transfer were investigated separately and simultaneously. Studies show fluid micro convection of nanoparticles as a result of brownian motion, grazing effect and increase of nanofluid residence time in comparison to base fluid and finally heat transfer improvement are some of the primary reasons which cause to increase of mass transfer in the nanofluid. Moreover applying magnetic field results in a torque on magnetic nanoparticles which increases nanoparticles movement, therefore mass transfer improves owing to enhancement of turbulency in boundary layer and decreases mass transfer resistance, consequently.

Keywords: **Gas Absorption, Diffusion Coefficient, Mass Transfer Coefficients, Nanofluid, Magnetic Field, Brownian Motion**

A Review on Photocatalytic Reduction of CO_2 to Methane

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Abstract
In the last decade, increasing concerns about emission of CO_2 gas into environment cause interesting research area about the removal of carbon dioxide. Recently, photocatalytic reduction of carbon dioxide to methane is one of the topics of interest to researchers in this field because of their reaction at ambient temperature and pressure specially using solar energy. In this paper, first removal pathway of carbon dioxide gaseous pollutants is studied and then method of abatement removal or conversion of carbon dioxide to safe and valuable compounds is discussed. Next part of this work will be focused on the mechanisms of photocatalytic conversion of carbon dioxide using TiO_2 and ZrO_2 as the most common semiconductors in photocatalytic conversion of carbon dioxide to methane. Finally, the types of photo reactor were used and most efficient photo catalysts to convert carbon dioxide to methane will be investigated.

Keywords: Carbon Dioxide, Photo Catalytic Processes, Renewable Energy, Photo Reactor

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Prediction of Flow Pattern in Horizontal Liquid-Liquid Two Phase Flow Using Artificial Neural Network

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Abstract
Flow pattern is one of the main parameters of two-phase liquid-liquid flows. Nevertheless, there is no anaccurate and comprehensive model to predict it. In this paper, artificial neural networks (ANNs) were used for prediction of flow pattern in horizontal liquid-liquid flows. The applied neural networks for this investigation were feed-forward back propagation (FFBP) and probabilistic neural network (PNN).1912 data points from 13 different flow pattern maps reported in literature were collected. Superficial velocity, viscosity ratio and density ratio of oil and water and interfacial tension between them, as well as inner diameter and roughness of pipes were chosen as input variables of both networks and 9 flow patterns were selected as their output variables. The results obtained from optimal structure of networks on their testing data set revealed that the PNN has better performance(withaccuracy of 96.34%) compared to FFBP (with accuracy of73.73%) and can be used as a comprehensive model to predict horizontal liquid-liquid two-phase flow patterns.

Keywords: Liquid-Liquid Flow, Flow Pattern, Oil-Water Flow, Artificial Neural Network

The Effect of Secondary Distributor on Hydrodynamic of Fluidized Bed Reactor

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Abstract

In the fluidized bed reactors, the gas-phase flow turbulent flow increases, causing clotting phenomenon and is away from the bubble flow regime. It also causing a rapid flow regimes and air transport and will be reduced performance of fluidized bed reactor.To solve these problems, in this research, in addition of floor distributor, a secondary distributor has been used for gas phase distribution.In the experiments the effect of gas flow secondary distributor on bubble diameter has been studied. Experimental results showed that bubble diameter was decreased 50 percent because of using secondary distributor. So it will be improve and increasing contact of gas –solid.

Keywords: **Fluidized Bed Reactor, Standard Deviation of Pressure, Secondary Distributor, Bubble Diameter**

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Effect of Calcium Carbonate Nano Particles on Morphology, Mechanical Properties and Crystallization Kinetic of PP/PET Blend

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Abstract

The aim of this research is investigation the effect of $CaCO_3$nano-particles on morphology, mechanical properties and crystallization kinetic of PP/PET blend. Then, different samples containing 3, 5 and 8 phr of nano sized $CaCO_3$were prepared via melt blending and two screw extruder. The results of scanning electron microscopy demonstrated that the addition of 5%wt of PP-GMA as compatibilizer, together with 3 phr of $CaCO_3$nano-particles had pronounced effect on morphology development of PP/PET polymer blend. According to mechanical properties, the sample containing 3 phr of nano $CaCO_3$ indicated the highest values of tensile strength and elastic modulus. The studying of crystallization behavior revealed that the compatibilization of PP/PET blend results in increment of PP crystallinity and decrement of PET crystallinity. The crystallinity degree of PP decreases and crystallinity of PET increases with the addition of nano $CaCO_3$, as well. Finally, the crystallization kinetic of PP/PET blend was estimated by Avrami equation.

Keywords: **Morphology, Crystallization Kinetic, Mechanical Properties, Calcium Carbonate Nano Particles, PP/PET Blend**

Biodesulfurization; Advances and Challenges

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Abstract

New strict regulations to reduce sulfur in fossil fuels require economic and efficient desulfurization methods. Biodesulfurization (BDS) can be an appropriate alternative for applying in industrial desulfurization to achieve the lowest sulfur content in feul owing to its high reflexibility because of utilization of enzyme microbial systems, mild operating conditions, higher safty, and lower environmental pollution. The aim of this research is to investigate on key issues, advances and challenges in biodesulfurization process. In spite of lots of researches performed in recents years, even the highest activity obtained is still insufficient to fulfill the industrial requirements. To improve the biodesulfurization efficiency, more researches should be performed in the fields such as increasing desulfurization activity, finding newer conversion pathways, sulfur removal at higher temperatures, applying genetic engineering techniques, isolating new strains for desulfurizing a broader range of sulfur compounds, optimization of bioreactors design, and examination of combined technologies with this process.

Keywords: Biodesulfurization, Fossil Fuels, Microorganism