Study of Magnetic Iron Oxide Nanoparticles Synthesis for Diagnosis-Therapeutic Applications

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Abstract

Owing to magnetic nanoparticles have the specific properties, they have been used in different sciences especially in medical applications. Therefore, the synthesis of magnetic nanoparticles is the most important topics. In this review paper, the investigation and comparison between different synthesis methods such as co-precipitation, sol-gel, thermal decomposition, micro-emulsion and hydrothermal are studied and then magnetic nanoparticles as a diagnosis-therapeutic agent are introduced. The previous studies showed that the methods included thermal decomposition and hydrothermal are the most appropriate process to synthesis nanoparticles in small and uniform distribution sizes, while the co-precipitation is the easiest method in among the others. The general limitation of this process is difficulty in control of the exact particle sizes. However, in the micro-emulsion technique there is a more ability to control the size and morphology of the particles. In sol-gel method it is possible to synthesize magnetic nanoparticles in different phases after the post heat treatment process. It is important to note that magnetic nanoparticles have a high potential for drug delivery, cancer diagnosis and therapy as well as magnetic resonance imaging.

Keywords: Magnetic Nanoparticles, Iron Oxide, Drug delivery, Diagnosis-Therapeutic

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Investigation of the Effect of Wick's Diameter on Thermal Performance of Heat Pipes

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Abstract

Simulation of a heat pipe was carried out assuming 2D, incompressible, steady state, laminar flow in both vapor region and wick structure. The Darcian model based in porous wick to determine liquid flow in liquid-wick section. The governing equations in vapor region are included; continuity, Navier-Stocks and energy equation. The result of axial outer wall temperature, centerline pressure and velocity magnitude were to be in well agreement with cylindrical heat pipe operation with an error of 0.2% . The effect of variation of wick diameter has been analyzed while the others parameters are considered in fixed values of length 966(mm), wall thickness of 0.85(mm) and wick thickness of 0.356, 0.178,1.424,2.136 and 2.848 (mm). The results showed that the heat transfer coefficient increases by decreases of the wick's diameter.

Keywords: Heat Exchanger, Heat Pipe, Heat Transfer, Simulation, Wick, Darcy's Law, CFD

Isothermal Modeling of CO_2 and H_2S Adsorption Using Metal Organic Frameworks (MOFs)

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Abstract
Adsorption of gases is one of the important processes in the oil, gas, petrochemical industries and also environmental protection. In this research, modeling of carbon dioxide and hydrogen sulfide gases adsorption was investigated using metal organic frameworks to obtain adsorption system behavior and adsorption capacity prediction. Three parameters and multilayer isothermal models were used in the modeling. Experimental data of carbon dioxide and hydrogen sulfide adsorption on four metal organic frameworks were used to obtain the model parameters. The correlation coefficient was used to evaluate the models performance. The modeling results showed that the adsorption process of CO_2 and H2S was physical and the adsorbents have best performance for carbon dioxide adsorption. Between multilayer models, BET model showed a good agreement with experimental data than other models.

Keywords: **Isothermal Modeling, Gas Adsorption, Carbon Dioxide, Hydrogen Sulfide, Metal Organic Frameworks**

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Application of Magnetic Nanoparticles in Biology and Food Fields

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Abstract
Magnetic nanoparticle adsorbentswith a size of 1-100 nm are used for magnetic separation processes and are classified into different groups based on their magnetic properties: ferromagnetic, ferrimagnetic, anti-ferromagnetic, diamagnetic, and paramagnetic. Due to their high surface to volume ratio, they have high energy levels and tend to reduce their energy levels. As a result, they have high loading capacity and limited dispersion. Magnetic nanoparticles are produced by different techniques, the most common of which is simultaneous deposition. These particles are very sensitive to parameters such as pH and temperature changes and ionic strength, and become stable by combining with carboxyl, phosphate and sulfate groups. These particles are used for polymer separation, removal of radioactive materials from wastewater, drinking water treatment, cancer treatment, enzyme immobilization, protein purification, food packaging and tracking techniques. These particles are extremely simple to use, cost-effective and low-risk.

Keywords: **Nanomagnetic Particles, Technique, Purification, Separation, Deactivation**

Microbial Degradation of Oil-Contaminated Water by Indigenous Microorganisms: A Review

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Abstract
Oil spills have caused major concern over their major threat on many different ecosystems. After initial efforts to curb the spread of pollution by chemical and physical techniques, bioremediation as an attempt to combat this pollution is the best and cheapest. Bioremediation features a great strategy on removal of oil spills through application of bioaugmentation and biostimulation as two complementary methodologies. Briefly, bioaugmentation works through application of oil degrading indigenous microorganisms and biostimulation works by stimulation of the growth of indigenous hydrocarbon degraders through addition of specific nutrients (mainly N&P) or other growth-limiting nutrients. In this report, we compared the effectiveness of strategies; autochthonous bioaugmentation and biostimulation in successful remediation of polluted marine environments. The results obtained from various literatures showed a significantly increased biodegradation of crude oil using local microbial consortiums.

Keywords: Biodegradation, Microorganisms, Crude Oil, Bioaugmentation, Biostimulation, Oil-Polluted Water, Biosurfactant

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Effect of Bioreactor on Production of Microbial Biodegradable Biopolymers

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Abstract
Biopolymers are biological macromolecules that have been made a large number of small units and similar which are connected covalently to make a long-chain. Because of the biopolymers are produced naturally of the living organisms such as plants, animals and microorganisms therefor are biodegradable, they are very good. biopolymers have been developed in various forms, therefore have capacity to use in various industries. In order to use biopolymers in industry to commercialization the production process and optimize its production. Regard to the main role a well bioreactor, providing a controlled environment in order to achieve optimal conditions for growth or production, Type of Bioreactor also affects the production of biopolymers. In this study, an overview of the biopolymers and various bioreactor and have been investigated suitable bioreactor for the production of microbial biopolymers.

Keywords: Biopolymer, Biodegradable, Bioreactor

The Review of Production Process Phthalic Anhydride by Selective Oxidation of O-Xylene

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Abstract

The main process to produce phthalic anhydride in the petrochemical plants is selective oxidation of o-xylene within a fixed bed reactor with TiO_2 supported V_2O_5 catalyst. Phthalic Anhydride (PA) is the one of the most applicable within industry. Production of plasticizer (polymeric additive to increase flexibility) and polyester is the one of the most important usage of PA. The most important deactivation factors of catalyst, is phase change from anatase to rutile and stabilization of vanadium V^{+4} inside the rutile *structure. This phase change causes a gradual decrease in selectivity to phthalic anhydride in procedure. In recent years, plenty of investigations have been carried out to deal with it. However, it has not obtained desirable structure of support for preventing the phase change from anatase to rutile, so that selectivity and catalytic activity will not be affected. This paper presents an overview of the oxidation catalyst process of o-xylene and synthesis methods.*

Keywords: **Selective Oxidation, O-Xylene, Phthalic Anhydride, Vanadium Pentoxide, Support of Catalyst, Promoters**

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Investigation of Optimum Effect of Matrix Acidizing in Carbonate Reservoirs Stimulation of Darian's Formation of Ahwaz Oilfield

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Abstract

Due to the failure of some stimulation operations which have applied on carbonate reservoirs of Darian's formation of Ahwaz oilfield, in order to improvement in formation damage and increase in permeability, the effect of several acids (HCL with 10%, 15% and 28% dosages) was evaluated by comprehensive research on a candidate well. Moreover, the porosity type of this formation was evaluated due to another research by using core analysis tests, FMI Tool reports and well testing analysis by PanSystem v3,4 software. According to the results, high concentration of acid, it is not always in tune with its increasing performance and the optimum concentration on the conditions of each reservoir and oil wells should be consider. Consequently, using HCL 15% is creating the best condition to this stimulation process. Success of this operation is also clear due to decreasing in skin factor of 5 to -4.45. Since there is a disagreement between the reservoir engineers regards to the being single or dual porosity of Darian's formation, notwithstanding of its carbonate reservoirs, being single porosity of this formation is more logical, according to the evaluation's results.

Keywords: **Stimulation, Acidizing, Permeability, Skin Factor, Well Testing, Carbonate**

Influence of Zirconium Silicate on Melting, Color Properties and Expansion Coefficient of Porcelain Glaze

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Abstract

This study deals with investigating the effect of different amounts (2-14%) of zirconium silicate ($ZrSiO_4$) on the physical and optical properties of porcelain glaze at 1350℃ firing point. The study was performed using different amounts of $ZrSiO_4$ in porcelain glaze and scanning electron microscopy (SEM) images, X-ray diffraction spectra (XRD), X-ray fluorescence (XRF) and colorimetric tests were used to study the mentioned properties. Result shows that by increasing $ZrSiO_4$ content from 2% to 14% the color, whiteness, opacity, and thermal expansion coefficient (TEC) changed significantly and all of these parameters were in their optimum point at 12% $ZrSiO_4$. High diffraction in glaze with 14% zircon decreases shines because of baddeleyte, zirconium oxide and zircon crystals.

Keywords: Zirconium Silicate, Porcelain Glaze, Ppaque Glaze