An Introduction to the Hazards Identification and Risk Assessment Techniques

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Abstract

In this paper qualitative, quantitative and hybrid techniques of hazard identification and risk assessment were presented. Qualitative techniques such as preliminary hazard analysis, checklist, what-if analysis, what-if/checklist analysis, 2 guide word analysis, hazard and operability study, failure modes and effects analysis, quantitative technique such as layer of protection analysis, Dow fire and explosion index, Dow chemical exposure index, hybrid technique such as fault tree analysis, event tree analysis, cause-consequence analysis, human reliability analysis event tree, were presented. Factors influencing the selection of techniques were discussed. The statistical analysis of scientific articles period of 2000-2009 shows relative frequency of quantitative (65.63%) ,qualitative (27.68), hybrid methods (6.70%).The hybrid techniques have great complexity due to their ad hoc character that prevents a wide spreading. Greatest number of risk analysis methods was in Industry (53.71%), Mechanics (12.38%) and Transportations (12.87%) and lowest number was in environment (0.43%).

Keywords: Hazards Identification, Risk Assessment, Qualitative, Quantitative and Hybrid Techniques.

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Membrane Bioreactor: A Review on the Operating Parameters and Parameters Related to the Characteristics of Biomass

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Abstract

Membrane bioreactor (MBR) is the combination of a membrane process with a suspended growth bioreactor and has been widely used for removing organic and inorganic contaminants as well as microorganisms from municipal and industrial wastewaters due to its distinct advantages over conventional technologies. In order to achieve the high quality of treated wastewater and reduce fouling in the MBR systems, several factors must be optimized. In the current study, at first, different types of MBRs were reviewed in terms of aeration, configuration, material and the membrane modules. Then the operational parameters affecting the performance of the MBR such as the hydraulic retention time, sludge retention time and concentration of feed inlet and also the parameters related to biomass characteristics such as biomass concentration, particle size distribution, microbial products (extracellular polymeric substances and soluble microbial products) and morphology of biomass were reviewed.

Keywords: Membrane Bioreactor (MBR), Operating Parameters, Biomass, Soluble Microbial Products (SMP), Extracellular Polymeric Substances (EPS), Hydraulic Retention Time (HRT), Sludge Retention Time (SRT), Morphology, Membrane Fouling.

Applications of New Membrane Reactor Technology in the Chemical Industry

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Abstract

In recent decades, the integration of separation processes and reactions in a unit known as membrane reactor technology as a very powerful tool to improve the efficiency and economy in the chemical industry, has put promising procedures toward the researchers. The main objective of this study was to give a full report on the use of new technologies of membrane reactors in the chemical processes. In this study, first a variety of membrane reactors including polymeric, silica, metal, zeolite and perovskite membrane reactors has been investigated. Then, the application of this novel technology in various chemical processes, including processes of reforming, dehydrogenation, isomerization and decomposition of ammonia and CO_2 and NO_x has been analysed. Nowdays, due to the application of fossil fuels, environmental problems caused by greenhouse gas emissions is taken into consideration. Hence, the hydrogen as a clean fuel alternative is suggested. Literatures indicated that hydrogen can be achieved by using membrane reactor technology during the hydrocarbons reforming processes. On the one hand, regarding to hydrogen production purpose and its use in fuel cells, ammonia is considered as a suitable energy carrier for hydrogen production and its decomposition process, greenhouse gas emissions, involving CO and CO_2, will not be obtained. On the other hand, by applying this technology in the analysis of nitrogen and carbon oxides, the harms caused from greenhouse gas emissions can be depleted.

Keywords: Membrane Reactor, Hydrogen, Decomposition of Ammonia, Membrane, Reforming.

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A Review on Plasmonic-Metal Nanostructures, and their Preparation Methods

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Abstract

Nowadays, metal nanostructures are interested due to their exclusive physical and chemical properties. In this review paper, different shape and size controlled methods for preparation and synthesis of metal nanostructures have been considered. Among these metal nanostructures, silver nanowires due to their plasmonic characteristics and potential applications in optoelectronic devices have been studied significantly. Therefore, here, physical and chemical methods of silver nanowire synthesis are presented in details. Furthermore, new procedures such as double reductant method, etching technique and construction of core-shell nanostructures are introduced. Since the Polyol method is the most successful way to prepare silver nanostructures with well-controlled shapes, this technique was explained comprehensively in this text.

Keywords: Metallic Nanostructures, Silver Nanowires, Polyol Process, Plasmonic Effect.

Experimental Measurement of Cooling Water Fouling in an Annular Flow Heat Exchanger

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Abstract

Cooling water as one of the most common heat transfer fluids used in the industrial units has great potential for scale formation in heat exchangers. In this study, large number of experiments performed to measure the cooling water fouling in a heat exchanger with annular flow and hydraulic diameter of 40 mm under forced convective heat transfer. The experiments performed to study the effects of parameters like fluid velocity (0.019, 0.037, and 0.058 m/s) and heat flux (16180, 18520, 24631 W/m2) on surface temperature, heat transfer coefficient and fouling resistance. In this study, increase of the heat transfer surface temperature with time was used as an evidence for deposit formation on the surface. Results showed that increasing the fluid velocity decreases the temperature of the heat transfer surface, and as a result enhances the heat transfer coefficient, and decreases the fouling resistance. Also, it was shown that increasing the heat flux enhances the surface temperature, decreases the heat transfer coefficient and increases the fouling resistance.

Keywords: Heat Exchanger Fouling, Fouling Resistance, Cooling Water, Heat Resistance.

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Design and Construction of Hydro Silica Gel Based on Polyacrylamide: Examining its Properties under Reservoir Condition

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Abstract

Like other oil fields around the world, excessive water production in oil fields in south of Iran is one of the major problems in the oil production process. It is possible that using of polymer gels injection technology as a diverting and/or blocking agent, improve the oil production. Accordingly, the reason behind the conduct of this study is the injection of polymer gels into these reservoirs with the purpose of increasing oil production and reducing water production. In the present study, design and construction of the hydro silica gel polymer system has been studied. In this work, a hydrogel was prepared by crosslinking of aqueous solutions of sulfonated polyacrylamide/ sodium silicate and organic initiator (citric acid). Central Composite Design (CCD) was used in order to determine the structure of suitable gel and the effect of parameters on gelation time as a basic and primary cause in the performance of such gels. Also, to offer a mathematical model for predicting gelation time (as a response) based on the parameters of polymer concentration, sodium silicate and the amount of initiator and their interactions. The guaranteed quadratic model was the result of analysis of variance for fitted quadratic curve which estimates the degree of reliability of 99%. The results indicated that the percentage weight of sodium silicate was the most effective parameter in the formation of hydro silica gels. Besides, by increasing of the sodium silicate initiator ratio, the gelation time was increased. Results also showed that at copolymer concentration higher than 4000ppm, the gelation time becomes too long. In this research, the mechanism of the performance of gelation time has further been offered based on designed parameters. Eventually, five new descriptions of gels were obtained, and considering the existing criteria for specifying optimized gel, two samples of hydro silica gel, one for conformance control, and the other one for relative permeability modifier were obtained for water shut off operation.

Keywords: Hydro Silica Gel Polymer, Water Shutoff, Gelation Time, Gel Strength, Formation Water.

Influence of Surface Characteristics on the Intensity of Scale Formation on Modified Surfaces

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Abstract

Various approaches are available for the reduction of scale formation on heat transfer surfaces. Among these methods, though, the surface modification is considered as an innovative and efficient, environmentally-friendly approach to mitigate fouling. The notion here is to reduce the interactions between the precursors and the modified surface thus least wetting of the surface by the precursors would be expected leading to mitigation of scale formation. In this study, previous studies on the respective subject is surveyed to in order relate the effect of surface characteristics on fouling. It is shown though that previous studies have sometimes made conflicting conclusions for which the reasons are discussed in details. The paper goes on to conclude that there exists no robust and general criterion to relate surface energy and its sub-components to fouling propensity of various coatings.

Keywords: Surface Modification, Surface Characteristics, Surface Energy, Intermolecular Interaction Energies, Heat Exchanger Fouling.

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The Effect of Pozzolanic Materials in Improve the Negative Impact of the Transition Zone in Concrete

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Abstract

In the space between cement paste and aggregate in concrete, a region with high porosity has been observed that is called interfacial transition zone. High porosity reduces compressive strength and tensile strength in concrete. That's why researchers seek to reduce the effect of the transition zone. Mineral additives in small sizes, can be two ways to improve the transition zone. First, by filling the porosity of concrete in transition zone and secondry with pozzolonic reactions that leads to the production of binder. For example, silica fume, nano silica, rice husk ash, metakaolin, slag, etc. which are amorphous silica, can react with calcium hydroxide, which is non-binder material and has a high concentration in transition zone. As a result, the production of binder (calcium silicate hydrate gel) causes the decrease porosity and increase bond strength of cement paste and aggregate.

Keywords: Silica Fume, Pozzolonic Materials, Interfacial Transition Zone, Mineral Additives.

Effect of Organic Template, Transition Metal, and Ultrasonic Irradiation on the Synthesis of SAPO-34 Crystals as a Catalyst for MTO Process

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Abstract

In this study, SAPO-34 molecular sieves were synthesized by using both sonochemical-assisted hydrothermal and conventional hydrothermal heating and characterized by XRD and SEM techniques. Furthermore, to evaluate the effect of template on quality, performance and structure of final products, morpholine and tetraethyl ammonium hydroxide (TEAOH) were used separately as structure directing agent (SDA). Moreover, NiSAPO-34 molecular sieve has been synthesized and compared with SAPO-34 in order to determine the effect of transition metal ion on the physicochemical properties of samples. According to the results, it is found that template had an important effect on determining the shape, morphology and size distribution of the final products, metal incorporation into SAPO-34 framework increased crystallinity, and ultrasound irradiation led to a narrow particle size distribution.

Keywords: **MTO Process, SAPO-34, Transition Metal Ion, Template, Sonochemical Method, Hydrothermal Synthesis.**