Catalytic Membrane Reactors

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Abstract

Recently, using membrane reactors in the processes contain catalytic reaction has attracted much more attention. In such hybrid systems, a membrane separation process is coupled with the catalytic reaction, and using membrane is led to increase the selectivity and the efficiency of the reaction. In this study, the types of membrane reactors based on the geometry, material of the membrane and the structure and function of catalytic reactors based on location and type of the catalyst are first mentioned. After, the reaction systems coupled with the membrane separation processes, such as catalytic membrane reactors, pervaporation membrane reactors and membrane bioreactors are investigated. In addition, type of the catalytic membrane reactors and the reaction occurred in these systems are discussed in detail.

Keywords: Membrane Reactor, Catalytic Reaction, Hybrid Processes, Separation

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Study of Mechanism of Bubble Nucleation, Bubble Growth and Bubble Disengagement in Solution Gas Drive Process in Heavy Oil Reservoirs

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Abstract

Bubble growth is one of the key parameters in solution gas drive modeling study. It is required that the dominant forces to be specified and calculated appropriately for the bubble growth modeling. In addition, performance capability and reliability of experimental models of bubble growth should be specified before consideration. In this paper, mechanisms of bubble formation, bubble growth and gas phase flow in solution gas drive process in heavy oil reservoirs are studied. Also, various theories with different correlations and assumptions are presented.

Keywords: Solution Gas Drive, Homogeneous Nucleation, Heterogeneous Nucleation, Bubble Growth, Gas Phase Flow

Numerical Modeling of Heat Transfer and Pressure Drop in a Modified Solar Heater Using Computational Fluid Dynamics

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Abstract

In this paper, a numerical modeling of heat transfer and turbulent flow in a solar heater with Delta-Winglet vortex generators is presented. Calculations by the finite volume are conducted using the SIMPLE algorithm. Air turbulent flow with various mass flow rates under the Reynolds number of 5000-22000 was investigated. The CFD predictions were compared with the experimental data and good agreement was observed. The results showed that Nusselt number and friction factor in a system fitted with combined rib and delta-winglet vortex generators are higher than those of traditional ribbed systems. In addition, a system fitted with combined ribbed top and bottom walls and vortex generators through the inlet was proposed, and increase in Nusselt number was shown in comparison with previous systems.

Keywords: Solar Heater, Vortex Generator, NusseltNumber, Friction Factor

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Investigation of Thermodynamic Perturbation Theory in Fluid Statistical Mechanics

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Abstract

Perturbation theory is a helpful tool in many branches of theoretical physics, and also the statistical mechanics of classical liquids. The perturbation strategy not only plays an important role in bulk fluid thermodynamic properties, but also, in recent year, has become more important in bulk solids, in classical density functional theory and integral equation thermodynamic theory. On the base of thermodynamic perturbation theory, thermodynamic quantities are related to molecular structures via THE radial distribution function and molecular structures are extremely established with hard sphere potential interaction. In the last two decades, there have been advances in all types of theories. All versions of this theory includ 1) Zwanzig approach which expressed so-called high temperature series expansion and formulate the first term of perturbation expansion 2) Barker-Henderson theory for the second order term and higher order terms, and also some modification of Barker-Henderson theory 3) Week-Chandler-Anderson soft-core perturbation theory has been developed by Ben-Amotz and Stell (BAS) via introduction of Boltzmann factor criterion as the effective diameter. In this work, different versions of thermodynamic perturbation theory for the bulk fluids are investigated and Zhou λ-expansion approach as a new version of thermodynamic perturbation theory will be introduced and compared with the Barker-Henderson macroscopic compressibility approach.

Keywords: Classical Fluids, Statistical Mechanics, Equation of State, Perturbation Theory, Effective Hard Sphere

Comparison of Precoat and Mixed Bed Resins in Condensate Polishing Plant, Regarding Applicability, Technical and Economical Aspects

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Abstract

Condensate polishing plant (CPP) is employed in power plants for treatment of all or a part of condensate stream in order that the standard quality of boiler/feed water be kept constant. The sources of the impurities could be damage of condenser tubes, concentration of negligible impurities in the boiler inlet water in the steam phase and/or corrision products of metals in contact with water or steam. CPP units treat water both physically and chemically. In order to deionize water, different types of ion-exchange resins are used as mixed or precoat. Selecting the resins type depends on water analysis and operating conditions.
In current paper, the sources of impurities in the condensate are described and the necessity of CPP application in steam and combined cycle power plants and also the advantages of the mentioned plants are discussed. Furthermore, different types of CPP systems are introduced and are compared from different aspects.

Keywords: Condensate Polishing Plant, CPP, Precoat Resin, Mixed Bed Resin

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Comparison of Different Methods for Removal of Ammonia Nitrogen and Nitrate from Wastewater

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Abstract

Growth of population and industrial development has led to increased production of wastewater. Different forms of nitrogen in some industrials such as fish farming attracted the attention of researchers to the efficient nitrogen removal methods. Nitrogen-rich waste from outflow of wastewater treatment plants, agriculture wastewater and surface runoff has increased nitrogen level in aquatic ecosystem and disrupt it. In this text nitrogen removal techniques are classified to four general categories include: physicochemical, biological, electrochemical and bio-electrochemical treatment. Physicochemical treatment include: reverse osmosis (RO), ion-exchange (IE), electro-dialysis (ED) and activated carbon. Three overcome approaches to biological treatment are suspended growth, attached growth and combination of the two methods. Among these methods biological and bio-electrochemical are more suitable because of the environmental sustainability, simplicity and low process cost.

Keywords: Wastewater Treatment, Nitrogen Removal, Biological Technique, Electrochemical Technique, Physicochemical Technique, Bio-Electrochemical Technique

Potentials and Challenges of Heavy Metal Recovery and Removal from Zinc and Lead Industrial Waste Streams Using Membrane Technology

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Abstract

Pollutions generated from zinc and lead industrial units are considered as one of the serious environmental concerns due to the presence of various types of heavy metals. Therefore, in recent years, numerous technologies have been exploited for the removal and recovery of heavy metals from waste water streams. With the emergence of novel technologies and particularly membrane-based separations, new opportunities are opened for application of membranes for the treatment of waste water streams with easier operation and higher productivity. The present manuscript aims to introduce the properties and potentials of various membrane technologies including ultrafiltration, reverse osmosis, nanofiltration and electrodialysis for the treatment of waste water streams containing heavy metals with special attention to the zinc and lead industry. The opportunities, challenges, benefits and limitations of each technology are presented and described in details. Based on carried out assessments and considering factors such as energy consumption, removal efficiency, membrane flux and process costs, nanofiltration can be recommended as one of the best choices for heavy metal removal from waste water streams. However, other studied technologies can also gain wide applicability for this purpose by overcoming the limitations and obstacles such as fouling, high energy consumption and chemical usage.

Keywords: **Membrane Technology, Zinc and Lead, Heavy Metals, Waste Water Treatment, Nanofiltration**

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Performance of Biosurfactants in Microbial Enhanced Oil Recovery (MEOR)

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Abstract

Microbial enhanced oil recovery method (MEOR) refers to all processes thatuse the capabilitie of various microorganisms to produce microbial metabolites to improve the efficiency of oil extraction. One of this metabolites, isbiosurfactant. Biosurfactants are surface active compounds that dissolve organic compounds in inorganic compounds by reduction the surface tension. In this paper will have an overview on methods and the advantages of using biosurfactants and effective factors in production and the impact of environmental condition on biosurfactantperformancein microbial enhanced oil recovery.

Keywords: **Enhanced Oil Recovery, Biosurfactants, Oil, MEOR**

Assessment of Heavy Metals (Ni, Cr, Cd) Removal by Avicennia Marina Plant Asalouyeh Zone

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Abstract

The goal of the present study is to investigate on elimination removal of heavy metals (Ni.Cd.Cr) while using Avicenna Marina plant. These plants are sampled from different parts of Hara jungles in Asalouyeh, after they have placed in pilot for a month in 2.5, 5.0, 10.0 and 15.0 ppm densities and pH=7.8 are studied separately and on a compound type from the items and consequently, the results are found by Spectrophotometer systems and the amount of remaining density is obtained in the Timar lotion. Considering experimental results in the filtration of any separate element with increase in Chrome and cadmium ion, increase in absorbance by the plant and in nickel with increase in density, we have been witness to the decrease in absorbance and in the mixture state of the elements in culture medium with increase in density of the elements, increase in absorbance of the chrome and nickel ion is observed, but with decrease of the total absorbance amount in comparison with separate state they were parallel. In nickel ion with increase of density, decrease in density process has been observed which has been accompanied with increase in total amount. In continuation of the researches, contact time effects has shown than the most absorbance amount during 5 days are carry out by the plants. To study pH effect, plants absorbance potential are studied in pH=2,4,6,8,10 and in ppm 15 density of Chrome ion during 7 days. Finally, according to the experimental results made, the most absorbance amount by the plant were respectively chrome ion > nickel> Cadmium in pH=8 during 5 days.

Keywords: Avicenna Marina Forest, Heavy Metals Removal, Mangroves Plant