Mathematical Modelling of Diffusion and Dispersion Mechanisms in Miscible Gas Injection Process

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Abstract

Diffusion and dispersion are considered as the two fundamental mechanisms for the miscible gas injection process in the oil reservoirs, which unfortunately are mostly disregarded in the reservoir simulators. In fact, these two phenomena tend to control the miscibility of the injected fluid with oil in the porous media. Neglecting theses (existing) phenomena in reservoir simulators may bring about erroneous results, which may subsequently role an unreliable basis to be applied into the gas injection projects. The aim of this work is to exhibit the error that should be emerged in case of neglecting these phenomena, in a quantitative manner. Initially, the effects of diffusion and dispersion are shown during a miscible gas-injection process using a one-dimensional model under different scenarios. Such scenarios include both considering and neglecting the diffusion and dispersion terms. A comparison between the results from each scenario should demonstrate if a considerable error should arise in the simulation results by neglecting these effects. It would also show if such neglecting will result in inaccurate estimation of gas composition change, oil recovery factor, and the gas breakthrough time. Based on the expected results, an appropriate dispersion coefficient for accurate design of miscible gas injection processes will be estimated and introduced.

Keywords: Molecular Diffusion, Physical Dispersion, Mechanical Dispersion, Miscible Injection

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The Importance of History Match Quality on Reservoir Performance Prediction by Application of Miscible Gas Injection Different Scenarios

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Abstract

Simulation is used as a management important tool for reservoir studies and history matching is the most important of issues in the simulation. One of the most important steps in hydrocarbon reservoir simulation is history match. To have a reliable future production or functioning from the reservoir, it is necessary to run a history match on simulated model of the reservoir. This process is generally carried out either manually or automatically. In this paper, the effect of precise and high quality history match is investigated in reservoir production forecast via applying some miscible gas injection and natural depletion scenarios on two different normal and fractured reservoir models separately. It is worthy of note that both reservoir models were subjected to automatic history match prepared. In each model, two situations of history match with different precision levels were chosen and then different scenarios were simulated. Finally, the result of scenarios were compared and evaluated according to the precision of each situation.

Keywords: History Matching Process, Reservoir Simulation, Uncertainty Parameters, Miscible Gas Injection

Synthesis Methods and Applications of (Metal-Organic) Frameworks (MOF)

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Abstract

Metal organic frameworks (MOFs) are regular structures obtained from the connection of organic and inorganic materials. MOFs are applicable materials in different scientific and industrial aspects. Various applications of MOFs are increaing in different processes due to their unique features such as: high surface area, high thermal and mechanical strength, low density and high porosity. This paper represents the most important recent research achievements of MOFs in selective adsorption, hydrogene storage, catalysis, luminescence, and drug delivery.

Keywords: **Metal Organic Frameworks, Gas Adsorption, Separation, Heterogeneous Catalysis, Luminescence**

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Modeling and Simulation of Simultaneous Heat and Mass Transfer Processes in the Force Convection

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Abstract

In this article, a modeling of the simultaneous heat and mass transfer processes in force convection for a laboratory system is provided. Solution of large sets of non-linear algebraic equations reveals that the mass transfer has an immense effect on the heat flux and this effect is greatly enhanced in present of condensation, evaporation and absorption. Simulation results about the effect of mass transfer on heat transfer coefficient and total heat flux for various systems such as water vapor condensation from humid air, evaporation of water into dry air and simultaneous water vapor evaporation into air containing ammonia and ammonia absorption from air to water, have been completely investigated.

Keywords: **Simultaneous Heat and Mass Transfer, Water Vapor Condensation, Water Evaporation, Ammonia Absorption**

Improving Glucose Bio Sensor Using Colloidal Gold Nanoparticles

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Abstract

One of the best methods for detecting a few glucose values is to use of glucose oxidase electrochemical sensor. The application of colloidal gold nanoparticles can be effective in biosensors structure as a complementary substance. This material was increased the efficiency and the operation. In this article, the biosensor electrode was prepared by the mixed of colloidal gold nanoparticles (24nm), carbon graphite powder and paraffin oil (A_{unano}/CPE). The amperometric experiments were done by applying 0.7V constant potential. The electrodes were put on glucose solutions with different concentration values (0-1 mM) and pH values (4, 6, and 8) and the amperometric values for each electrode (A_{unano}/CPE and CPE only) were determined. The highest produce current was obtained in 1 mM at pH=6 as optimal conditions. The amperometric responses of A_{unano}/CPE was compared to carbon past electrode (CPE) in different pH and concentration values. Based on the results, the use of colloidal gold nanoparticles improve the biosensor performance.

Keywords: Colloidal Gold Nanoparticles, Ampere Metric, Biosensor, Glucose, Glucose Oxidase

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Modification on Properties of Magnesium Hydride for Hydrogen Storage

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Abstract

In this study, hydrogen fuel and its advantages as well as hydrogen storage methods are introduced. Based on the investigations, using metal hydrides, especially magnesium hydride, is the most promising method for hydrogen storage. Magnesium hydride offers high storage capacity, light weight, low cost and high safety. In spite of these advantages, hydrogen release temperature is high and also desorbtion kinetic is slow for this material. Furthermore, magnesium hydride could easily be poisoned when exposed to oxygen. The mentioned problems have caused limitations in technical application of this material in hydrogen storage. In current study, methods to overcome these problems and to modify magnesium hydride properties are discussed.

Keywords: Hydrogen Storage, Metal Hydride, Magnesium Hydride

Future Progresses of Polyacetylene Based Conductive Polyurethanes

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Abstract
Intrinsically conductive polymers (ICPs) are the polymers with structures including conjugated double bonds in their backbones which have low electrical conductivity naturally. Electrical conductivity of these materials that in some cases are comparatively with conductivity of metals could be raised significantly with the assistance of special reagents. Doped polyacetylenes are the polymers with proper electrical conductivity, but their commercialization due to relatively difficult processing and intrinsically instability is encounter with various problems. Polyurethanes are one of the best modifiers to ICPs features because of their excellent mechanical, physical and chemical properties. This can be obtained through common blending with conductive polymer or to introduce polyacetylene structure in to polyurethane backbone by chemical modification.

Keywords: **Intrinsically Conducting Polymers, Polyacetylene, Polyurethanes, Doping, Electrical Conductivity, Telechelic Polymers**

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Design of Shell-Tube Heat Exchangers Equipped with Static Mixers

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Abstract
This paper presents a rapid algorithm for designing of shell-and-tube heat exchangers equipped with static mixer inserts. The proposed algorithm uses formulation of the Kern and Bell-Delaware methods to describe the shell side flow pattern and the effect of calculation of heat transfer coefficient separately. The results are considered for application of the proposed algorithm in simple real case studies. In this work advantages of heat exchangers equipped with different static mixers and the effect of their working conditions in turbulent regime are studied. The effect of changing the number of tube passes is evaluated. The results are also compared with the previous studies.

Keywords: **Shell and Tube Heat Exchangers, Static Mixer, (Bell-Delaware) Method, Kern Method, Rapid Design Algorithm (RDA)**

Review of Mass Transfer and Solubility Modeling in Subcritical Water Extraction

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Abstract

In this study, mass transfer and solubility modeling of subcritical water extraction have been investigated. The Methods for estimating solute dissolved in subcritical water include experimental models, Hansen solubility parameters, solubility model based on pure component properties, the modified UNIFAC model, dielectric constant. The existing methods based on solubility data are limited. The solubility data of various solutes include hydrocarbons, essential oil compounds, pesticides, poly-phenolic compounds at high and low boiling point temperatures of water. Knowledge of phase equilibrium, mass transfer rate and solubility data for the design of extraction processes and equipment are important.

Keywords: Extraction, Mass Transfer, Solubility, Subcritical Water