# Ethanol Production by *Mucor Hiemalis*

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**Abstract**

*Ethanol production by the filamentous fungus Mucor hiemalis under anaerobic conditions was investigated. Effects of medium composition including vitamins, trace metals, $ZnSO_4$, $CaCl_2$, $K_2HPO_4$, $(NH_4)_2SO_4$, $MgSO_4$, and yeast extract were studied, using either factorial design or central composite rotatable design (CCRD) of the experiments. Yeast extract concentration showed a significant effect on the growth and ethanol production by the fungus, which could not be substituted by the other defined components. The inoculation of fungus spores and incubation for 36 h resulted in 0.47 g/g ethanol and 0.16 g/g biomass at the best conditions. The optimum concentration of yeast extract was 4 g/l, and no other nutrient except the carbon source was necessary. The fungus produced glycerol as the only major byproduct in terms of concentration, and yielded 0.012-0.085 g/g.*

**Keywords:** **Ethanol, Mucor Hiemalis, Experimental Design, Fermentation, Medium Optimization**

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# Necessity of Paying Attention to Product Design Beside Process Design in Chemical Engineering Education

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**Abstract**

*In recent years the chemical process industry has faced important technical, economical and social challenges. As a result, the nature of its products, businesses, strategies and ultimately the needs associated with the skills and technical knowledge of chemical engineers suffered enormous evolutions. All of these, driving the minds to create a new branch of chemical engineering as chemical product design (CPD). Improve the situation of employment for chemical engineers through small businesses with low risk, is one of the advantages of CPD development in country. General procedure of chemical product design together with its characteristics and two case studies are introduced in this paper.*

**Keywords:** **Chemical Product Design; Chemical Process Design; Chemical Engineering Education**

# General Modeling of the Four-Stage Falling Film Evaporators With Wavelets

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## Abstract
*Supercritical solvents, known also as dense gases, are the preferred choices over conventional solvents when the extract has a superior quality, usually associated to a high economic value. This is also true for raw materials, favours, fragrances, and other thermo labile substances in the cosmetic and pharmaceutical industries or in cases where toxicity represents a major issue. The application of the supercritical fluid extraction technology often depends on the correct prediction of the phase behavior of mixtures in the critical region so different models have been developed for this phase behavior. Most processes encountered in chemical engineering can be described by an analytical model in the form of a first principal model (FPM). Capabilities of traditional models are often limited and more proper models are needed for prediction of processes which need more accuracy and less development time. On the other hand, artificial neural networks (ANNs) are computationally efficient tools which generate a good model if sufficient experimental data is available. Though such models provide not much information on the internal dynamics of the process but they could provide accurate input to output model of the process. The network parameters are estimated by training the net with a prior knowledge of the process.*

**Keywords:** **Falling Film Evaporators, Noise Reduction, Wavelet, Wavenet, Time Delay Detection, Self Similarity**

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# Modeling of Biological Removal of $H_2S$ from Gas Flows in Biotrickling Filters

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## Abstract
*Wastewater treatment, oil and gas facilities along with the other industrial sections such as food, pulp and paper industries are the main sources of hydrogen sulfide emission to the atmosphere. Hydrogen sulfide is a toxic, flammable and corrosive gas, so several methods have been used for its removal. The physical and chemical methods are not cost effective and cause secondary pollution. The biological methods have recently received increasing interests as they can overcome the process and disposal costs. In this work a Biotrickling filter with counter-current flows of gas and liquid was modeled. In this dynamic model, it was assumed that hydrogen sulfide transferred from the gas phase to the liquid bulk, then to the biofilm. The effects of gas flow rate, liquid velocity, column height, and residence time on the performance of the bioreactor were investigated. The model showed that by increasing the gas flow rate up to 1.8 $m^3h^{-1}$, elimination capacity was increased, whereas removal efficiency was decreased. Moreover, by increasing the velocity of the trickling liquid from 2 to 15 m/s, removal efficiency increased from 26% to 99.7%. Higher heights of bioreactor resulted in higher removal efficiency of hydrogen sulfide and its effect was more significant at lower residence times.*

**Keywords:** **Biotrickling Filter, Hydrogen Sulfide, Elimination Capacity, Removal Efficiency, Modeling**

# Study of Formation Conditions of Gas Hydrate in Gas Transfer Pipelines by Using Minimization of TPD Function

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**Abstract**

*In this work, stability analysis calculations of gas hydrate for transmitted gas of Sarakhs and Kangan refinery into 56 inch pipeline at the base of minimization of TPD function and for determination of thermodynamic formation conditions of gas hydrate were performed. After determination of equilibrium pressure of formation of hydrate in various temperatures, results in pressure-temperature curve for these two gas refineries are displayed. Genetic algorithm is used for minimization of TPD function. In this work, results with data of HWHYD Model are compared.*

**Keywords:** **Stability, Gibbs Free Energy, Minimization, Gas Hydrate**

# Experimental Study and CFD Simulation of Decoking Hydrocyclone in Jam Petrochemical Company

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**Abstract**

*In this work CFD simulation of water-coke hydrocyclone has been considered and influence of effective parameters have been investigated. The RSM turbulence model, mixture multiphase approach Schiller Naumann drag model have been used. The results are in good agreement with empirical data from industrial hydrocyclone in Jam Petrochemical Company. The simulation results show that with enhancement of entrance particle size the separation efficiency increases. Moreover, three different turbulence models (RNG K-ε, Realizable k-ε and RSM) applied in this work and results show that the RSM is the best approach in terms of accuracy. Moreover, changes in mass flow rate in inlet show that increasing the flow rate can increase the efficiency. Additionally, the number of inlets has been examined in this study. The results show that the two inlets design can produce the better results compared to single inlet one.*

**Keywords:** **Hydrocyclone, CFD Simulation, Turbulence Models, Decoking, Mixture Model**

# Viscosity of Polar Fluids in the Critical Regions from the Perturbed Virial Expansion

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**Abstract**

*In this work, viscosity of polar fluids such as R125, R22, and R134 in the critical regions are calculated theoretically. For this purpose, the perturbed virial expansion is first applied to calculate the fluid critical points. Then, using these points, the critical viscosity is obtained. In this work, two potential models like the dipolar hard-sphere and Stockmayer potential have been used. According to the obtained results, it is found that: i) the critical temperatures, pressures and viscosities obtained by using the Stockmayer potential are better than the dipolar hard- sphere potential. ii ) the critical densities obtained by using the both models, are equal.*

**Keywords: Polar Fluid**, *Stockmayer Potential*, *Dipolar Hard- Sphere Potential*, **Perturbed Virial Expansion, Critical Points**

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# Differential Scanning Calorimetery as a New Tool for Medical Diagnosis

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**Abstract**

*Early detection, cost and time-consuming procedures were always considered in designing new tools for medical diagnosis for various diseases. Detecting biomarkers as important indicators of diseases are promising procedures. Although modern techniques such as proteomics have been solved many problems, they are both cost and time-consuming and also are not much able for detecting protein complexes. Differential scanning calorimetery (DSC) is one of the modern methods with high accuracy and sensitivity, which is capable of diagnosis for diseases at early stages through detecting biomarkers. Plasma & cerebrospinal Fluid (CSF) thermograms of the patients seem to act as specific biological signature that indicate total amount of changes occur in protein structure during the different stages of particular diseases. It is very soon to judge about DSC technique but current studies have revealed new hopes in diagnosis and investigation of the early stages of the diseases. In this article theoretical illustration and medical application of DSC is explained.*

**Keywords: Differential Scanning Calorimetery (DSC), Cancer, Biomarker, Sensitive and Accurate Diagnostic Procedure, Early Stage Detection, Protein Conformational Change**

چکیده مقالات

# Comparison of Miscible and Immiscible Gas Injection in Respect of Formation Damage and Displacement Characteristics in Porous Media

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**Abstract**

*This study investigates asphaltene precipitation and deposition due to miscible/immiscible gas injection as well as its impact on rock properties and gas injectivity in one of Iranian southwestern oilfields. Displacement characteristics like GOR, breakthrough time and oil recovery are also studied.*
*According to experiments, induced miscible/ immiscible gas injection permeability impairments are negligible. Therefore, gas injection has no negative impact on the formation regarding asphaltene precipitation and deposition.*
*Ultimate oil recoveries are about 73% and 66% for miscible and immiscible gas injections respectively. These approximate oil recoveries are obtained in laboratory core scale representing microscopic sweep efficiencies then to convert it to field recoveries it should be multiplied by macroscopic ones to be experienced in the field application.*

**Keywords:** **Gas Injection, (Miscible/Immiscible), Asphaltene Precipitation, Formation Damage, Oil Recovery**