# Investigation of Mixing in Solids

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**Abstract**
*The target of solids mixing is to obtain a product with acceptable quality or to control rates of heat transfer, mass transfer and chemical reaction. First, the part of this review paper is to introduce the role of solids mixing in industries. Second, mechanisms of solids mixing are investigated, and then segregation phenomenon which determines a satisfactory mixing is briefly discussed. In the next section, types and quality of mixtures are investigated. Finally, the principles of sampling and selection of mixers are briefly investigated.*

**Keywords: Solids Mixing, Segregation, Mechanism of solid mixing, Mixing indexes, Solids Mixers**

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# Predicting Pressure Drop in Venturi Scrubbers Based on Annular Two Phase Flow Model

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**Abstract**
*Venturi scrubber is one of the most effective devices controlling the air pollution. High pressure drop in these devices is one of the problems affecting their efficiency. So it is necessary to develop a model to predict pressure drop in venturi scrubbers accurately. There are many models for this purpose. The model of Viswanathan is based on annular two phase flow. This is a flow pattern that includes a flow of liquid film layer on the walls and a flow of gas and liquid drops in the core. Due to similarities between annular two phase flow pattern and the flow of gas and drops in venturi scrubber, this model can predict pressure drop in these devices effectively. Unfortunately there are some ambiguities in the model proposed by Viswanathan. In the present work it is tried to modify this model to remove its ambiguities and improve it. Good agreement between results of the proposed model with experimental data shows the ability of this model to predict pressure drop in venturi scrubbers.*

**Keywords: Pressure Drop, Venturi Scrubber, Modeling, Annular Two Phase Flow, Air Pollution**

# Investigation of Interaction Between DNA and AOT-Ionic Reverse Micelles in DNA Nano-Encapsulation Process

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**Abstract**
*Reverse micelles are nano-size systems were used in different processes such as, separations and kinetics. Also, these systems are suitable for modeling of bio-membrane processes in laboratory, invivo conditions. In this study, the nano-encapsulation of DNA macromolecule in an anionic reverse micellar system, AOT, and interaction between species were investigated. For this purpose, the UV and circular dichroism spectra were used to show DNA solubilization, nano-encapsulation, and interaction between entrapped DNA and reverse micelles, respectively. The experimental results showed the capability of anionic reverse micellar system for DNA nano-encapsulation and molecular condensation.*

**Keywords: Reverse micelle, Nano-encapsulation, Condensation, Circular-dichroism, DNA**

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# Application of Nanotechnology in Production and Optimization of Solar Cells

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**Abstract**
*This research is a report on nowadays situation of solar energy in the world and methods which nanotechnology could increase the efficiency of solar cells. Because of increasing price and instability in fuels market, researches have been developed about replacement energies. Solar energy is one of these replacement sources, that is reachable in most of the world. so it always have been in survey and research via scientists. Problems in the using of this kind of energy are including: low efficiency of solar cells and their expensive costs. Recent researches showed that using of nanoparticles in solar cells manufacturing can improve this situation. This review explains the basic activities to usage of nanotechnology in production and improvement of solar cells.*

**Keywords: Renewable energies, Nanotechnology, Solar cells, Nanoparticle**

# A Comparison Between New Biologial Method for Nitrogen Removal from Wastewater

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**Abstract**

*Recently, several new processes for nitrogen removal have been developed. Conventional microbial nitrogen removal includes two separate steps of nitrification and denitrification. In the nitrification step, the conversion of $NH_4^+$ to $NO_2^-$ and further to $NO_3^-$ will be happened and in the denitrification step nitrate will be converted to gaseous nitrogen with nitrite as intermediate component. The presence of different autotrophic and heterotrophic microorganisms in these two steps and different aerobic and anaerobic conditions needed for nitrification and denitrification, make require the use of two separate reactors with independent clarifier. The new processes are based on partial nitrification of ammonium to nitrite combined with anaerobic ammonium oxidation that decreases the carbon source and oxygen demand. Some of these processes include the single reactor that decrease the costs, needs lesser space and produce lesser sludge. Among these new processes, we can mention system for high ammonia removal over nitrite (SHARON), the anaerobic ammonium oxidation (ANAMMOX) process, the completely autographic nitrogen removal over nitrite (CANON) process, and the combined ANAMMOX- SHARON. In this paper, different biological nitrogen removal methods have been presented and a comparison has been made with the criteria such as $N_2O$ production, needs of pH control, dissolved oxygen concentration, chemical oxygen demand, sludge production, percentage of nitrogen removal and economical conditions.*

**Keywords: Wastewater, Biological treatment, Nitrification, Denitrification, Nutrient removal, SHARON process, ANAMMOX process, CANON process**

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# A Short Review on Resources, Applications and Different Methods for Production of Cadmium

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**Abstract**

*The cadmium element was discovered by Strodmeyer from Germany in1817. Its concentration in the earth crust is about 0.08 to 0.5 ppm. The cadmium atom and its compounds are very toxic and poisonous through inhalation and ingestion. In spite of its toxicity, its uses in different industries have been developed so the production and recovery of it seems extremely necessary. In this paper we discussed the primary and secondary cadmium resources and different methods for production and recovery of it. Also its application in different industries such as battery, electroplating, pigments, synthetic chemicals and ceramic was mentioned. Production of cadmium from hydrometallurgical zinc residue, dusts containing cadmium, bacterial methods, leaching, non- solvent extraction, and solvent extraction methods, was studied. Finally solvent extraction methods for selective extraction of cadmium, nickel, and zinc were proposed as the best method.*

**Keywords: Cadmium, Recovery, Leaching, Solvent extraction**

# Biological Treatment of Wastewaters through Thermophilic Aerobic Process

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**Abstract**

*Wastewater treatment using Thermophilic aerobic method was reviewed in this article. Most of thermophilic processes have been studied in laboratory or pilot scale, while full-scale applications are rare. The thermophilic aerobic treatment includes advantages like fast biodegradation rates, low sludge production yield, resistance against high organic loading rates, and effective inactivation of pathogenic microorganism. Substrate utilization rates, reported in the literatures are 3-10 times greater than that observed with analogous mesophilic processes. Sludge production values reported under thermophilic condition is less than 0.3 Kg SS/Kg $COD_{removed}$, which is lower than generally obtained in mesophilic processes. Also the stability against high loading rates in thermophilic processes is reported 30–180 Kg COD/$m^3$.d which is obviously more than those of mesophilic treatments. Thermophilic aerobic process is particularly advantageous for the treatment of high-strength wastewaters because of fast biodegradation rates and low sludge yields. However, despite of above-mentioned advantages, many researchers have reported poor bacterial flock formation as well as weak sludge dewaterability for thermophiles. Therefore, further work on thermophilic aerobic processes is still needed to identify optimum operating conditions, and determine the best method to accommodate the oxygen uptake rates of these systems.*

**Keywords: Biological treatment, Aerobic, Thermophilic, High strength wastewater**