Effect of Temperature on Hydroxyapatite Sintering and Bisphosphonate Adsorbtion on it

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Abstract

Hydroxyapatite is one type of calcium phosphates that is used widely in Bone and teeth treatment because of its Bio compatibility and bioactivity. Hydroxyapatite imlants are applied widely in bodies too. One of the most imortant osteoporosis drugs group is bisphosphonate which prevent calcium lossing.
Our goal in this paper is to use bishosphonate as second phase of comosite.Hydroxyapatite granules are floated in Bisphosphonate solution and a comosite made that is investigated because bisphosphonate adsorbtion affect on the Hydroxyapatite properties.
As a part of the project we have studied about sintering temerature changes in presense of bisphosphonate.

Keywords: **Etidronate, Hydroxyapatite, Osteoporosis**

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Fracture Reservoir Simulation Using Finite Element Method with Logarithmic Shape Functions

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Abstract

This research presents a new numerical method for solving single phase flow in oil reservoirs which is able to forcaste the reservoir behavior. The method uses Galerkin finite element formulation in a logarithmic space for calculation of pressure distribution, which yields a logarithmic approximation of pressure around the wellbore. Due to the consistency of this approximation with the actual behavior of pressure in reservoirs, this method leads to a great enhancement in accuracy of simulation results. The method has been deployed in an object oriented programming environment for solving dual porosity model equations and tested on on some case sample models. Comparison of simulation results with analytical solution and the finite difference method shows the superiority of logarithmic finite element method over conventional methods in reservoir simulation. Combination of this method with other numerical methods (control volume) can be used to simulate multi phase flow.

Keywords: **Finite Element Method, Logarithmic Shape Functions, Fractured Reservoir Simulation**

A Study of Dynamic Mechanical Thermo-Analysis of a Silicone-Based Hybrid Nanocomposite Prepared via the Sol-Gel Route for Nonlinear Optics Applications

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Abstract

In this work, a Nonlinear Optical Dye containing silica hybrid network was prepared via the sol-gel method, by copolymerization 3-methacryloxypropyltrimethoxysilane (MPTMS) and 2-hydroxylethylmethacrylate (HEMA). Disperse Red 1 was introduced as the dye. The samples were characterized by DMTA (Dynamic Mechanical Thermo-Analysis) in order to have detailed information on the synthesized silicone-based nanocomposites. The investigations confirmed the development of reactions and revealed the appropriate mechanical and thermal properties. The dye-containing samples represented a better behavior compared with the blank one. The mechanical integrity was still maintained in the range of 250-300°C. In addition, the synthesized hybrid material showed an almost broad region for its glass transition temperature (with an averaged midpoint of ~130°C), which is an advantage for having smaller stiffness changes in hybrid nanocomposites.

Keywords: **Nanocomposite, Hybrid Network, Dynamic Mechanical Thermo-Analysis, Sol-gel, Nonlinear Optics (NLO)**

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Optimal Control Method of Exit Pollutants of Sulfur Recovery Unit in an Oil Refinery

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Abstract

Due to pollution of the sulfur recovery units in oil and gas refining industry and limititaion of environmental laws, more treatmemnt of sulfur recovery unit's tail gas is needed. In this research, at first, complete study on operational conditions and exit streams had done. Next step was based on knowing of tail gas treating processes, which dry- bed, cold bed absorption, amin- based, redox- based and oxidation processes had known. In continue, sulfur recovery unit of one of the refineries in Iran had selected as a target unit and flowrate and analysis of its tail gas had surveyed. Acoording to results, basic study, environmental limititaion and also tail gas treating processes, amin- based hydrogenation process was selected as an optimum process for efficient removal of sulfurous components of tail gas like sulfur dioxide and hydrogen sulfide in a sulfur recovery unit of target sulfur recovery unit tail gas.

Keywords: **Sulfur Recovery Unit, Claus Unit, Tail Gas Treating Unit, Amin- Based Process, Sulfur Dioxide, Hydrogen Sulfide**

Feasibility Study of Membrane Processes for Treatment of Industrial Wastewater Contains Heavy Metals

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Abstract

Bioenvironmental effects of industrial wastewaters are growing due to the fact that technology is being developed as a result of more energy needed every day. Development of membrane processes applications for wastewater treatments increase possibility of membrane processes or hybrid of membrane processes with other processes to be employed in industrial plants. In this paper, results of wastewater treatment by membrane processes and hybrid membrane processes for treatment of industrial wastewaters contain heavy metals reported. The research results in this filed show that membrane processes can be well employed in hybrid processes for treatment of industrial heavy metal wastewaters. Membrane processes are able to reduce concentration of heavy metal in the wastewater and enhance quality of the treatment process. The quality of wastewaters treated with membrane processes and hybrid processes are exactly compatible with standards of World Health Organization (WHO).

Keywords: Industrial Wastewaters Treatment, Heavy metals, Membrane Processes

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Study of Preparation and Properties of (Polymer /TiO_2) NanoComposites

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Abstract

In recent years, there has been considerable interest in Polymer / TiO_2 Nano Composites due to their novel mechanical, photocatalytic activity, optical properties and electronic application, which are rarely present in the pure polymer or conventional composites. With modified surface of nano scale TiO_2 and better dispersion of nano particles in polymer matrix, mechanical properties of nanocomposite is better than pure polymer. Photocatalytic activity of TiO_2 / nano composites is reversible and this activity increase by increasing the pH of environment. The large surface area of nano fillers causes that the interaction between the nano particle surface and the surrounding chains polymer higher than interaction between chains polymer. These interactions cause the enhancement or restriction of chain mobility near the particle surface and could significantly affect morphology in their formed nanocomposites. With decreasing the size and amount of nano scale TiO2 in nano Composite, optical properties are improved. High dielectric constant nano- TiO_2 causes that dielectric constant of TiO_2 nanocomposites is better thant pure polymers.

Keywords: Polymeric Nanocomposites, Nano Scale TiO2, Mechanical Properties, Photocatalytic Activity, Morphology, Optical Properties and Electrical Applications

Numerical Simulation of a Concentric Orifice Meter for the Computation of Discharge Coefficient in the Turbulent State, Using Computational Fluid Dynamics

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Abstract

Flow measurement is of vital importance in the oil and gas industry. The pressure drop which occurs in flow measuring devices, to compensate for it and convert the theoretical to actual flow rate by the discharge coefficient is of considerable importance. In this work, computational fluid dynamics has been utilized to evaluate the discharge coefficient for an orifice meter in a turbulent state for β in the range of o.3 to 0.7. The flow was assumed axisymmetric and k-ε model has been adopted for the turbulent state. The numerical results of the present study have been compared with the experimental data for Reynolds number in the range 10000-200000. The findings of this work reveal that there exist a minimum error 0.25 and a maximum of 4.36 percent. Therefore, due to lower CPU time, capability and accuracy of this scheme, this method could be adopted to evaluate the discharge coefficient for a concentric orifice meter.

Keywords: **Simulation, Orifice Meter, Turbulent Flow, Discharge Coefficient, Computational Fluid Dynamics**

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An overview on Reduction of Excess Sludge Production in Activated Sludge Systems

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Abstract

One of the most important problems in activated sludge systems, is the excess sludge production in wastewater treatment plants, in which its stabilization and disposal has attracted the most attention to itself. In this research, several procedures to reduce the sludge in aerated systems, especially in activated sludge system is explained. Some of the procedures are 1. Lysis-Cryptic growth which includes alkaline-thermal treatment, ozonation, chlorination, and increasing dissolved oxygen. 2. Maintenance metabolism 3. Uncoupling metabolism 4. Predation on bacteria. Also in this research, for each of the above mentioned procedures, some examples are provided. In some procedures which are most chemically (such as ozonation and uncoupler additions), the amount of excess sludge is reduced to zero. Therefore, the best solution for elimination of excess sludge, has been known as chemical procedures; although economical considerations should always be taken into account.

Keywords: **Activated Sludge Process, Excess Sludge, Sludge Reduction, Ozonation, Metabolic Uncoupler**

Production of Biodiesel from Microalgae Dunalliela Salina

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Abstract

In this research the possibility of biodiesel fuel production by methanolysis of Dunalliela Salina microalgae oil by use of whole cells of Rhizopus oryzae (R. oryzae) PTCC 5174 immobilized within biomass support particles (BSPs) of polyurethane as a biocatalyst (containing lipase) were investigated. Methanolysis was carried out with stepwise additions of methanol in every 24 h in the presence of 0.1M phosphate buffer (pH=6.8). The whole process was complete for 72 h. After separation of impurities by centrifugation, 59% conversion of methyl esters obtained in reaction of transesterification. To improve the conversion rate more methanol and solvent (acetone and normal hexane) were added to the reaction mixture which increased the conversion rate to 90% and 72%. The use of additional methanol resulted in enzyme inactivation. When methanol with molar ratio 2:1 was added; the conversion was reduced to 67%. The presence of a suitable amount of methanol in the reaction mixture is important because extra methanol causes the immobilized cells to lose their activities. From the results obtained in this method, unlike other methods, does not require complex process for product purification has a suitable conversion yield and can be used for large scale production.

Keywords: Biodiesl, Microalgae, Immobilized Cells, Dunalliela Salina, Rhizopus oryzae