Effect of Various Formulations of Unsaturated Polyester Inhibitors on Mechanical, Thermal and Migration of Nitroglycerin in Double Base Rocket Propellants

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Abstract

Unsaturated polyesters are used as a inhibitor in double base rocket propellant grains. In this paper, the effect of chain length glycol, filler addition, varying amounts of styrene and adding compounds containing halogens on the gel time, the exothermic peak temperature, viscosity, tensile strength, percent elongation, strong bonding with the propellant, the amount nitroglycerin migration in unsaturated Polyester will be reviewed. The results showed that a significant improvement of nitroglycerin migration, gel time, exotherm peak temperature and mechanical properties when polyester chain length is reduced. It also reduces water absorption and nitroglycerin was observed with increasing concentrations of styrene monomer to 40 percent in polyester systems. The use of flame retardant materials such as EACGP also Showed improved resistance to flame and oxygen index polymer.

Keywords: Unsaturated Polyester, Inhibitor ,Double Base Rocket Propellants, Nitroglycerin Migration

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The Role of Nano-Aluminium in Burning Behavior of Solid Composite Propellants

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Abstract

Metallic nanoparticles are widely used in high energy materials (explosives, propellants and pyrotechnics). Nanoparticles are used in solid propellants as fuel additives in order to improve the performance. In this paper, the role of nano-aluminum particles on burning behavior of solid composite propellant has been investigated. Nano-aluminum particles are considered as one of the most important energetic components of metallic fuel in the solid composite propellants. Studies showed that the addition of nano-aluminum particles increases the burning rate, reducing the amount of agglomeration, decreasing diameter of burning particles, falling combustion temperature and reducing the amount and size of residual ash. The use of nano-aluminium particles leads to reduction the pressure exponent in the burning rate law. Based on reviews size reduction of nano-aluminium particles from micron to nano, increases the burning rate of solid composite propellants about 100 percent.

Keywords: Nano-Aluminum Particles, Solid Composite Propellants, Burning Rate, Combustion

The Effective Parameters in Silver Nanoparticles Synthesized by the Chemical Reduction Method

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Abstract
In recent years, silver nanoparticles have attracted the attention of many researchers due to its special physical and chemical properties. Much of these properties are due to the high surface to volume ratio of the particles. These properties make silver nanoparticles as one of the most widely used nanoparticles in industry as well as medicine. There are different methods of silver nanoparticles synthesis, among those; chemical reduction is the most common method because of its simplicity and ability to control of the shape and size of the nanoparticles. In chemical reduction method the size and morphology of the particles can be easily controlled, by changing parameters such as the concentration of silver salt, reducing agent and stabilizer, temperature, pH and reaction time. In this article it has been tried to have a short review on the parameters that affect size and morphology of the silver nanoparticles, synthesized by the reduction method.

Keywords: Silver Nanoparticles, Chemical Reduction, Synthesis Parameters, Particle Size

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Mathematical Modeling of Mass Transfer Operation of Cuminum Cyminum Seed for Determining of Moisture Diffusion Coefficient During the Drying Process

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Abstract
In this research, moisture diffusion coefficient of Cuminum cyminum seed was determined as a function of its moisture content during thin layer drying process. This work was performed with two planar and cylindrical shape assumptions for the seed. Then the mathematical modeling of the mass transfer operation during the drying of the seed was developed using finite element method and its results compared with the experimental moisture content of the seed. Correlation coefficient and root mean square error in planar shape assumption were 0.992 and 0.0188 respectively whereas these two statistical criteria in cylindrical shape assumption were 0.973 and 0.11, respectively. Therefore this study revealed that higher correlation and lower error was found for the planar shape as compared to cylindrical shape assumption.

Keywords: Mass Transfer, Drying, Cuminum Cyminum, Moisture Diffusion Coefficient

Bioleaching of Electronic Waste: A Review

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Abstract

In recent years the market demand for electronic instruments with attention to their low life time is increasing rapidly which create a new environmental challenge. E-waste contains a vast range of hazardous metals which an improper management can threat human society seriously. On the other hand on average e-waste can supply about 40 million ton of materials. But the complex and non heterogeneous nature of this waste was the main barrier for recycling. Traditional methods are highly cost and produce hazardous intermediate material. Bioleaching is environmental-friendly and economical for recovery of metals from e-waste by using microorganisms such as bacteria and fungi. In this article, previous articles about bioleaching of e-waste are studied. The result showed bioleaching is an effective method for metal extraction from e-waste. Some base metals as like as Cu, Ni, and Zn were extracted totally and Au, a stable metal, can recovered about 50%.

Keywords: Electronic Waste, Printed Circuit Boards, Recovery, Bioleaching

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Aging Study of HTPB Based Composite Solid Propellants

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Abstract

The aging is one of the main parameters used in the evaluation of propellants service life in rocket and missile systems. Today, HTPB based composite solid propellants have become the most effective propellants in solid rocket motors around the word. Aging may originate from different types of processes: chemical, mechanical, and physical. In this paper, some of the most important factors affecting the aging and the methods for their determination were investigated. The most common method of evaluating propellant aging is accelerated aging tests which it's performed to obtain information about aging characteristics in a relatively short period. The main chemical methods that are recently used to determine the aging of composite solid propellants is the determination of soluble component of binder polymer propellant structure. Also, the most important physical tests that can be investigated are the stress - strain, stress - relaxation, creep tests, and dynamic - mechanical tests.

Keywords: Aging, Composite Solid Propellants, Aging Processes, Aging Mechanism, HTPB

A New Empirical Correlation for Prediction Water Content of Natural Gas

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Abstract

Determination and separation of water content of natural gas streams is vital in the gas processing and transportation. In this work a thermodynamic model , using Peng-Robinson equation of state, was proposed for the prediction of the water content of natural gas(methane,CH4) in temperature range of 273-733K and pressure range of 0.5 – 34.6 MPa and then the agreement with the experimental data were also examined. The average absolute error was obtained as 3.61%. with the aid of the produced data, general form of the equation for prediction of water content of methane was proposed. The coefficients of the equation were determined by employing GRG Non-Linear method, in the same temperature range as above, to reduce the error furthermore. The proposed equation was also tested and corrected for hydrocarbons heavier than methane with presence of acidic gases.

Keywords: **Water Content, GRG Non-Linear Method, Methane, Acidic Gases, Sweet Gas, Peng-Robinson Equation of State**

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Improving the Characteristics and Desalination Performance of Thin Film Composite Reverse Osmosis Membranes by Nanoparticles

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Abstract

Reverse osmosis (RO) membrane technology is one of the most updated and advanced methods for desalination of saline and brackish waters. Polyamide thin film composite (TFC) membrane is the most widely used membrane in this process. Nevertheless, obstacles such as the trade-off between permeate water flux and salt rejection as well as fouling, and in particular biofouling, lead to performance loss. One of the promising strategies for improving the characteristics of TFC membranes is incorporation of nanoparticles and nanotubes in the selective thin film layer of the membrane. The incorporation of nanoparticles and nanotubes during interfacial polymerization of TFC membrane bring different effects. Using nanoparticles such as zeolite and carbon nanotubes can improve the desalination performance and using nanoparticles such as silver improves the biofouling resistance. The present manuscript investigates the effects of using various nanoparticles on the desalination performance, surface properties and biofouling control of reverse osmosis membranes and obstacles on the way of commercialization.

Keywords: **Desalination, Reverse Osmosis, Thin Film Composite, Nanoparticles, Nanotubes**

Analysis of Hydrogen Network in Noori (Borzouyeh) Petrochemical Complex Using Pinch Technology

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Abstract

Recently, sever environmental constraints caused market's tendency to use lighter and cleaner fuels. Thus, hydrogen and light fuel producer units were become important in refineries and petrochemical complexes. Management of hydrogen consumption in these plants is a dominant issue. In this study, a comprehensive analysis was carried out on hydrogen network in a live petrochemical plant using pinch technology. The results showed 16.5% reduction in fresh hydrogen consumption if there was a correct grass-root design.

Keywords: Hydrogen Management, Hydrogen Network, Pinch Technology, Grass Root Design