Clean Nitrating Agent Dinitrogen Pentoxide and its Application in Nitration

Lü Chun-xu

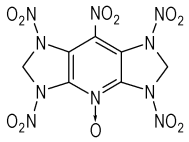
Chinese Journal of Energetic Materials,2010,18(6):611 -617

This review brings out the potential of N_2O_5 as versatile nitrating agent for the synthesis of modern and novel HEMs. N_2O_5/nitric acid system is a very powerful nitration reagent and particularly valuable for the nitration of highly deactivated aromatics. N_2O_5/organic solvent system is a much milder and more selective nitration reagent, which is suitable for the cases that the substrates or products are sensitive to acid or water, and for region-selective O-nitration.

Designs and Synthetic Routes of Nitramine Explosives Containing Pyridine Ring

LU Ming, NIE Fu-de

Chinese Journal of Energetic Materials,2010,18(6):618 -622



The concept of new nitramine explosive containing pyridine ring is proposed, into which the nitramine group with N—N bonds is introduced as much as possible. The molecular structures of several target compounds and their synthetic method with different synthetic reactions such as condensation, *N*-nitration, *N*-oxidation and *C*-nitration and so on are designed.

Green Synthesis of 2,2-Dinitro-1,3-propangdiol

LIU Ya-jing, CHEN Bin, LIU Wei-xiao, GAO Fu-lei, XU Ruo-qian, JI Yue-ping

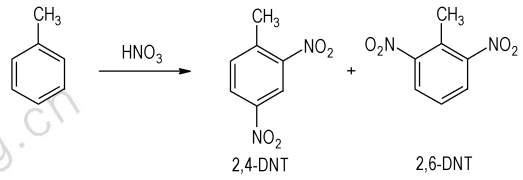
Chinese Journal of Energetic Materials,2010,18(6):623 -626

2,2-dinitro-1,3-propangdiol was synthesized. The optimum reaction condition were obtained as follows: $K_3Fe(CN)_6$, 0.1 mol, $Na_2S_2O_8$, 0.25 mol, reaction temperature, -5 ~0 ℃, reaction time, 4 hours.

Green Synthesis of Dinitrotoluene

SHANG Yan, WANG Bo-zhou, YE Zhi-hu, WANG You-bing, ZHOU Jie-wen

Chinese Journal of Energetic Materials,2010,18(6):627 -629

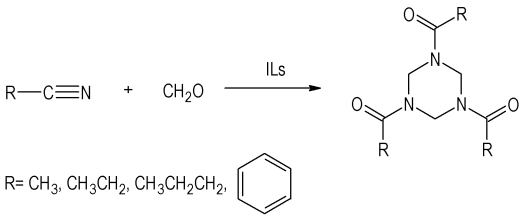


Dinitrotoluene (DNT) was prepared by nitrating toluene with nitric acid (97%).

Green Synthesis of 1,3,5-tri-substituted Perhydro-*s*-triazines in Ionic Liquids

YU Qin-wei, YANG Jian-ming, XUE Yun-na, LI Ya-ni, Lü Jian

Chinese Journal of Energetic Materials,2010,18(6):630 -634



The green synthesis of three 1,3,5-substituted hexahydro-*s*-triazines was carried out in various ionic liquid (IL). The sulfuric acid functional ILs have selectivity of above 98% and could be reused for three times. The target products' yield could be up to 80%.

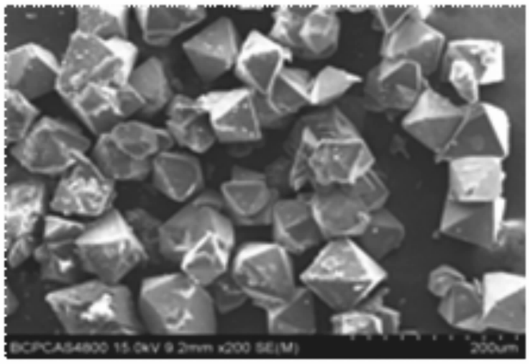
Migration of Polymer Deterrent in Two Kinds of Propellants

LIU Shao-wu, LIU Bo, ZHENG Shuang, WANG Qiong-lin, PAN Qing, ZHANG Yuan-bo, HAN Bing, WEI Lun

Chinese Journal of Energetic Materials,2010,18(6):635 -638

The migrations of polyester deterrent NA in DIANP propellant and nitramine propellant were investigated by accelerated aging tests, closed-bomb tests and interior ballistic tests. The concentration profiles of deterrent NA in two kinds of propellants before and after long-term storage were studied by FTIR microspectroscopy.

Recrystallization of RDX in a Ionic Liquid-DMSO Co-solvent System



REN Bai-yu, WANG Peng, LI Qing-xia, MENG Zi-hui, WANG Bo-zhou, GE Zhong-xue

Chinese Journal of Energetic Materials,2010,18(6):639 -642

The recrystallized RDX by Ionic liquid-DMSO co-solvent systems and the H_2O-precipitated or MeOH-precipitated RDX have been investigated by means of DSC thermograph and SEM.

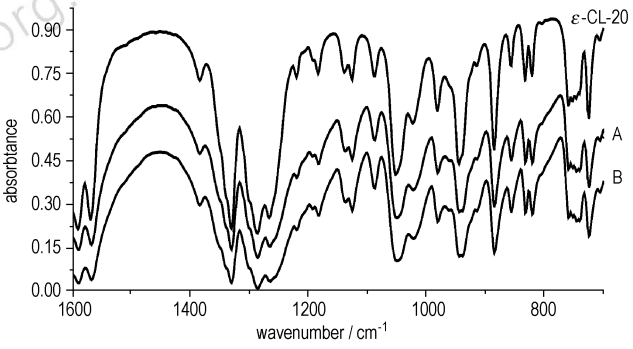
Preparation of RDX/RF Nanocomposite Energetic Particles by Emulsion-sol-gel Technique

ZHANG Juan, YANG Guang-cheng, NIE Fu-de

Chinese Journal of Energetic Materials,2010,18(6):643 -647

The hexahydro-1,3,5-trinitro-1,3,5-triazine/resorcinol-formaldehyde (RDX/RF) gel composite energetic particles was prepared by means of emulsion process and sol-gel techniques. Scanning electron microscopy (SEM), BET method, X-ray powder diffraction (XRD) and differential thermal analysis (DTA) were used to characterize its structures.

Crystal Transition of ε-CL-20 in Different Solvent

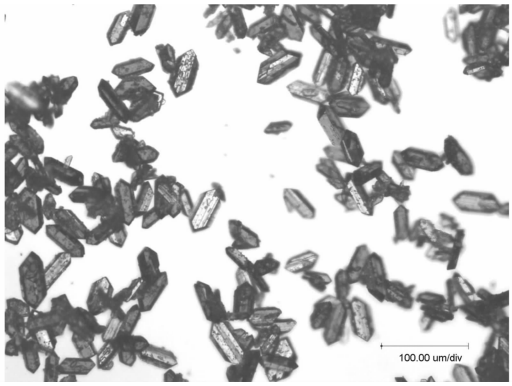


SONG Zhen-wei, YAN Qi-long, LI Xiao-jiang, QI Xiao-fei, LIU Meng

Chinese Journal of Energetic Materials,2010,18(6):648 -653

ε-CL-20 was recrytallized from a number of single and mixed solvents, and the resulting crystal forms were characterized by FTIR and SEM. The FTIR curves (shown below) of crystals obtained from alcohol(A) and dichloromethane(B) are the same as that of the original ε-CL-20. These two solvents have no effects on the crystal transition of ε-CL-20.

Synthesis Process and Property of New Primary Explosive Copper(Ⅰ) Nitrotetrazolate



Copper(Ⅰ) nitrotetrazolate (CuNT) was synthesized from cuprous chloride, sodium 5-nitrotetrazolate, etc. The synthesis process was studied through single factor experiment. The properties of this compound were also discussed. The test results show that CuNT is an excellent green primary explosive. In some initiating devices, CuNT is a substitute for $Pb(N_3)_2$ and lead styphnate.

PU Yan-li, SHENG Di-lun, ZHU Ya-hong, CHEN Li-kui, YANG Bin, WANG Yan-lan, XU Min-hao

Chinese Journal of Energetic Materials, **2010, 18(6): 654 -659**

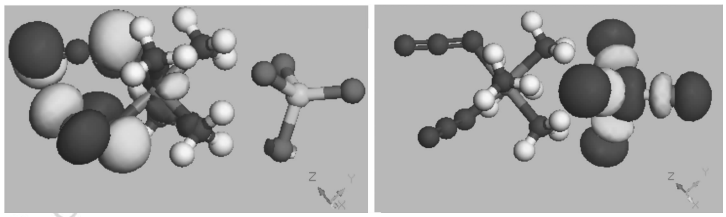
Synthesis and Performance of Coprecipitating Primary Explosive FSFH

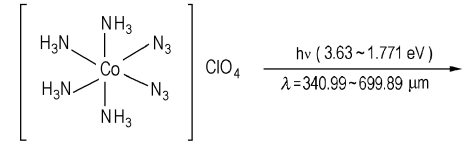
The novel free-lead primary explosive ferric styphnate-ferric hypophosphite(FSFH) was synthesized by coprecipitating method. The properties of FSFH were tested. It may be used for primer charge and stab initiating composition.

CHEN Li-kui, SHENG Di-lun, ZHU Ya-hong, YANG Bing, ZHANG Yu-feng, XU Min-hao

Chinese Journal of Energetic Materials, **2010, 18(6): 660 -664**

Quantum Chemistry and Photochemical Decompose Mechanism of Tetraamminediazido Cobalt(Ⅲ) Perchlorate (DACP)





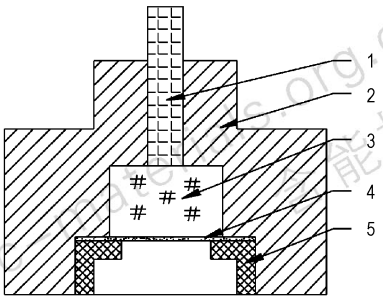
$$ClO_4^{\ominus} + N_3^{\oplus} + Co^{+3} + NH_3 \xrightarrow{\text{oxidation-reduction reaction}} CoCl_2 + N_2 + CO_2 + NH_3 + H_2O$$

The DACP structural characteristics, and spectral performance, photochemical decomposition mechanism had been analyzed. The DACP outside electron was moved from N atom in $-N_3$ to Cl atom in $-ClO_4$. The transition energy was divided into many levels. There was sequence absorbing peaks in the range of 340.99 - 699.89 nm. The DACP theory IR spectra were calculated, the results are essentially consistent with experimental values.

SHENG Di-lun, WANG Yan-lan, ZHU Yan-hang, CHENG Li-kui, YNAG Bin, XU Ming-hao

Chinese Journal of Energetic Materials, **2010, 18(6): 665 -669**

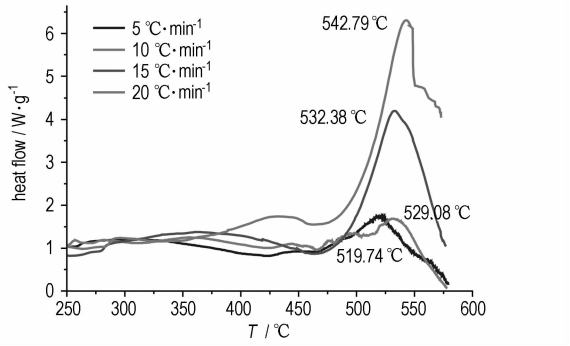
Experimental and Numerical Studies on Flyer Initiation Device



A novel explosive driven flyer initiation device was designed. Different flyer initiation velocities were obtained by changing the density of PETN explosive. The velocity of flyer is changeable from 2660 m · s^{-1} to 3150 m · s^{-1}, corresponding pressure range is 54 – 86 GPa.

JIANG Xiao-hua, CHEN Qing-chou, LI Min, PENG Qi-xian
Chinese Journal of Energetic Materials, **2010, 18(6): 670 – 673**

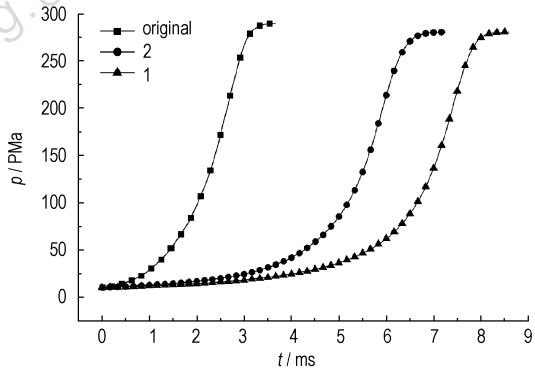
Ignition Performance of Nano Al-MoO_3



The nano-energetic materials Al-MoO_3 was prepared by immersing the powders in a solvent and then mixing the two powders including nano-Al and MoO_3 using an ultrasonic mixer, and its thermal decomposition characteristics were analyzed by DSC.

XUE Yan, REN Xiao-ming, XIE Rui-zhen, SHI Chun-hong, LIU Lan, ZHANG Ye
Chinese Journal of Energetic Materials, **2010, 18(6): 674 – 676**

Combustion Characteristics of Desensitized Triple Base Propellant



The desensitized triple base propellant containing NGu were prepared by polymer deterrent technology with and without saturator. Their surface structure of the propellant were characterized by electron microscopy. The combustion characteristics were investigated by means of the ignition test, closed-bomb tests and interior ballistic tests.

ZHENG Shuang, LIU Bo, YU Hui-fang, LIU Shao-wu, ZHANG Yuan-bo, WANG Feng, WEI Lun, LI Da, HAN Bing
Chinese Journal of Energetic Materials, **2010, 18(6): 677 – 680**

Influence of 8-Hydroxyquinoline Metal Derivatives on Combustion of NEPE Propellants

LI Ji-zhen, SHAO Chong-bin, FU Xiao-long, FAN Xue-zhong, LIU Xiao-gang

Chinese Journal of Energetic Materials, 2010, 18(6): 681 -684

Effects of 8-hydroxyquinolinate metal derivatives, such as, $PbHql_2$, $CuHql_2$, $NiHql_2$, $AlHql_3$, $PbCuHql_4$, $PbCuHql_4$, $PbNiHql_4$, $CuNiHql_4$ and its mixtures on the combustion characteristics of NEPE propellants were experimentally studied.

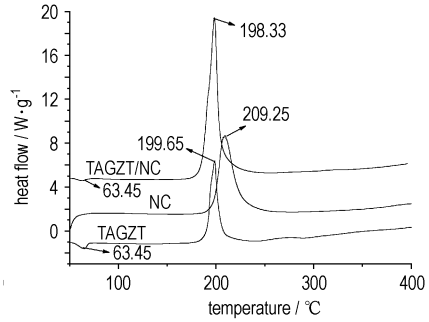
Surface and Interface Properties of Composite Modified Double-base Propellant Containing Ammonia Perchorate and Aluminum

WANG Han, FAN Xue-zhong, ZHOU Wen-jing, LIU Xiao-gang, WEI Hong-jian, LI Ji-zhen

Chinese Journal of Energetic Materials, 2010, 18(6): 685 -688

The surface properties of AP with various particle size and nitrocellulose (NC) with various contents of nitrogen, and the interface properties between NC and AP were studied by using the dynamic contact angle and interface tension technique. And the effects of the surface and interface properties on mechanical properties of Composite Modified Double-base Propellant Containing AP and Aluminium were also investigated.

Compatibility of Triaminoguanidinium Azotetrazolate with Main Components of Propellants

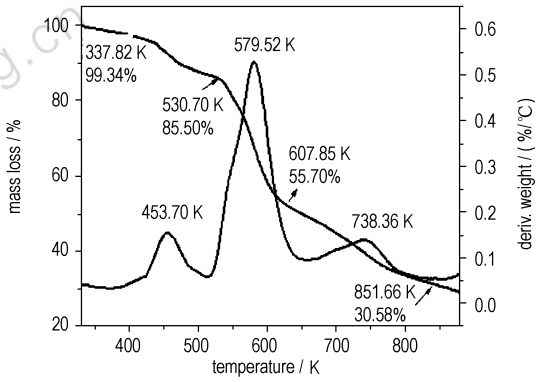


WANG Qiong, WEI Hong-jian, LI Ji-zhen, FAN Xue-zhong, FU Xiao-long, JI Yue-pin

Chinese Journal of Energetic Materials, 2010, 18(6): 689 -693

DSC and VST experiments were used to study the compatibility of triaminoguanidinium azotetrazolate (TAGZT) with main components of propellants simultaneously.

Thermal Behavior, Specific Heat Capacity and Adiabatic Time-to-Explosion of Poly 5-vinyltetrazole



PANG Wei-qiang, FAN Xue-zhong, LIU Qing, LI Ji-zhen, SHI Xiao-bing, FENG Li-min

Chinese Journal of Energetic Materials, 2010, 18(6): 694 -698

Thermal behaviors of poly 5-vinyltetrazole were studied by thermogravimetry-derivative themogravimetry (TG-DTG) and the second thermal decomposition process is the main one. The thermal decomposition reaction kinetic equation of the second (main) decomposition stage is: $\frac{d\alpha}{dt}=\frac{10^{21.03}}{\beta}\frac{3}{2}(1-\alpha)[-\ln(1-\alpha)]^{1/3}\exp(-2.292\times10^5/RT)$.

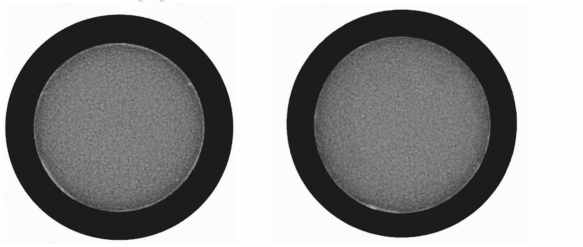
Experimental Study on Vulnerability of Explosive PMX-1

GAO Li-long, WANG Xiao-feng, NAN Hai, YU Ran, XI Peng, FENG Xiao-jun

Chinese Journal of Energetic Materials,2010,18(6):699 -701

The vulnerability response charactcristics of the explosive was improved. PMX-1 charges could pass 12.7 mm bullet impact test, fast cook-off test and slow cook-off test by consult the MIL-STD-2015C "Hazard Assessment Tests for Non-nuclear Munitions".

Experiment Research on Security of Insensitive Explosive Charge During Penetration

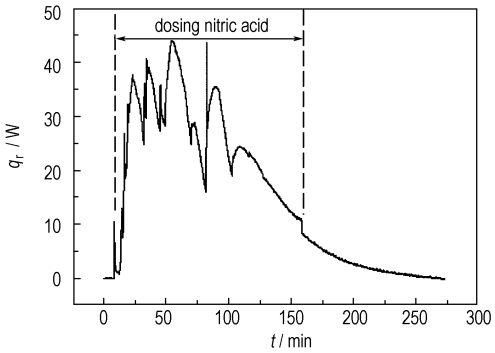


LI Yuan-yuan, GAO Li-long, LI Wei, XI Peng

Chinese Journal of Energetic Materials,2010,18(6):702 -705

Comparing with the projectile before penetration test and recovered projectile by industrial computed tomography, the explosive charge had no differences. It shows that the explosive is insensitive.

Thermal Hazard Analysis of Dinitrotoluene Nitration



CHEN Li-ping, CHEN Wang-hua, PENG Jin-hua, LIU Rong-hai

Chinese Journal of Energetic Materials,2010,18(6):706 -710

DNT nitration is an exothermal reaction with high heat generation. Here, DSC, ARC and RC were used to analyse the thermal hazard of this reaction.

Review on TATB Recrystallization Technology

ZHANG Hao-bin, SUN jie, SHU Yuan-jie, KANG bin

Chinese Journal of Energetic Materials,2010,18(6):711 -716

The progress in recrystallization technology of TATB, especially how to obtain TATB with different crystal morphology in recrystallization was summarized, which may provide some academic guide for restraining the irreversible growth and deformation of TATB-based PBXs.

Research Progress of Catalytic Nitration of Toluene

LIU Li-rong, ZHANG Suo-xin, ZHANG Xiao-bo, XU Wei-na, WANG Yu-dong, Lü Chun-xu

Chinese Journal of Energetic Materials,2010,18(6):717 -727

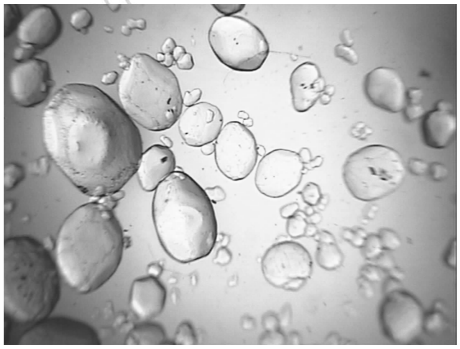
Recent research progress in clean nitration of toluene, including the application of nitrating reagent and catalyst is presented. Their specific features, merits and demerits are outlined, and the perspectives of the catalytic nitration of toluene are prospected. The potential application of dinitrogen pentoixde nitrating reagent and catalysts for catalytic nitration of toluene is put forward. It is a clean nitrated technology in vast prospects of industrial application.

Synthesis, Thermal Stability and Sensitivity of 2, 4-Dinitroimidazole

WANG Jun, DONG Hai-shan, ZHANG Xiao-yu,
ZHOU Jian-hua, ZHANG Xiu-li, LI Jin-shan
Chinese Journal of Energetic Materials,2010,18(6): 728 -729

2, 4-Dinitroimidazole (2, 4-DNI) was synthesized, and its properties such as thermal stability, sensitivity and safety were tested and evaluated.

Design and Control Method of RDX Crystal Characteristics



HUANG Ming, LI Hong-zhen, XU Rong, KANG Bing,
ZHANG Chao-yang, GAO Xao-min, NIE Fu-de, CHEN Bo
Chinese Journal of Energetic Materials,2010,18(6): 730 -731

A special set of crystal control thchnique is designed, and RDX crystals with nedle-like, spherallity, and some defects and with high quality are produced.

Executive editor: JIANG Mei Computer typesetter: ZHANG Gui-hong

读者·作者·编者

向审稿人致谢

2010 年,在各级领导的关心和各位同行专家的帮助下,本刊得以顺利出版发行,为此,编辑部特向在 2009 年 11 月 10 日 ~2010 年 12 月 15 日为本刊审阅稿件的各位审稿人(以汉语拼音为序)致谢!

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