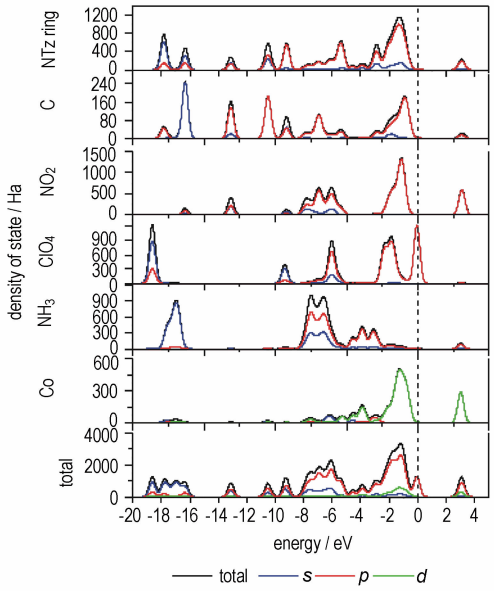
Innovation and Development of Pyrotechnic Composition

New infrared illuminants, pyrotechnic pulse signal agents, sonar decoy agents, extended-range projectiles at the bottom of the exhaust agents, light radiation blind interference pyrotechnics, put out the burning or deflagration of the pyrotechnic soft kill, "cold" pyrotechnics, minimum smoke/smokeless pyrotechnic agent have distinctive characteristics of innovation and development.

PAN Gong-pei

Chinese Journal of Energetic Materials, **2011**, **19**(5): **483 –490**

Theoretical Studies on Structure and Properties of Bis-(5-nitro-tetrazolato) Tetraammine Cobalt (Ⅲ) Perchlorate Molecule and Crystal



The density functional theory was used to study molecule and crystal of bis-(5-nitro-tetrazolato) tetraammine cobalt (Ⅲ) perchlorate (BNCP). DFT calculations of BNCP were performed using four different spin-restricted functionals (SVWN5, PBE, TPSS and B3LYP) with the 6-31G** as the basis set.

SHANG Jing, ZHANG Jian-Guo, SHU Yuan-jie, YIN Ming, ZHANG Tong-lai, ZHOU Zun-ning, YANG Li

Chinese Journal of Energetic Materials, **2011**, **19**(5): **491 –496**

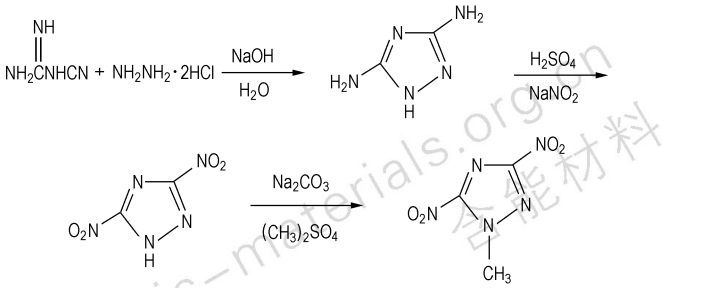
Synthesis and Characterization of *N*-(2-Nitroxyethyl) alkylnitramines

N-methyl-*N*-(2-nitroxyethyl) nitramine (Me-NENA), *N*-ethyl-*N*-(2-nitroxyethyl) nitramine (Et-NENA) and *N*-butyl-*N*-(2-nitroxyethyl) nitramine (Bu-NENA) were prepared by the reactions of methyl ethanolamine, ethyl ethanolamine, butyl ethanolamine and nitric acid, acetic anhydride respectively. The structures of the target products were identified by ^{1}H NMR, IR and elemental analysis.

GAO Fu-lei, JI Yue-ping, LI Pu-rui, LIU Wei-xiao, WANG Ying-lei, LAN Ying, LIU Ya-jing

Chinese Journal of Energetic Materials, **2011**, **19**(5): **497 –500**

Synthesis and Characterization of 1-Methyl-3,5-dininitro-1,2,4-triazole

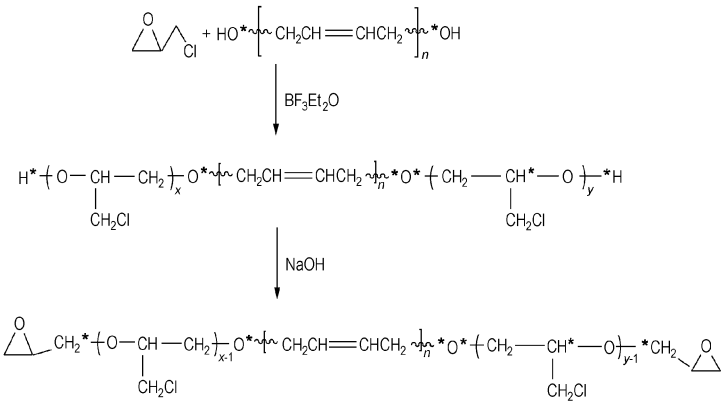


YANG Ke-ming, CAO Duan-lin, LI Yong-xiang,
WANG Jian-long, WANG Ding

Chinese Journal of Energetic Materials,2011,19(5):501 -504

1-Methyl-3,5-dininitro-1,2,4-triazole (MDNT) was synthesized from hydrazine dihydrochloride and cyanoguanidine. The total yield is 16.75%, melting point is 95 -96 ℃, and purity is more than 99% for the purified MDNT.

Synthesis of Epoxy Terminated Polybutadiene

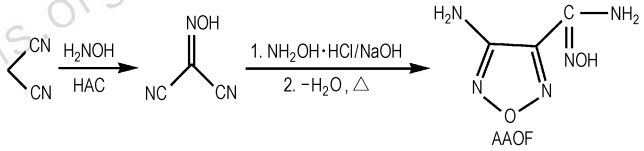


LI Na, GAN Xiao-xian, MO Hong-chang,
LI Lei, LU Xian-ming, HAN Tao

Chinese Journal of Energetic Materials,2011,19(5):505 -508

Chloropolyether terminated polybutadiene (CTPB) was synthesized with hydroxyl terminated polybutadiene(HTPB) as initiator and boron-trifluoride etherate as catalyst by cationic ring-opening polymerization of epichlorohydrin. Epoxy terminated polybutadiene (ETPB) was synthesized by ring-closing reaction of CTPB under basic conditions.

Synthesis of 3-Amino-4-amidoximinofurazan with High Yield



ZHOU Yan-shui, ZHOU Cheng, WANG Bo-zhou,
LI Jian-kang, HUO Huan, ZHANG Ye-gao,
WANG Xi-jie, LUO Yi-fen

Chinese Journal of Energetic Materials,2011,19(5):509 -512

3-Amino-4-amidoximinofurazan(AAOF) was synthesized from dicyanopropane by a two-step procedure. The overall yield of AAOF can be up to 95% and purity 98.5%.

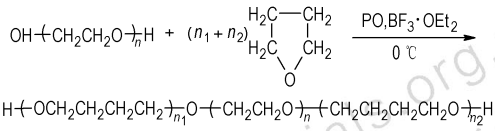
A Simple Method for Preparing 3,5-Diaminopyridine

LIANG Chang-yu, HU Bing-cheng, DAI Hong-sheng,
SUN Cheng-guo, XU Shi-chao

Chinese Journal of Energetic Materials,2011,19(5):513 -517

3,5-Diaminopyridine (DAP) and 3,5-dimethoxycarbonylaminopyridine (DMAP) were synthesized from 3,5-dimethylpyridine via a three-step reaction (oxidation, ammoniation and Hofmann degradation).

Synthesis of HTPE and Properties of HTPE Elastomers

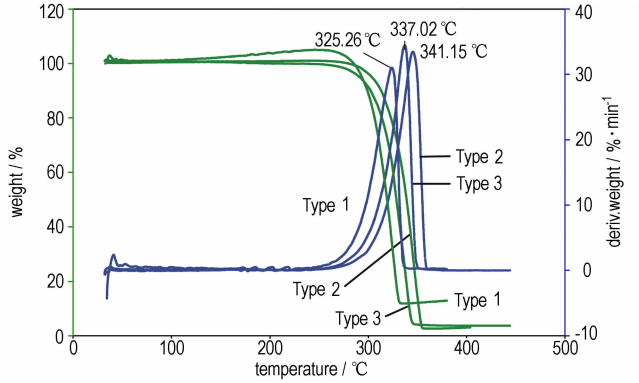


Hydroxy terminated polyether (HTPE) binder with novel structures was synthesized by ring-opening polymerization of tetrahydrofuran, using polyethylene glycol (PEG) as a macroinitiator, boron-trifuoride ethylether complex ($BF_3 \cdot OEt_2$) as the catalyst, and epoxy propane (PO) as agent assistant ring-opening.

WANG Cun-dong, LUO Yun-jun, XIA Min

Chinese Journal of Energetic Materials, **2011, 19(5): 518 −522**

Preparation and Thermal Properties of Fine LLM-105 with Different Crystal Form

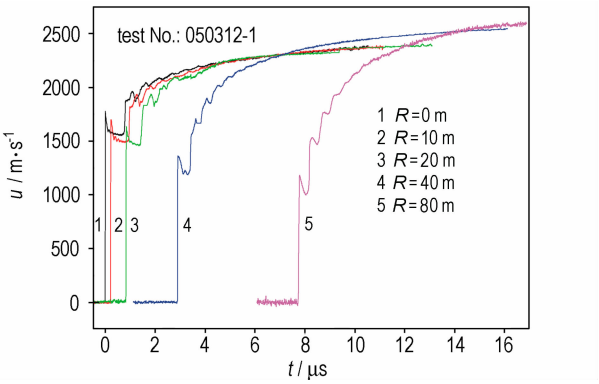


Fine 2, 6-diamino-3, 5-dinitropyrazine-1-oxide (LLM-105) was prepared with solvent-nonsolvent method. And its thermal properties were analyzed with TG-DTG, DSC and Kissinger equation.

WANG You-bing, GE Zhong-xue, WANG Bo-zhou, YE Zhi-hu, LI Ya-nan, SHANG Yan

Chinese Journal of Energetic Materials, **2011, 19(5): 523 −526**

Research on Flyer Acceleration of Divergent Detonation of Insensitive Explosive

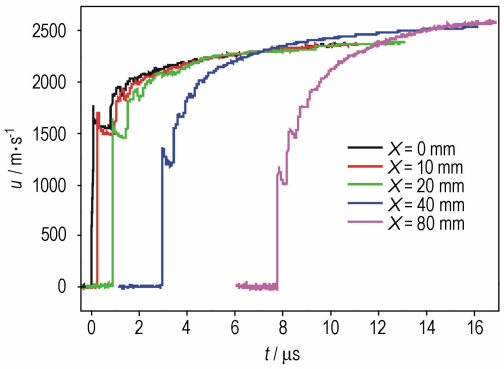


TATB based explosive and HMX based explosive were investigated with bigplate experiment and numerical simulation.

ZHAO Feng, YU De-shui, PENG Qi-xian, WEN Shang-gang, LI Ping

Chinese Journal of Energetic Materials, **2011, 19(5): 527 −531**

Application of VISAR in Bigplate Experiment

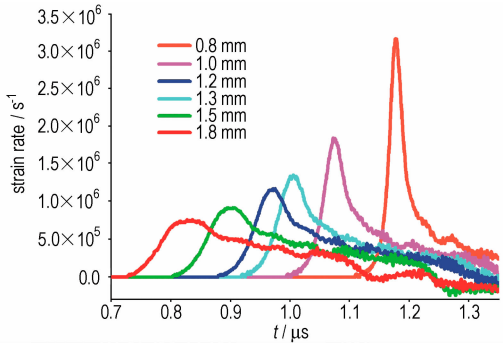


YU De-shui, ZHAO Feng, PENG Qi-xian, LI Ping

Chinese Journal of Energetic Materials, 2011, 19(5): 532 –535

Velocity interferometer system for any reflector (VISAR) testing technology with slanting incidence was used in bigplate experiment to measure the movement of the flyer.

Response of JO-9159 under Magnetically Driven Quasi-Isentropic Compression to 5 GPa

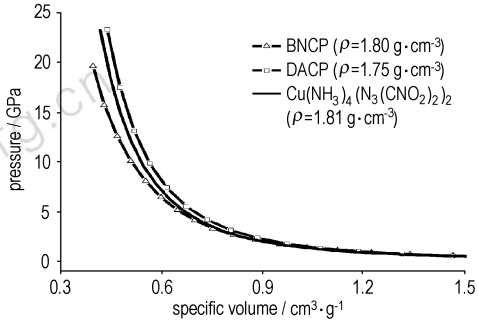


CAI Jin-tao, ZHAO Feng, WANG Gui-ji,
ZHAO Jian-heng, WENG Ji-dong, WU Gang

Chinese Journal of Energetic Materials, 2011, 19(5): 536 –539

Under quasi-isentropic compression, the gradient of particle velocities between the windows and the samples becomes larger and the peak of strain ratio becomes narrower but higher when samples become thicker.

Calculation of Detonation Parameters of Metal Compounds Explosives

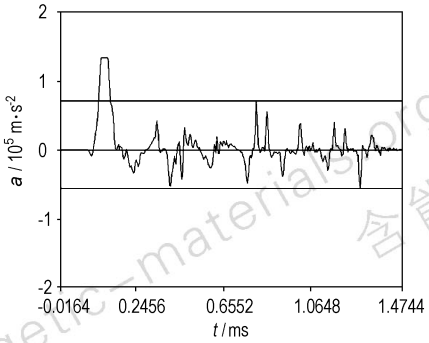


QIN Wen-zhi, LONG Xin-ping, JIANG Xiao-hua, HE Bi

Chinese Journal of Energetic Materials, 2011, 19(5): 540 –543

The detonation properties of BNCP, DACP and tetraamminebis(3,5-dinitro-1,2,4-triazolato-N^1) copper (Ⅱ) were calculated by VLW code. The coefficients of the JWL equation of state were fitted using the calculated isentropic expansion data.

Simplified Calculation Method of Blast Vibration Acceleration in Concrete Target Head Face

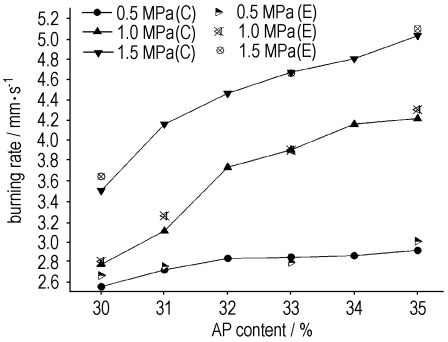


SONG Pu, WANG Xiao-ming, GU Xiao-hui,
LIANG An-ding, ZHAO Xiang-jun

Chinese Journal of Energetic Materials, **2011**, **19**(**5**): **544 – 547**

The simplified calculation method of blast vibration acceleration of target head face was put forward in solid medium after charge explosion. Blast experiments in concrete were performed, and the simplified calculation method was verified by the experimental results.

Calculation for Primary Combustion Characteristics of Boron-based Fuel-rich Propellant based on PSO-BP Neural Network

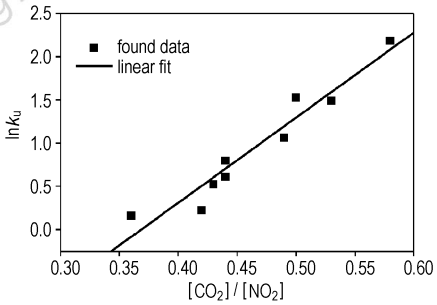


WU Wan-e, ZHU Zuo-ming, SHUAI Ling

Chinese Journal of Energetic Materials, **2011**, **19**(**5**): **548 – 552**

With particle swarm optimization (PSO) optimizing biases and weights of back-propagation (BP) neural network, a simulation model for primary combustion characteristics of boron-based fuel-rich propellant based on PSO-BP neural network was established and validated, and then was used to predict primary combustion characteristics of boron-based fuel-rich propellant.

Effect Factors on PDSC Characteristics Equation of the Burning Rate



HENG Shu-yun, LIU Zi-ru, XIE Ming-zhao, ZHANG La-ying,
REN Xiao-ning, WANG Xiao-hong

Chinese Journal of Energetic Materials, **2011**, **19**(**5**): **553 – 556**

The "burning-heat factor" k_u values of RDX-CMDB propellants (R series propellants) are affected by burning catalysts and a linear correlation or an approximate linear correlation appears in between the relative concentrations of main gaseous products of decomposition and k_u or m values.

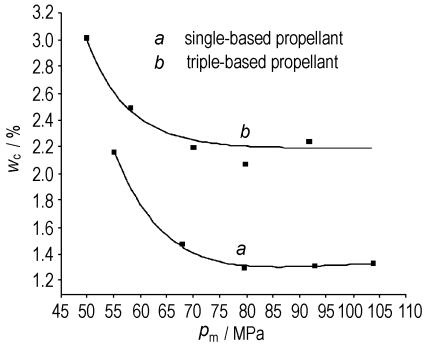
Effects of New Combustion Stabilizers on Combustion Performances of Double-based Propellant

ZHANG Xiao-hong, ZHANG Pei, WANG Bai-cheng, SUN Zhi-gang, WANG Ying, CHEN Xue-li

Chinese Journal of Energetic Materials, **2011**, **19**(5): **557 −560**

The effects of five new combustion stabilizers with high-melting point, WB, WC, ZrB_2, ZrO_2 and SiC on combustion performances of screw extrusion double-based propellant were investigated.

Effect of Charge Density and Combustion Pressure on Adhesiveness Combustion Residue of Gun Propellant Charges

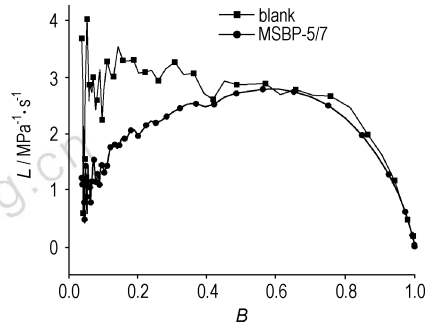


QIAO Li-jie, DU Ping, WANG Ze-shan

Chinese Journal of Energetic Materials, **2011**, **19**(5): **561 −564**

The effect of different charge density, different combustion pressure and different propellants on the adhesiveness combustion residue release was studied by closed bomb test.

A Study of Propellant with Low Erosion and High Combustion Progressivity

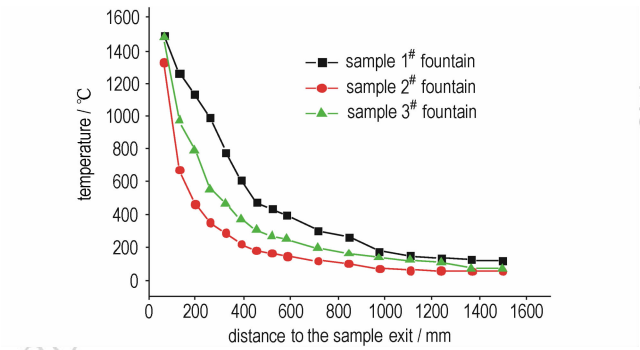


LIU Bo, WANG Qiong-lin, LIU Shao-wu, ZHENG Shuang, YU Hui-fang, WEI Lun, ZHANG Yuan-bo

Chinese Journal of Energetic Materials, **2011**, **19**(5): **565 −568**

The modified single base propellant was prepared by using an impregnated-deterred technology. The erosion of the propellant to barrel was characterized by erosion tube test. The static combustion performances of the propellant were investigated by closed-bomb test. The dynamic interior ballistic performance of the propellant was studied by 857-30 mm gun.

Flame Temperature Distribution Characteristics of Typical Stage Fireworks



CHEN Tao, FU Xue-cheng, ZHAO Li-zeng,
XUE Gang, WANG Xin, BAO Zhi-ming
Chinese Journal of Energetic Materials,2011,19(5): 569 −574

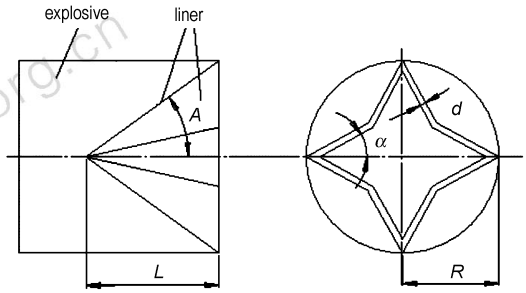
The flame temperature distribution in the centerline of three kinds of fountain stage of fireworks with different dosage were studied by thermocouple tree testing apparatus consisting of 59 thermocouples and a data recording system.

A Method to Measuring Muzzle Flash of Gun Propellants

YUAN Zhi-lei, HE Zeng-di, LIU Lin-lin, Lü Zhi-xing,
FAN Xue-kun, ZOU Xiu-mei
Chinese Journal of Energetic Materials,2011,19(5): 575 −579

A high speed CCD(charge-coupled device) camera was used to shoot the muzzle flash of gun propellants A and B used in 30 mm gun, and nitramine gun propellant C just-in-time, and the image processing software Image-Pro Plus6.0 was used to edit the photograps.

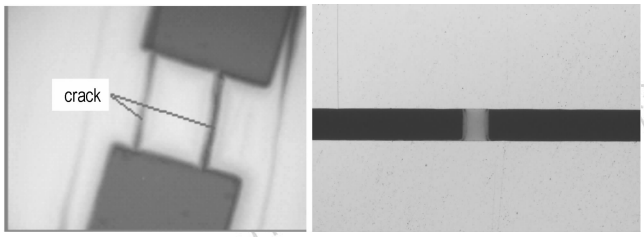
Effects of Star Shaped Liner of Different Half a Wedge on Jet Formation



YAO Zhi-hua, WANG Zhi-jun, LI De-zhan
Chinese Journal of Energetic Materials,2011,19(5): 580 −583

The process that a structure of the new star-shaped liner forms jet was studied by numerical simulation.

Fabrication of Ni-Cr Film Igniting Resistor



XIE Rui-zhen, REN Xiao-ming, WANG Ke-xuan,
XUE Yan, PENG Zhi-ming, LU Bin
Chinese Journal of Energetic Materials, **2011**, **19**(**5**): **584 -587**

The sputtering and etching techniques of Ni-Cr film igniting resistor were studied in order to achieve even resistance and low firing voltage, at the same time, the parameter of igniting resistor was tested.

An Important Energetic Material: 5-Substituted Tetrazole Energetic Metal Complexes

SHU Yuan-jie, LI Hua-rong, GAO Xiao-min,
YIN Ming, XIONG Ying, LI Yin-chuan
Chinese Journal of Energetic Materials, **2011**, **19**(**5**): **588 -596**

This paper introduces some synthesis and research trends of 5-substituted tetrazole energetic metal complexes (TEMCs), especially TEMCs with the most important ligands 5-cyanotetrazole (CT), 5-nitrotetrazolium (NT) and 5-aminotetrazole, which may provide not only some academic guide for further study on TEMCs, but also designing and searching for new high energetic density compounds.

Review on Preparation and Separation Methods of Fullerenes

WEI Xian-feng, LONG Xin-ping, HAN Yong
Chinese Journal of Energetic Materials, **2011**, **19**(**5**): **597 -602**

The preparation, separation and purification methods for fullerenes were introduced. Factors that influenced fullerenes synthesis were also analyzed.

Executive editor: WANG Yan-xiu; JIANG Mei Computer typesetter: LI Shao-hui