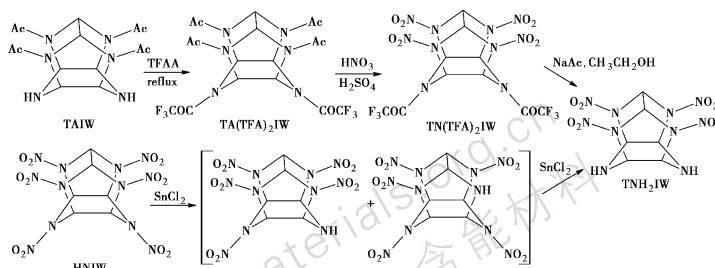


### Synthesis and Quantum Chemical Study on 2,6,8,12-Tetranitro-2,4,6,8,10,12-hexaazaisowurtzitane



2,6,8,12-Tetranitro-2,4,6,8,10,12-hexaazaisowurtzitane ( $\text{TNH}_2\text{IW}$ ) was synthesized from 2,6,8,12-tetraacetyl-2,4,6,8,10,12-hexaazaisowurtzitane ( $\text{TAIW}$ ) by protection, nitration and deprotection.  $\text{TNH}_2\text{IW}$  could also be obtained by reduction of hexanitrohexaazaisowurtzitane ( $\text{HNIW}$ , CL-20) with  $\text{SnCl}_2$ . The molecular geometries, electric structures, and thermodynamic properties of  $\text{TNH}_2\text{IW}$  were calculated using the density functional theory (DFT) method at the B3LYP/6-31G\* level.

LI Yu-chuan, QI Cai, SUN Cheng-hui, PANG Si-ping,  
ZHAO Xin-qi

*Chinese Journal of Energetic Materials*, 2010, 18(2): 121–127

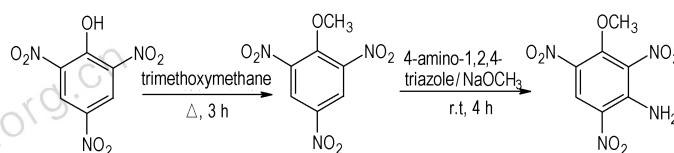
### Prediction of Enthalpy of Formation of Aromatic Polynitro Compounds by Bond Parameter Method

TIAN De-yu, WANG Xiao-xuan, LIU Jian-hong,  
HONG Wei-liang, HUANG Gui-sen

*Chinese Journal of Energetic Materials*, 2010, 18(2): 128–134

Enthalpy of formation of 51 kinds aromatic polynitro compounds were predicted by a bond parameter method.

### Synthesis and Properties of 3-Amino-2,4,6-trinitroanisole

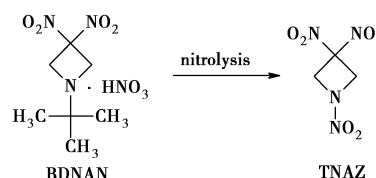


ZHANG Xue-mei, DONG Hai-shan, XIA Yun-xia,  
LIU Xiao-feng

*Chinese Journal of Energetic Materials*, 2010, 18(2): 135–138

Using commercial picric acid as raw materials, 3-amino-2,4,6-trinitroanisole was synthesized. Its properties were preliminarily studied.

### Preparation of TNAZ from Nitrolysis of N-Tert-butyl-3,3-dinitroazetidinium Nitrate



XIONG Cun-liang, JIA Si-yuan, LIU Qian, WANG Bo-zhou,  
HUO Huan

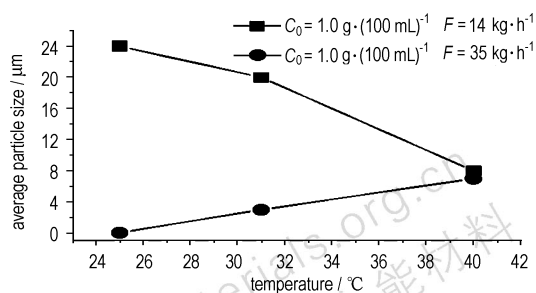
*Chinese Journal of Energetic Materials*, 2010, 18(2): 139–142

Taking *N*-tert-butyl-3,3-dinitroazetidinium nitrate (BDNAN) as precursor, 1,3,3-trinitroazetidinium (TNAZ) was synthesized by five different nitrolysis systems. The optimal nitrolysis system was  $\text{NH}_4\text{NO}_3/\text{Ac}_2\text{O}$ .

### Recrystallization of Ammonium Perchlorate from Ethanol Using Supercritical Carbon Dioxide as Antisolvent

WEN Li-qun, ZHANG Tong-lai, QIN Qing-feng

*Chinese Journal of Energetic Materials*, 2010, 18(2): 143–147

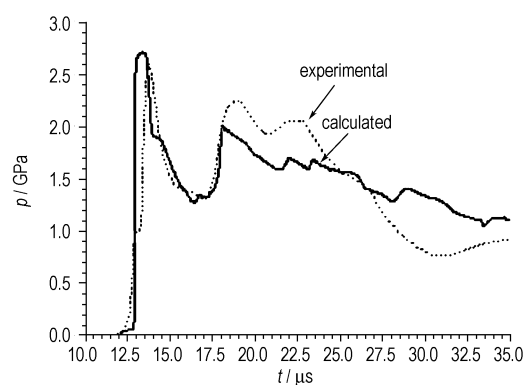


The recrystallization of AP was carried out using supercritical CO<sub>2</sub> as the anti-solvent and ethanol as solvent. The volumetric expansion curves of CO<sub>2</sub>-ethanol were measured and the vapor-liquid equilibrium of CO<sub>2</sub>-ethanol system was calculated with Peng-Robinson equation. The effects of the main operation parameters on the result of the gas anti-solvent (GAS) recrystallization process were studied experimentally, such as the initial concentration of the solution, the final pressure and hold time after the pressurization.

### Experimental and Numerical Calculation Study on Shock Sensitivity of Aluminum Explosive

ZENG Dai-peng, TAN Duo-wang, LI Shang-bin, LI Tao

*Chinese Journal of Energetic Materials*, 2010, 18(2): 148–151



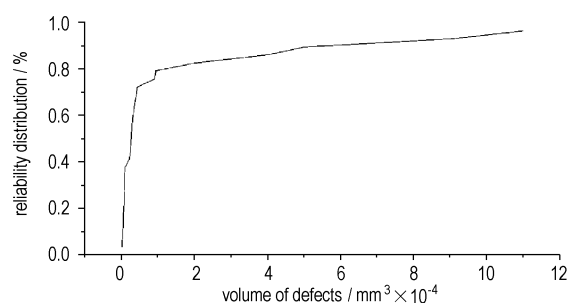
The initiation behaviors of two aluminum explosives (HL-10-L-1 and HL-109-L-1) under long period and low value impulse loading were studied using big gap test and numerical calculation. The critical gap thickness and of nondetonation and nonviolence reaction were obtained.

### Intragranular Defects and Shock Sensitivity of RDX/ HMX

HUA Cheng, HUANG Ming, HUANG Hui, LI Jin-shan,

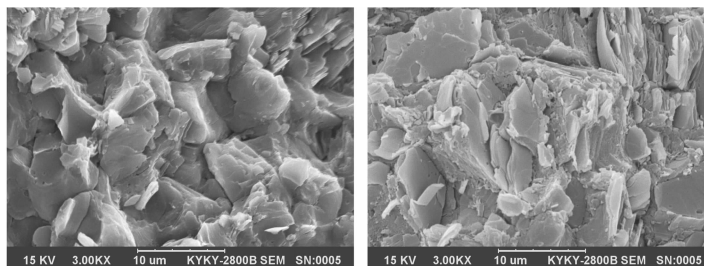
NIE Fu-de, DAI Bin

*Chinese Journal of Energetic Materials*, 2010, 18(2): 152–156



The crystal internal defects of RDX/HMX and RS-RDX/RS-HMX were characterized.

### Effects of Thermal Ageing on Mechanical Properties of PBX Based on TATB

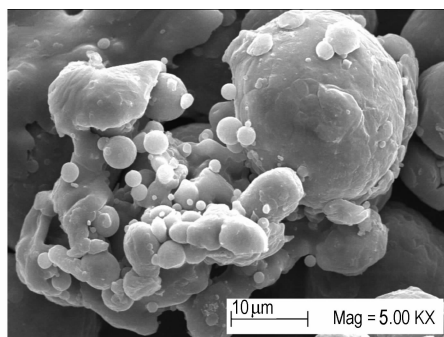


WEI Xing-wen, LI Jing-ming, TU Xiao-zhen, Wang Pei,  
ZHOU Xiao-yu

*Chinese Journal of Energetic Materials*, 2010, 18(2): 157–161

SEM photograph of rupture section of a PBX specimen after tension test at 55 °C. It's found that the interfacial mechanism between binder and TATB crystal does not change after aged at 75 °C for 360 days.

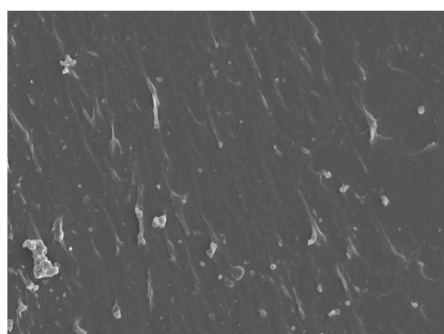
### Ignition Temperature of 2Al/Fe<sub>2</sub>O<sub>3</sub> Thermite



ZHANG Song-lin, WU Bin, QIN Zhi-gui, ZHANG Qing-ming  
*Chinese Journal of Energetic Materials*, 2010, 18(2): 162–166

Ignition temperature of 2Al/Fe<sub>2</sub>O<sub>3</sub> thermite was studied by analysis and experiments. Failure temperature of aluminum particle oxide film was analyzed according to the weight, resistance and appearance of aluminum powder undergoing different temperatures. Critical ignition temperatures of thermite spheres with different radii were calculated by Frank-Kamenetskii theory and measured by a high-temperature muffle furnace.

### Mechanical Properties of GAP/HTPB Blend Binders



NI Bing, QIN Guang-ming, RAN Xiu-lun

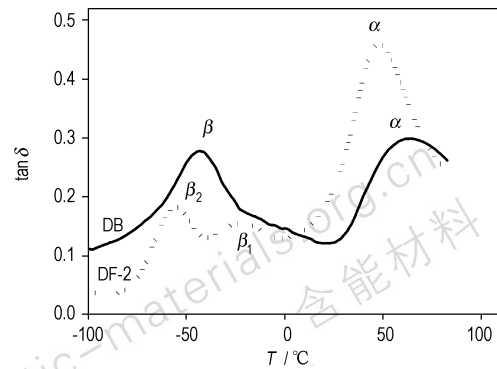
*Chinese Journal of Energetic Materials*, 2010, 18(2): 167–173

Interpenetrating polymer networks (IPN) of GAP/HTPB were prepared under varying reaction conditions. The physical and mechanical properties of IPN were evaluated by static tensile test and DMA. The morphology of IPN of GAP/HTPB was characterized by SEM.

### Effects of DNTF Contents on Dynamic Mechanical Properties of Modified Double-base Propellant

LI Liang-liang, WANG Jiang-ning, LIU Zi-ru

*Chinese Journal of Energetic Materials*, 2010, 18(2): 174–179

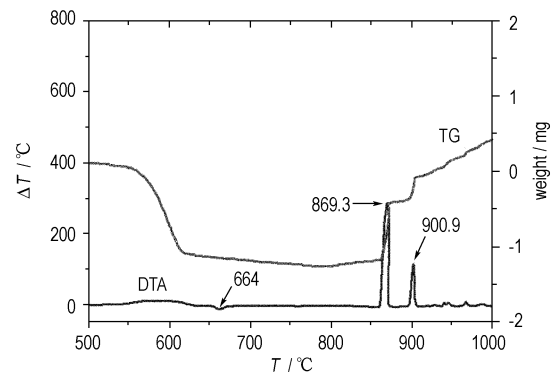


It is shown that the content of 3,4-dinitrofurazanfuroxan (DNTF) can obviously affect the dynamic mechanical properties of DF (DNTF-CMDB) propellants. The DF propellant with 20% DNTF has optimal mechanical properties at high and low temperature.

### Effect of Magnesium Powder Particle Size on Combustion Properties of Mg/PTFE Fuel-rich Propellant

ZHENG Lei, PAN Gong-pei, CHEN Xin, QIAO Li

*Chinese Journal of Energetic Materials*, 2010, 18(2): 180–183



The effect of magnesium powder particle size on the combustion properties of Mg/PTFE fuel-rich propellant was studied. The thermal properties of Mg/PTFE were studied by using differential thermal analysis (DTA) and thermogravimetry (TG). The linear and molar burning rate were measured, and the flame temperature was surveyed.

### Mechanical Comminution of Discarded HTPB Propellant

JIANG Da-yong, WANG Xuan-jun, BAI Yun, HAN Qi-long

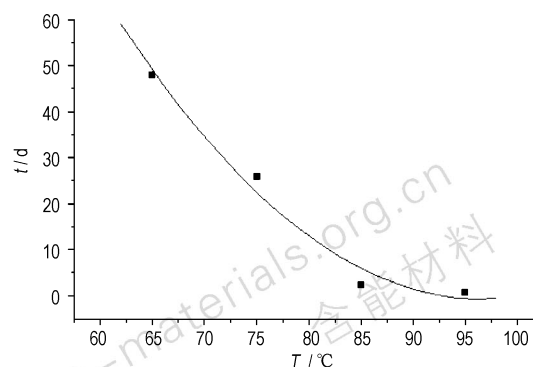
*Chinese Journal of Energetic Materials*, 2010, 18(2): 184–187



The dry cyclone method is ideal one to smash the discarded HTPB propellant with 1 mm diameter of smashed materials and little loss of effective composition. 8# detonator could be ignited by the explosive prepared with the materials.

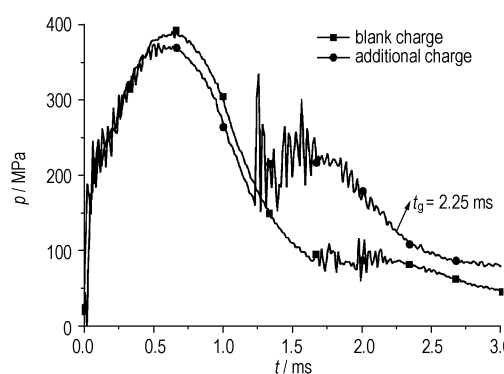
### Service Life of RB Nitramine Propellant

LIAO Xin, DU Ping, WANG Ze-shan

*Chinese Journal of Energetic Materials*, 2010, 18(2): 188 – 191

Using the method of heat-accelerative ageing and comparing with biaromatic-3 propellant, service life of RB nitramine propellant can be estimated easily.

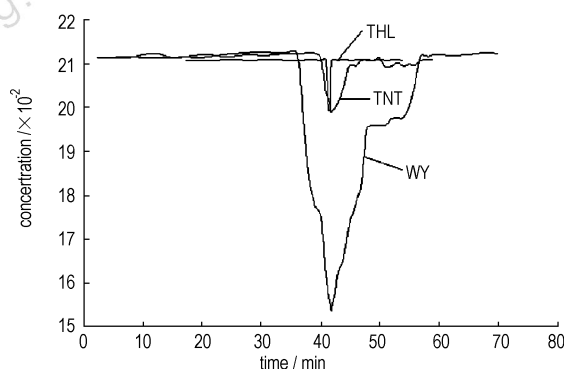
### Application of a New Gun Propellant in Barrel Additional Charge

ZHANG Jiang-bo, YANG Yan, ZHANG Yu-cheng,  
JIANG Shu-jun, YU Bin, WANG Feng*Chinese Journal of Energetic Materials*, 2010, 18(2): 192 – 195

A experimental device that additional chambers were mounted on a barrel of 14.5 mm ballistic machine gun was adopted in order to study the pressure platform-like effect of increasing muzzle velocity with a barrel additional charge. The 6/7-XDGZB gun propellant was used as the main charge, and the 4/1-XDZJ was used as the additional charge.

### Target Determination Technology on Detonation Gaseous Products of a Thermo-baric Warhead

HU Lan, LIU Hong-ni, REN Chun-yan, ZHANG Ting

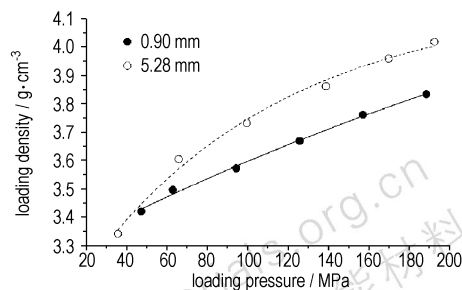
*Chinese Journal of Energetic Materials*, 2010, 18(2): 196 – 199

A suit of on-line test equipment based on electrochemical sensor was used to determine detonation gaseous products of a thermo-baric warhead. Arrangement and protection of the equipment was discussed, Concentration-time curves of gaseous products in thermo-baric warhead detonation were obtained. Anoxia asphyxia and miasma asphyxia effects were proposed and calculated.

### Experimental Study on Relationship between Pressure and Density of CMC-Pb (N<sub>3</sub>)<sub>2</sub> Micro-charges

HE Ai-jun, YAN Nan

*Chinese Journal of Energetic Materials*, 2010, 18(2): 200–204

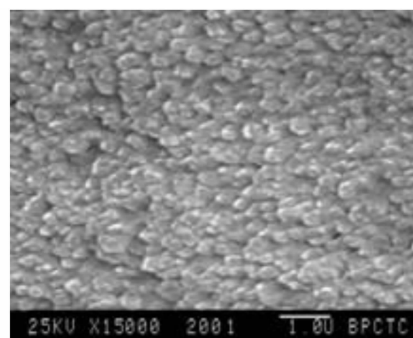


The relationships between loading pressure and loading density by volumetric method were studied. The primer explosive was lead azide carbosymethyl cellulose (CMC-Pb (N<sub>3</sub>)<sub>2</sub>). The charges internal diameter is 0.9 mm and 5.28 mm.

### Preparation and Properties of Mg/PTFE Thin Film

LIU Gui-lin, LI Guo-xin, WANG Guang-hai, LAO Yun-liang

*Chinese Journal of Energetic Materials*, 2010, 18(2): 205–208



Mg/PTFE thin film pyrotechnic was produced by magnetron sputtering and evaporated deposition using magnesium as the combustible and polytetrafluoroethylene as the oxidant. The differences of the two film technologies were investigated and the adhesion, the granularity and the burning rate of the thin film were measured.

### Property Assessment of a Initiating Device by Accelerated Life Test

TU Xiao-zhen, WEI Xing-wen, WANG Pei

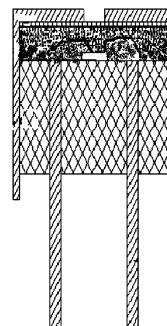
*Chinese Journal of Energetic Materials*, 2010, 18(2): 209–212

The change of a initiating device's function time was studied by accelerated life test at 60 °C, and relative humidity 95%.

### Ignition of Semiconductor Bridge with Nickel Hydrazine Azide

MA Peng, ZHU Shun-guan, ZHANG Lin, ZHANG Lei, XU Lu

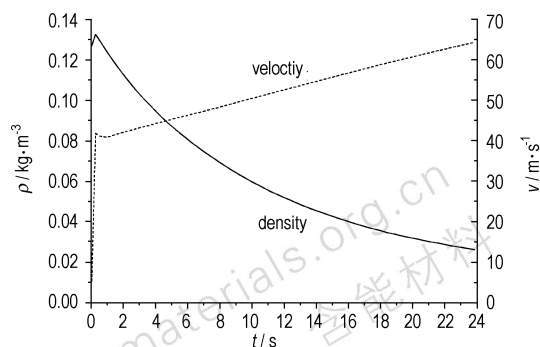
*Chinese Journal of Energetic Materials*, 2010, 18(2): 213–216



A new powerful primary explosive nickel hydrazine azide (NHA) was used as charge for semiconductor bridge (SCB).

### Numerical Simulation of Interior Flow Field in a Base Bleed Unit During Working

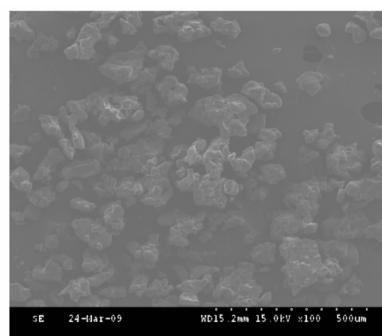
ZHANG Ling-ke, ZHOU Yan-huang, LU Xin, LU Chun-yi  
*Chinese Journal of Energetic Materials*, 2010, 18(2) : 217 – 221



The inner flow-field in base bleed unit when the propellant grain burning was calculated and analyzed. The distribution and values of gas parameters were obtained.

### Preparation and Performance of a New Powdery Ammonium Nitrate Fuel Oil Explosive

HUANG Wen-yao, YAN Shi-long, WANG Xiao-guang, YUAN Sheng-fang, WU Guo-qun, XU Peng  
*Chinese Journal of Energetic Materials*, 2010, 18(2) : 222 – 225



A new powdery ammonium nitrate fuel oil explosive was produced. The microstructure and sensitivity of the explosive were analyzed, and the effects of the charge density on detonation velocity and under water explosion energy were also studied.

### Separation of TAT and TRAT using HPLC

LOU Zhong-liang, MENG Zi-hui, MENG Wen-jun, WANG Peng  
*Chinese Journal of Energetic Materials*, 2010, 18(2) : 226 – 228

A HPLC method was developed for the separation of TAT and TRAT, which are intermediates for the synthetic reaction of 1, 3, 5, 7-tetranitro-1, 3, 5, 7-tetraazacyclooctane (HMX).

### Progress in the Constitutive Models Including Damage of Energetic Materials

LI Jun-ling, LU Fang-yun, ZHAO Peng-duo, CHEN Rong  
*Chinese Journal of Energetic Materials*, 2010, 18(2) : 229 – 235

A survey of the developments in the science community of energetic materials with damage mechanics was carried out from two aspects, which are the macro-mechanics phenomenon and the micro-statistic mechanics. The multi-scale analysis as a possible way was introduced.

### Review on Ageing of I-RDX and I-RDX Based PBX

GAO Xiao-min, HUANG Ming  
*Chinese Journal of Energetic Materials*, 2010, 18(2) : 236 – 240

The ageing research of insensitive RDX (I-RDX) and polymer bonded explosive (PBX) were reviewed. The crystal characteristics of RDX and evaluation methods, and the crystal characteristics and impact sensitivities of I-RDX and I-RDX based PBX before and after aging were summarized.

Executive editor: WANG Yan-xiu Computer typesetter: ZHANG Gui-hong