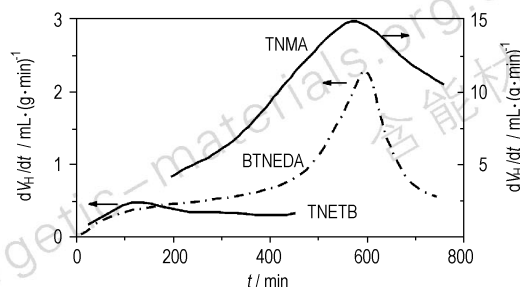


**Differential and Integral Isoconversional Non-linear Methods and Their Application in Physical Chemistry Study of Energetic Materials—II. Thermal Decomposition of TNMA, BTNEDA and TNETB**



The thermal decomposition processes of 2, 2, 2-trinitroethyl-*N*-nitromethyl amine ( TNMA ), bis ( 2, 2, 2-trinitroethyl-*N*-nitro ) ethylene diamine ( BTNEDA ) and 2, 2, 2-trinitroethyl-4, 4, 4-trinitrobutyrate ( TNETB ) under the conditions of vacuum, high loading density at low temperature and low loading density at high temperature were studied by using a highly sensitive Bourdon glass membrane manometer.

SONG Quan-cai, HU Rong-zu, ZHAO Feng-qi,  
GAO Hong-xu, DONG Hai-shan

*Chinese Journal of Energetic Materials*, 2007, 15(3): 193 – 195

**Study on the Synthesis and Properties of *N*-Methyl-2-(3-nitrophenyl) Fullerenopyrrolidine**

JIN Bo, PENG Ru-fang, SHU Yuan-jie, HUANG Yi-ming,  
WANG Rong, CHU Shi-jin

*Chinese Journal of Energetic Materials*, 2007, 15(3): 196 – 197

The reaction of C<sub>60</sub> with *N*-methylglycine and *m*-nitrobenzaldehyde gave 2-(3-nitrophenyl)-*N*-methylfullerenopyrrolidine ( MNPF ). The thermal stability of MNPF was studied by DTA, and the effects of MNPF on the mechanical sensitivity and friction sensitivity of HMX were studied.

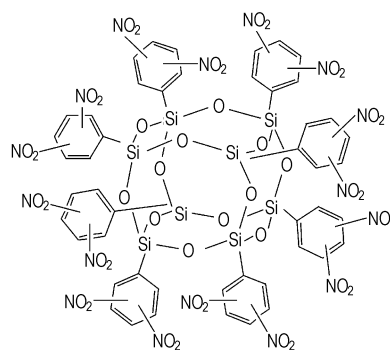
**Preparation and Performance Testing of Ultra-fine PYX**

WANG Bao-guo, ZHANG Jing-lin, CHEN YA-fang

*Chinese Journal of Energetic Materials*, 2007, 15(3): 198 – 200

The micron PYX particle with  $d_{50}$  of 1.06  $\mu\text{m}$  was prepared by the method of solvent-nonsolvent recrystallization technology with DMF (*N,N*-dimethylformamide) as solvent and distilled water as nonsolvent. SEM and Laser Particle Size Analysis were used to characterize its particle size and size distribution. Performances such as energy output, ignition point, impact sensitivity were tested.

**Study on Synthesis and Performances of Polyhedral Octa-( dinitrophenyl ) Silsesquioxane**

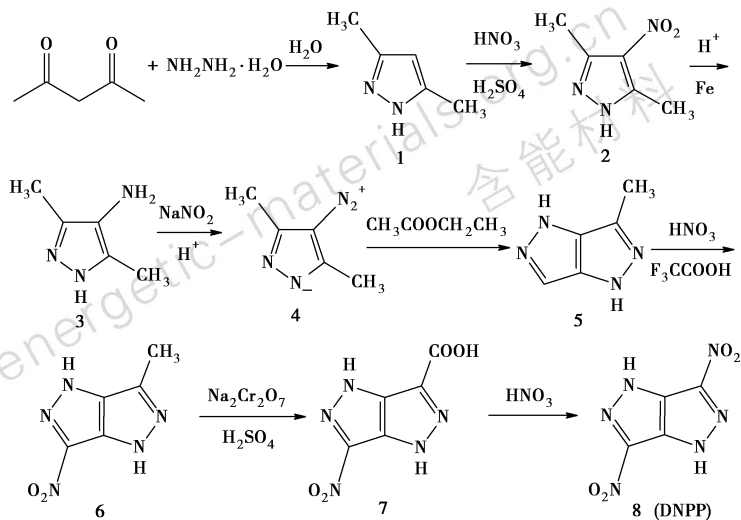


DU Jian-ke, GAO Jun-chi, YANG Rong-jie

*Chinese Journal of Energetic Materials*, 2007, 15(3): 201 – 204

Octa ( dinitrophenyl ) silsesquioxane ( ODNPS ) was synthesized and characterized. The results show that ODNPS is a thermal stable energetic material.

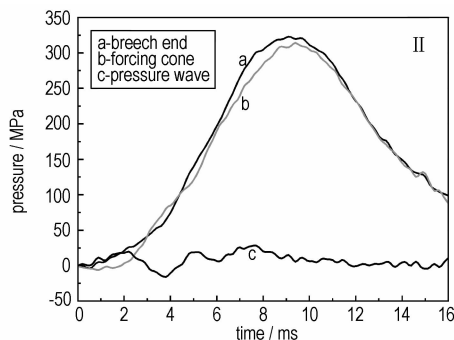
## Synthetic Improvement of DNPP



LUO Yi-fen, GE Zhong-xue, WANG Bo-zhou,  
ZHANG Hai-hao, LIU Qian

*Chinese Journal of Energetic Materials*, 2007, 15(3): 205 – 208

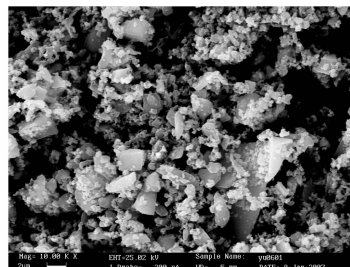
1H,4H-3,6-dinitropyrazolo[4,3-C]pyrazole (DNPP) was synthesized and its structure was confirmed by IR,  $^1\text{H}$ NMR,  $^{13}\text{C}$ NMR and elemental analysis.

Study on  $\text{KNO}_3/\text{C}_6\text{H}_5\text{NO}_3/\text{NC}$  Type Composition

CUI Qing-zhong, JIAO Qing-jie, REN Hui, YANG Rong-jie  
*Chinese Journal of Energetic Materials*, 2007, 15(3): 209 – 213

Compared with black powder, mechanic/static sensitivities of  $\text{KNO}_3/\text{C}_6\text{H}_5\text{NO}_3/\text{NC}$  composition decreased obviously, combustion heat and working capabilities increased about 57% and 40%, respectively.

## Preparation and Characterization of BNCP Superfine Particles



YU Wei-fei, ZENG Gui-yu, SHANG Yao, LI Jin-shan,  
NIE Fu-de, ZHANG Qi-rong, CHENG Bi-bo, YIN Qiang  
*Chinese Journal of Energetic Materials*, 2007, 15(3): 214 – 216

Superfine particles were obtained from original particles of BNCP (tetraamine-cis-bis (5-nitro-2H-tetrazolato-N<sub>2</sub>) cobalt (III) perchlorate) with miller. Their SEM images, XRD chart, BET surface area, DSC curves, impact sensitivity, and friction sensitivity were measured as compared with original particles.

### Effects of Particle Size of BNCP on the Laser Initiation Sensitivity and Delay Time

CHEN Li-kui, SHENG Di-lun, MA Feng-e, ZHU Ya-hong,  
YANG Bing, ZHANG Yu-feng

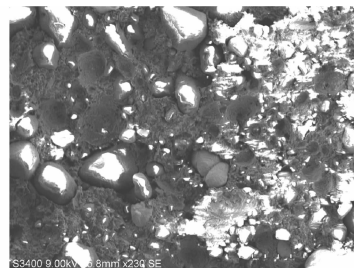
*Chinese Journal of Energetic Materials*, 2007, 15(3): 217 – 219

The effect of particle size of BNCP/C on the laser initiation sensitivity and delay time were investigated, and small particles were found to cause low laser initiation threshold value and short delay time.

### Effect of RDX Particle Size on Properties of CMDB Propellant

JIAO Qing-jie, LI Jiang-cun, REN Hui, Wang Li-xia,  
ZHANG Li-rong

*Chinese Journal of Energetic Materials*, 2007, 15(3): 220 – 223

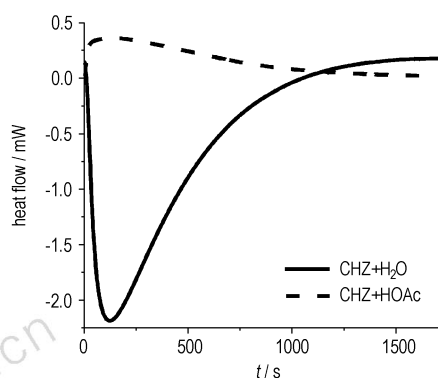


The effects of RDX particle size on properties of CMDB propellant were experimentally studied.

### Solubility, Enthalpies of Dissolution and Thermokinetics of the Dissolution Reaction in Solvent of Carbohydrazide

YANG Li, PEI Qin, CAO Yun-ling, ZHANG Tong-lai,  
HE Wei

*Chinese Journal of Energetic Materials*, 2007, 15(3): 224 – 227



The solubility of carbohydrazide (CHZ) in deionized water, *N,N*-dimethylformamide, absolute ethanol, acetic acid and chloroform at 298.15 K were measured. Enthalpies of integral solution and thermokinetics of the solution reactions of CHZ in deionized water, acetic acid glacial were also obtained using a SETARAM C80 II microcalorimeter.

### Specific Heat Capacity of Sodium Salts of 2,4,6-Trinitro-1,3,5-trihydroxybenzene

LI Ling-hui, ZHANG Tong-lai, ZHANG Jian-guo,  
SUN Cui-na

*Chinese Journal of Energetic Materials*, 2007, 15(3): 228 – 230

The continuous specific heat capacities at constant pressure ( $C_p$ ) of 2,4,6-trinitro-1,3,5-trihydroxybenzene (TNPG), mono-substituted sodium ( $\text{Na}_1$ TNPG), di-substituted ( $\text{Na}_2$ TNPG) and tri-substituted ( $\text{Na}_3$ TNPG) trinitrophenol glucinate were measured by differential scanning calorimeter (DSC) method. The deviation analysis indicates that DSC method is effective and can be used to measure the specific heat capacity of other energetic materials. The correlation coefficients that are close to 1 show that the  $C_p$  values of these compounds are well-regulated.

### Application of Sodium Borohydride ( $\text{NaBH}_4$ ) in Incendiary Agent

GUI Da-yong, LIU Ji-ping, DAI Lan

*Chinese Journal of Energetic Materials*, 2007, 15(3): 231 – 234

The use of a sodium borohydride ( $\text{NaBH}_4$ ) in incendiary agent was investigated by calculation and experiment to improve the energy properties of the pyrotechnics. An optimized composition of incendiary agent with  $\text{NaBH}_4$  having its good performances were presented.

### Mechanical Properties of JMZ Gun Propellants

XU Wan-yu, HE Wei-dong, WANG Ze-shan

*Chinese Journal of Energetic Materials*, 2007, 15(3): 235 – 239

The static and dynamic mechanical properties of gun propellant containing NC, RDX and polyether-urethane PET with mixed nitrate ester as plasticizing agent were tested by DMA and materials tester at different temperatures. The influence rule of prepolymers of PET and curing agent contents on mechanical properties of propellants were obtained.

### Relationship between Energy and Power Capability of Propellant

HUANG Zhen-ya, LI Xiao-an

*Chinese Journal of Energetic Materials*, 2007, 15(3): 240 – 243

The projectile muzzle velocity is not always equivalent at a same impetus or potential energy, and propellant will possess a different power capability when it is used in weapon with different gas expanding ratio.

### Evaluation of Coherence Strength of Energetic Crystalline Granules by Compressive Stiffness Method

LI Ming, WEN Mao-ping, HUANG Ming, XU Rui-juan,  
LI Hong-zhen, XU Rong

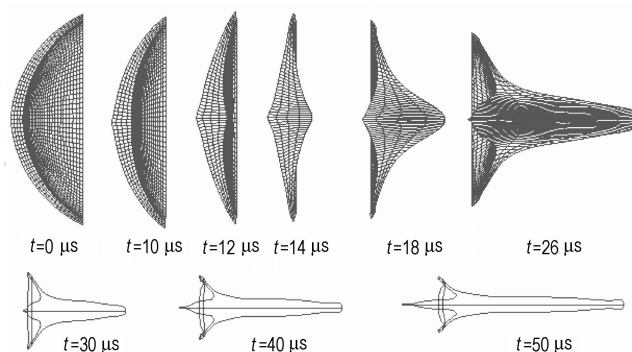
*Chinese Journal of Energetic Materials*, 2007, 15(3): 244 – 247

A quantitative method, i. e. confined quasi-static compressing method was used to evaluate the statistical coherence strength of energetic crystalline granules. The results show that recrystallization processes improve coherence strength and quality of RDX crystalline granules compared to industry grade coarse RDX, while two recrystallization processes cause little difference in coherence strength of processed granules.

### Preliminary Study of High Velocity Rod-Shaped Projectile

LI Cheng-bing, SHEN Zhao-wu, PEI Ming-jing

*Chinese Journal of Energetic Materials*, 2007, 15(3): 248 – 252



The forming mechanism and process of a high velocity rod-shaped projectile was simulated by LS-DYNA software.

### Experimental Study on the Damage Effect of Semi-armor-piercing Projectile Blasting in Multi-layer Targets

ZHOU Ning, REN Hui-qi, SHEN Zhao-wu, LIU Rui-zhao

*Chinese Journal of Energetic Materials*, 2007, 15(3): 253 – 256

The results show that the optimal blasting depth of semi-armor-piercing projectile in concrete covered multi-layer targets is less than in the other targets, and the largest dent volume and dent sectional area in bitumen concrete covered multi-layer targets created by semi-armor-piercing projectile blasting are larger than that in concrete covered multi-layer targets.

### Numerical Simulation of Jet Formation to Hemispherical Liner with Hole

ZENG Bi-qiang, JIANG Chun-lan, WANG Zai-cheng

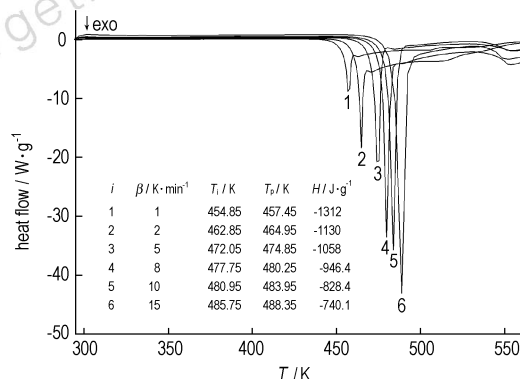
*Chinese Journal of Energetic Materials*, 2007, 15(3): 257 – 260

The proceedings of jet formation to whole hemispherical liner and hemispherical liner with hole were numerically simulated with the finite element code LS-DYNA3D. The theoretical presents and numerical results are found to be in good agreement with the experimental data.

### Simple Method of Measuring Oxidation Activation Energy of *n*-Dodecane

YU Cai-xiang, MI Zhen-tao, ZHANG Xiang-wen

*Chinese Journal of Energetic Materials*, 2007, 15(3): 261 – 264

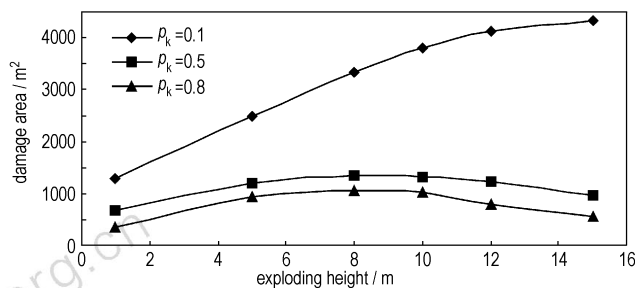


The oxidation temperature and oxidation induction time of *n*-dodecane, a main component in aviation fuel, were determined by means of pressure differential scanning calorimetry (PDSC).

### Engineering Calculation Method for the Lethal Probability of Blast-fragmentation Warhead

WANG De-wu, LI Wei-ping

*Chinese Journal of Energetic Materials*, 2007, 15(3): 265 – 268



The values of the damage area vary with the exploding height. A peak value exists in different lethal.

### Determination of Surface Free Energy Components of $\epsilon$ -CL-20 by Thin-Layer Wicking Technique

DU Mei-na, LUO Yun-jun, LI Guo-ping

*Chinese Journal of Energetic Materials*, 2007, 15(3): 269 – 272

The solid surface free energy components of  $\epsilon$ -CL-20 were determined by the Washburn equation with the thin-layer wicking technique. The results show that the surface free energy components of  $\epsilon$ -CL-20 from different liquids are in good agreement with each other.

### Digital Image Processing Technique to Test the Solid Rocket Plume

ZHANG Shuo, WANG Ning-fei, ZHANG Ping

*Chinese Journal of Energetic Materials*, 2007, 15(3): 273 – 276

The display of maximum luminance pixel points can be used to analyze the position and scope of the highest temperature area, and to make the correct diagnosis to the first mach disk and back combustion area.

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**Research on Treatment of Nitrogen Oxides in Explosive Industry by Rotating Packed Bed with NaOH Solution**

LI Peng, LIU You-zhi, LI Yu, DIAO Jin-xiang,  
KANG Rong-can, JIAO Wei-zhou

*Chinese Journal of Energetic Materials*, 2007, 15(3): 277 – 280

A new absorption equipment—rotating packed bed was applied. The results show that the absorption efficiency of single stage can amount to 81.8% at a gas flow rate of  $2 \text{ m}^3 \cdot \text{h}^{-1}$ , liquid gas ratio of  $20 \text{ L} \cdot \text{m}^{-3}$  and high gravity factors of 90. Absorption efficiency of double stages with oxidation equipment can amount to 95.4%.

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 **$\text{O}_3/\text{H}_2\text{O}_2$  Oxidative Treatment of TNT Red-Water in a Rotating Packed Bed**

DIAO Jin-xiang, LIU You-zhi, WANG He, LI Peng,  
KANG Rong-can, MENG Xiao-li

*Chinese Journal of Energetic Materials*, 2007, 15(3): 281 – 284

The specific property of the  $\text{O}_3/\text{H}_2\text{O}$  oxidative treatment of TNT red-water in a rotating packed bed was investigated. The results show that the optimum process conditions are found when the initial pH value is about 11, the molar ratio of  $\text{H}_2\text{O}_2$  to  $\text{O}_3$  is about 1, and the ratio of liquid to gas is about 0.25.

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**Treatment of TNT Wastewater by Supercritical Water Oxidation**

CHANG Shuang-jun, LIU Yu-cun

*Chinese Journal of Energetic Materials*, 2007, 15(3): 285 – 288

The tests were carried on the treatment of TNT wastewater by supercritical water oxidation (SCWO). The results show that SCWO can efficiently degrade organics in TNT wastewater with  $\text{O}_2$  oxidant. Reaction temperature, pressure, residence time and oxygen excess are the main influence factors in removing COD (chemical oxygen demand) of TNT wastewater.

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**Progress in Insensitive High Energetic Materials *N*-Guanylurea-dinitramide**

LEI Yong-peng, YANG Shi-qing, XU Song-lin, ZHANG Tong

*Chinese Journal of Energetic Materials*, 2007, 15(3): 289 – 293

The properties of *N*-guanylurea-dinitramide (GUDN, FOX-12) were reviewed, the latest progress in application in propellant, gas generating composition and insensitive explosive were introduced.

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**Study on the Anti-infrared Performance of Liquid Smoke Composition**

ZHOU Zun-ning, YAN Fei, CUI Yu-ling, LIU Wei-qiang,  
MEI Qing-he

*Chinese Journal of Energetic Materials*, 2007, 15(3): 294

The IR spectrum transmittance of the obtained liquid anti-infrared smoke composition were 11.7% in 3 – 5  $\mu\text{m}$  band and 3.9% in 8 – 14  $\mu\text{m}$  band.

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**Properties of Insensitive Octogen**

XU Rui-juan, KANG Bin, HUANG Hui, JIANG Yan,  
LI Jin-shan

*Chinese Journal of Energetic Materials*, 2007, 15(3): 295 – 296

The crystal qualities and sensitivity properties of a kind of insensitive Beta octogenfine particle (FD-HMX) were prepared and characterized with many different analysis methods.