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刊名题写：张爱萍

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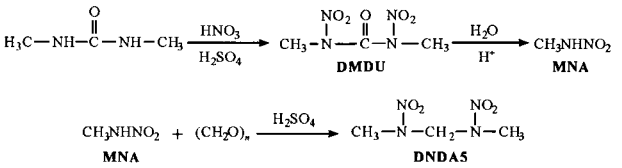
Progress in the Application of Molecular Dynamics Simulation in the Study of Physical and Chemical Properties of Propellant Components

The application progress of molecular dynamics simulation method in solid propellant research was reviewed. The calculation methods and results of micro-structure, thermal decomposition and mechanical properties of propellant components were summarized. It is suggested that the key research direction of the application of molecular dynamics methods in solid propellants in the future are the physical and chemical properties of multi-component propellant formulation system, and the kinetics of curing and thermal decomposition reactions of propellant. At the same time, the accuracy of simulation calculations should be further improved. 77 references are attached.

ZHANG Chong-min, ZHAO Xiao-feng, FU Xiao-long, FAN Xue-zhong, LI Ji-zhen

Chinese Journal of Explosives & Propellants, 2018, 41(6): 531-542.

Synthesis and Thermal Properties of 2,4-Dinitro-2,4-diazapentane

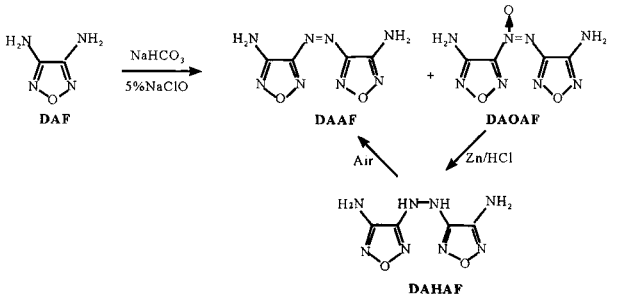


2,4-Dinitro-2,4-diazapentane (DNDA5) was synthesized via nitration, hydrolysis and condensation, using 1,3-dimethylurea as raw material, and the yield of DNDA5 was 64.1%. The structure of DNDA5 was characterized by ^{1}H NMR, ^{13}C NMR, IR and elemental analyses. Its thermal decomposition properties and compatibility with commonly used components of propellants and explosives were studied by DSC.

CHEN Bin, WANG Ying-lei, LU Ting-ting, LIU Ya-jing, GAO Fu-lei

Chinese Journal of Explosives & Propellants, 2018, 41(6): 543-548.

Synthesis and Purification of 3,3′-Diamino-4,4′-azofurazan

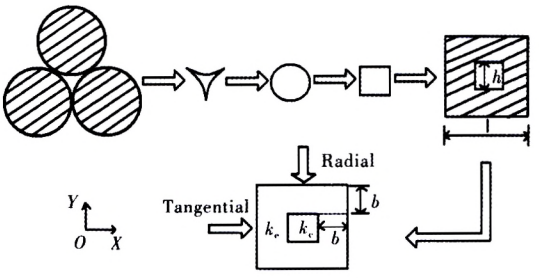


Crude 3,3′-diamino-4,4′-azofurazan (DAAF) with purity of 96.19% was synthesized from 3,4-diaminofurazan (DAF). The high-purity DAAF (>99.60%) was achieved by Zn/HCl reduction and air oxidation of crude product in DMF solvent. Its structure was characterized and purity was determined.

MENG Yu-fu, WANG Xiao-xu, ZHANG Yong, HUNG Ming, WU Jin-ting, CHEN Ming-long, QIAO Qiong-qing, XU Jin, LI Hong-bo

Chinese Journal of Explosives & Propellants, 2018, 41(6): 549-553.

An Elementary Fractal Thermal Conduction Theory Model for Nanometer Energetic Materials

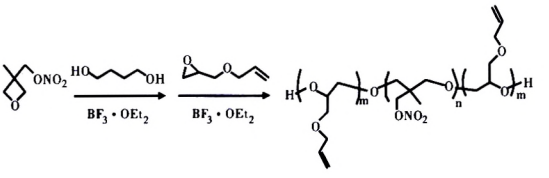


WANG Yi, SONG Xiao-lan, HUANG Hao, LI Feng-sheng

Chinese Journal of Explosives & Propellants, 2018, 41(6): 554-561.

The particle size fractal dimension of nano RDX and nano HMX was calculated, and the thermal conduction models for micron and nano energetic materials were proposed based on fractal theory.

Synthesis and Curing of Energetic Binder Triblock Alkenyl PolyNIMMO

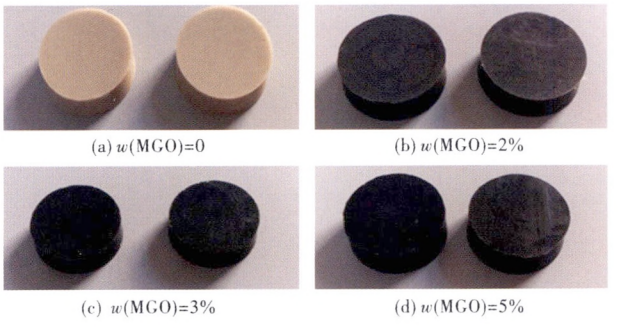


WANG Xiao-chuan, SHU Yuan-jie, MO Hong-chang, LU Xian-ming, LIU Ning

Chinese Journal of Explosives & Propellants, 2018, 41(6): 562-566.

Energetic binder triblock alkenyl poly3-nitratomethyl-3-methyloxetane (NIMMO) was synthesized by cationic ring-opening polymerization method using 1,4-butylene glycol as initiator, $BF_3 \cdot OEt_2$ complex as catalyst, NIMMO as the first monomer and allyl glycidyl ether (AGE) as the second monomer. The poly(oxazoline) elastomer was prepared using synthesized energetic binder and tetramethylterephthalobisnitrile oxide (TTNO) as raw materials. Mechanical properties and thermal properties of the elastomer were investigated.

Preparation and Properties Test of the Modified Graphene Oxide/Polyurethane Composite Coating Layer

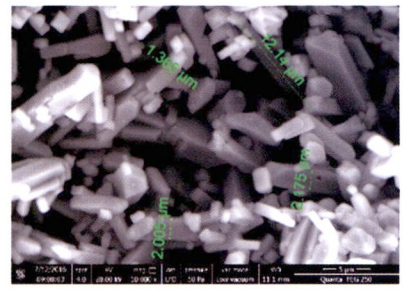


ZHAO Liu-ming, CHEN Teng, LI Wan-hui, LI Xiao-ming, LI Qiang, WANG Qing-hua, GUO Shuang-feng, JIANG Wei

Chinese Journal of Explosives & Propellants, 2018, 41(6): 567-572.

IPDI was used to modify graphene oxide. MGO/polyurethane coating layer was prepared by solution blending method. Tensile test, ablative resistance and residue ratio of MGO/polyurethane coating layer were investigated.

Optimization of Synthesis Process and Property Test of Silver Acetylide-silver Nitrate

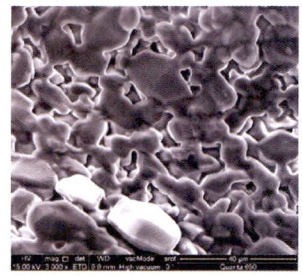


XU Hai-bin, PEI Ming-jing, ZHANG De-zhi, SUI Ya-guang, CHEN Bo, YANG Jun, TANG Shi-ying

Chinese Journal of Explosives & Propellants, 2018, 41(6): 573-577.

A light-ignition explosive, silver acetylide-silver nitrate (SASN), was synthesized from silver nitrate, acetylene, etc. The synthesis process was studied through experiments to try to increase the yield as much as possible. The particle size, morphology, composition of the product were characterized by SEM, XRD and DSC and sensitivity apparatus was used to measure its sensitivities to heat, impact, friction, flame and electrostatic spark. The kinetic parameters of thermal decomposition were obtained by Kissinger's method.

Application of Nitrile Butadiene Rubber Bonding Agents in CL-20/GAP System

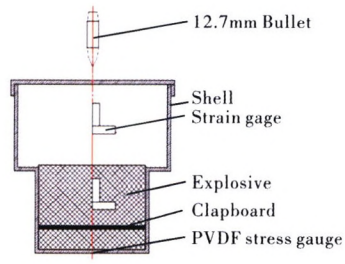


XU Shuang, WU Zhuo, PANG Ai-min, LI Hong-xu, TANG Gen

Chinese Journal of Explosives & Propellants, 2018, 41(6): 578-581.

The mechanical properties of propellants, liquid nitrile butadiene rubber, plasticized liquid nitrile butadiene rubber and hydroxyl-terminated liquid nitrile butadiene rubber were added separately to propellants as bonding agents. The coating effect of bonding agent on CL-20 was observed by scanning electron microscope(SEM). The effect of bonding agents on mechanical properties of GAP films was tested by material stretching machine at 20℃, and the effect of bonding agents on mechanical properties of propellant was tested at −40, 20 and 70℃. The mechanical loss factor tgδ of propellants was measured by thermal dynamic mechanical analysis(DMA).

Response Characteristics of Double-layer Charge with Cavity under Bullet Impact Environment

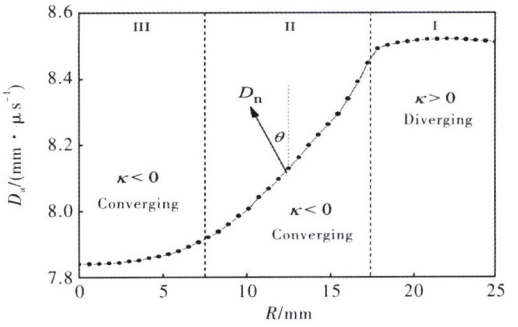


NIE Shao-yun, ZHAO Xue-feng, YAO Kui-guang, DAI Xai-gan, WEN Yu-shi

Chinese Journal of Explosives & Propellants, 2018, 41(6): 582-587.

A double-layer charge structure with cavity was designed for the research on the response characteristics of the charge under bullet impact. The strain, stress and shock wave pressure were measured during the test, and the response of the device under impact were analyzed. The microstructure and elements variation of samples were also checked by examining the remained samples via SEM and XPS.

Detonation Waveform and Driving Performance of a Kind of Coaxial Binary Composite Charge

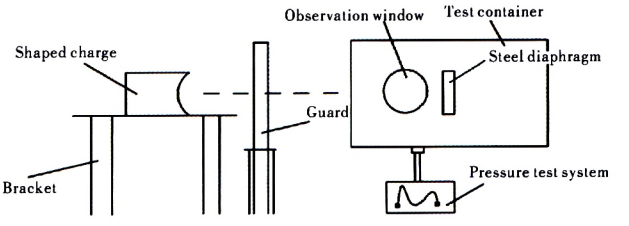


SHEN Fei, WANG Hui, LUO Yi-ming

Chinese Journal of Explosives & Propellants, 2018, 41(6): 588-593.

The DNTF based explosive with high detonation velocity for outer layer and the aluminized explosive with high heat of detonation for inner layer were composed to the coaxial composite charge, and its detonation waveform characteristics were studied by a high-speed scanning camera. The driving characteristics of the composite charge were compared with that of the two kind of single charges by using cylinder test.

Study on Energy Release Characteristics of Fe/Al Energetic Jet

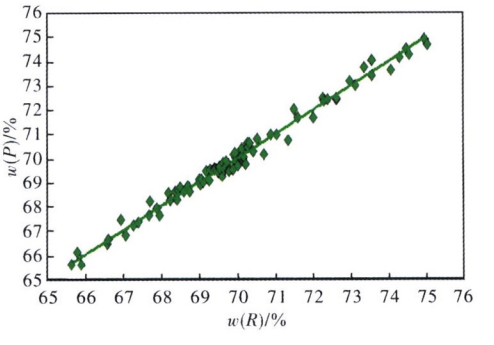


DU Ye, LI Qiang

Chinese Journal of Explosives & Propellants, 2018, 41(6): 594-598.

A testing system for collecting energy released from energetic materials under impact loading was constructed, and a data processing method for overpressure difference was proposed. The energy release characteristics of Fe/Al energetic materials under impact loading were obtained.

Rapid Detection Method of Nitrating Acid in Nitroglycerin Production Process

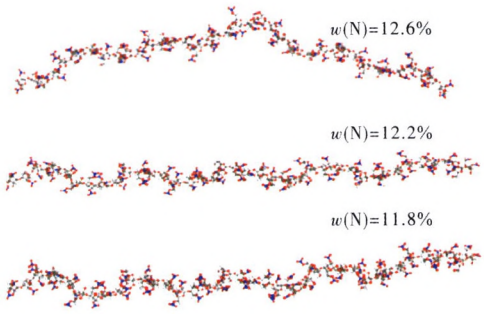


WEN Xiao-yan, CHEN Man, YAN Rui, HU Lan, LI Jun-ping, LIU Hong-ni, WANG Jing-na

Chinese Journal of Explosives & Propellants, 2018, 41(6): 599-604.

The fast detection method of nitrating acid was studied by using near infrared spectroscopy, and the quantitative models of sulfuric acid, nitric acid and nitroglycerin was established and were compared with those of chemical analysis.

Effect of NC with Different Content of Nitrogen on the Mechanical Properties of CMDB Propellants

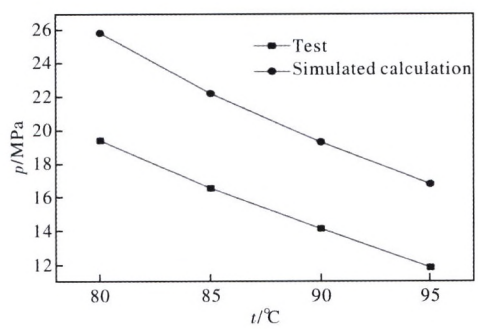


ZHANG Ya-jun, LI Ji-zhen, TANG Qiu-fan, LI Wei, WANG Ke, FAN Xue-zhong, QU Bei, ZHANG Zheng-zhong, YAN Hai-tao, BAO Yuan-peng

Chinese Journal of Explosives & Propellants, 2018, 41(6): 605-610.

The intermolecular interaction of NC was weakened while the interaction between NC and NG was strengthened with increasing of N content. The mechanical properties of casting CMDB propellants can be improved by compounding the NC with high N content and the NC with low N content.

Effect of Temperature on Formation Pressure and Offset Distance of Preparing the Double-base Gun Propellants

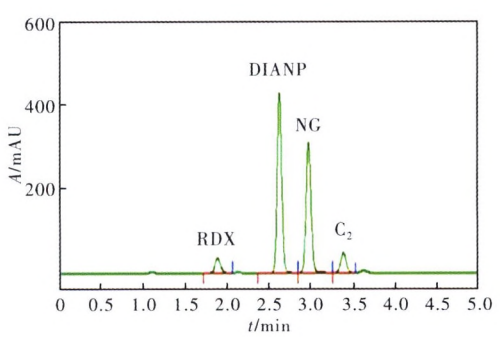


ZOU Feng-juan, HU Xiao-qiu, LIANG Hong-ye, LIU Zhi-tao

Chinese Journal of Explosives & Propellants, 2018, 41(6): 611-616.

The effect of temperature on the pressure and offset distance in forming process of gun propellant was studied through changing the extrusion process parameters (preheating temperature of the materials for gun propellant and preheating temperature of the mould). Through fitting several set of data about shear rate, shear viscosity and temperature, the Bird-Carreau model was chosen as the rheological model. Fluent software is used to do the conjugate heat transfer analysis between the mould and materials for the gun propellant. In addition, a series of extrusion forming tests are conducted to obtain the pressure distributes in the flow channel of materials for the gun propellant and the maximum deformation of the die pins.

Determination of Four Components in Azidonitramine Gun Propellant Containing RDX by RP-HPLC

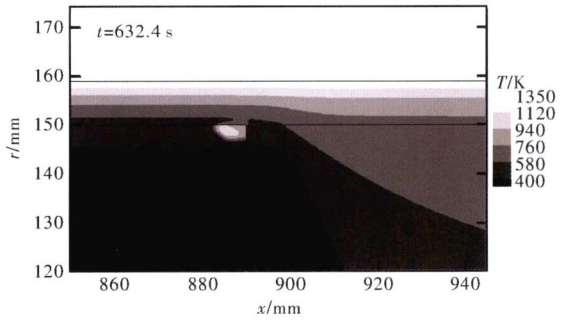


YANG Cai-ning, ZHAO Juan, CHEN Man, JIA Lin, WANG Ge-yang, ZHANG Yu, HE Ke-wei

Chinese Journal of Explosives & Propellants, 2018, 41(6): 617-620.

A high performance liquid chromatography (HPLC) was established for determination the content of four components, RDX, NG, DIANP and C_2 in azidonitramine gun propellant containing RDX. The analysis results show that the established method are accurate and reliable, which can meet the needs of actual sample analysis.

Numerical Simulation of Fast Cook-off Characteristics for a Large Scale Solid Rocket Motor

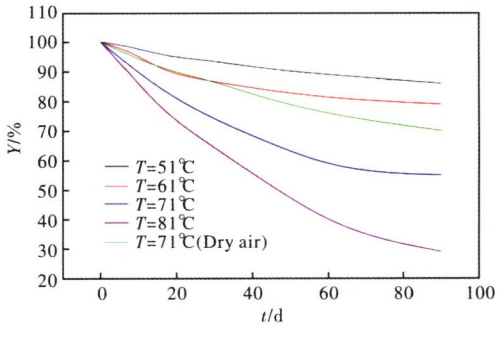


YE Qing, YU Yong-gang

Chinese Journal of Explosives & Propellants, 2018, 41(6): 621-626.

A simplified two-dimensional axisymmetric fast cook-off model was established for a solid rocket motor loaded with AP/HTPB propellant. The fast cook-off behavior of the motor was numerically simulated under the different working condition. A linear relationship between the ignition delay t_i and the heating rate k was obtained.

Aging Life Evaluation of a Tri-base Gun Propellant

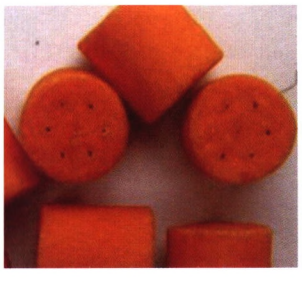


SONG Li-qian, LIU Da-bin, QIAN Hua, LIU Bing-xin

Chinese Journal of Explosives & Propellants, 2018, 41(6): 627-631.

The relative content of centralite under different aging conditions was measured by a bromination method. The safety storage life was predicted by Berthelot's equation.

Study on the Preparation and Properties of Modified Single-base Gun Propellant with High Nitrogen Content



YU Hui-fang, LI Zi-chao, LIU Bo, WEI Lun, ZHENG Shuang, HAN Bing

Chinese Journal of Explosives & Propellants, 2018, 41(6): 632-636.

The modified single-base gun propellant (MSBP) with high content of nitrogen in the nitrocellulose was prepared by the energy-increased and desensitizing processes. The MSBP has an obvious burning progressivity and the burning progressivity increases with the high content of NG and deterrent. The 14.5 mm gun test shows that it has higher muzzle velocity and the characteristics of low temperature coefficient when using the MSBP with high content of nitrogen.

刊名题写:张爱萍

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