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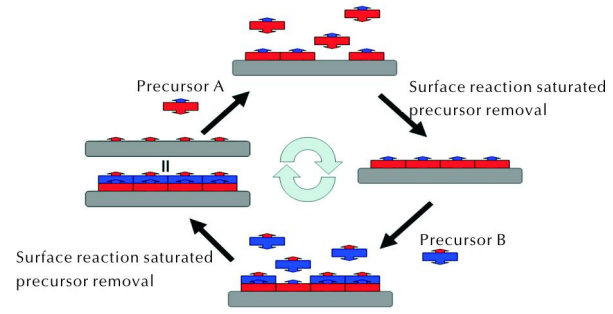
Contents

Research Progress on Application of Atomic Layer Deposition in Surface Fabrication of Energetic Materials

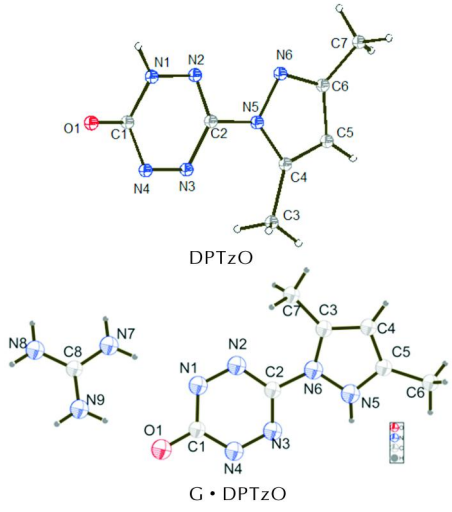


QIN Li-jun ,GONG Ting ,YAN Ning ,LI Jian-guo ,HUI Long-fei ,HAO Hai-xia , FENG Hao

Chinese Journal of Explosives & Propellants ,2019 ,42(5) :425-431 .

ALD is a thin film coating technology featuring unique capabilities such as precise film thickness control , low temperature deposition , large area and three-dimensional uniformity . These features make ALD a promising technology for fabricating energetic materials . In this article , the latest research progresses on ALD fabrication of energetic materials were reviewed .

Crystal Structure and Thermal Decomposition Behaviors of 6-(3 ,5-Dimethyl-1H-pyrazole)-1 ,2 ,4 ,5-tetrazin-3-one (DPTzO) and Its Guanidine Salt

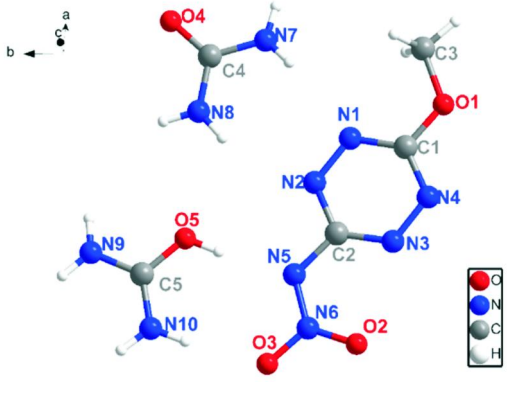


ZHANG Cong , CHEN Xiang , BAI Yang , GUO Zhao-qi , MA Hai-xia

Chinese Journal of Explosives & Propellants ,2019 ,42(5) :432-437 .

DPTzO and its guanidine salt (G • DPTzO) were synthesized and the structures were characterized by FT-IR , EA , ^{1}HNMR , ^{13}C NMR and XRD . The thermal decomposition processes of the two compounds were analyzed by DSC and TG-DTG under non-isothermal conditions .

Synthesis , Structure and Properties of 3-Methoxyl-6-Nitramine-1 ,2 ,4 ,5-tetrazylated Urea

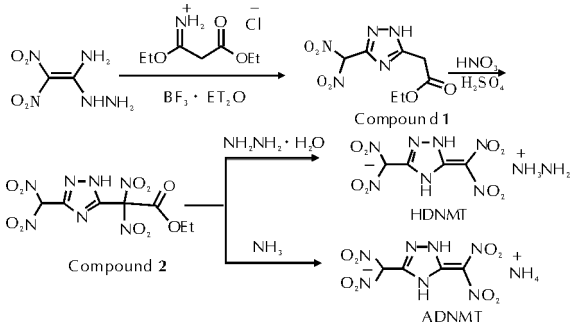


REN Jie , ZHANG Tian-he , LI Zhi-min , WANG Lin , ZHANG Tong-lai

Chinese Journal of Explosives & Propellants ,2019 ,42(5) :438-444 .

An energetic compound of 3-methoxyl-6-nitramine-1 ,2 ,4 ,5-tetrazylated urea was synthesized by reaction of urea with 3 ,6-dinitramine-1 ,2 ,4 ,5-tetrazine in methanol . Its thermal behaviors , heat of combustion and sensitivities were studied .

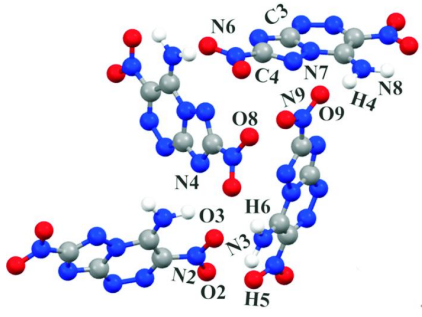
Synthesis, Thermal Behavior and Energy Characteristics of Insensitive High Energetic Ionic Salts of HDNMT and ADNMT



Two kinds of insensitive energetic ionic salts, mono-hydrazinium 3,5-bis(dinitromethyl)-1,2,4-triazolate(HDNMT) and mono-ammonium 3,5-bis(dinitromethyl)-1,2,4-triazolate (ADNMT), were synthesized via the reactions of cyclization, nitration and alkali-hydrolysis. Their structures were characterized by FT-IR, ^{1}H NMR, ^{13}C NMR and elemental analysis. The thermal behaviors of HDNMT and ADNMT were studied by DSC and TG-DTG. The energy characteristics of modified double-base (CMDB) propellant containing HDNMT and ADNMT were calculated by NASA-CEA software under the standard condition.

HUO Huan, GUO Tao, WANG Zi-jun, BI Fu-qiang, WANG Bo-zhou
Chinese Journal of Explosives & Propellants, 2019, 42(5): 445-449.

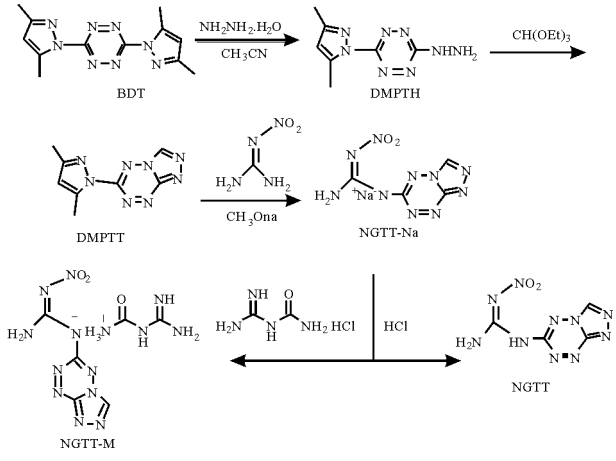
Periodic DFT Study on High Pressure Behavior of Nitrogen-rich Energetic Crystal 4-Amino-3,7-Dinitrotriazolo-[5,1,c][1,2,4] Triazine



The high pressure behavior of nitrogen-rich energetic crystal 4-amino-3,7-dinitrotriazolo-[5,1,c][1,2,4]triazine (DPX-26) in the hydrostatic pressure range of 0—130 GPa was investigated by employing the GGA/PBE-G06 method of periodic density functional theory (DFT). The changes of crystal structure, molecular structure and electronic structure of DPX-26 with pressure were analyzed by calculating lattice parameters (a, b, c), bond lengths, band gaps (ΔE_g) and density of states (DOS).

YANG Dong-fang, LI Hui-li, LIU Jin-jian, ZHAO Guo-zheng, LU Ming
Chinese Journal of Explosives & Propellants, 2019, 42(5): 450-454.

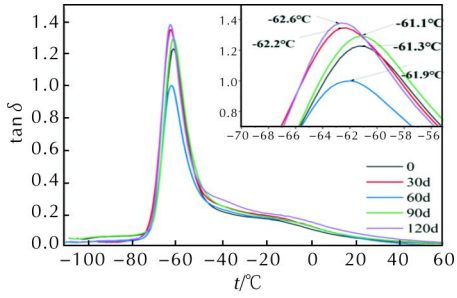
Synthesis and Performances of 3-Nitroguanidino-1,2,4-triazolo[4,3-b]-s-tetrazine and Its Guanylurea Salts



3-Nitroguanidino-1,2,4-triazolo[4,3-b]-s-tetrazine (NGTT) was synthesized and its N-gualnylurea salt was obtained. Their structures, thermal stabilities, detonation velocities, detonation pressures and specific impulses as monopropellant were characterized and calculated.

JIA Si-yuan, ZHANG Hai-hao, BI Fu-qiang, WANG Bo-zhou, ZHANG Jia-rong
Chinese Journal of Explosives & Propellants, 2019, 42(5): 455-459.

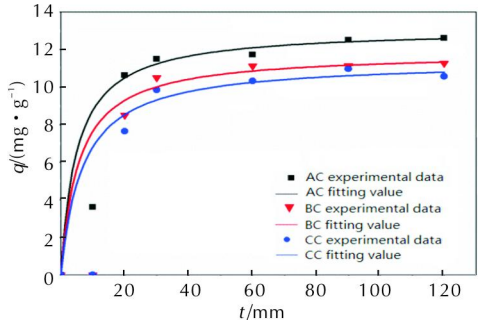
Study on the Storage Stability of Propargyl-Terminated Polybutadiene Prepolymer



The storage stability of PTPB was investigated by tracking test. The chemical structures and properties of PTPB stored at different temperatures and times were characterized by ^{13}C-NMR, FT-IR, TG, GPC and viscosity tests. The PTPB elastomers were prepared from the stored PTPB prepolymer and azido-glycidyl ether (GAP) and the properties of elastomers were characterized by FT-IR, DMA and mechanical tests.

GAO Wen-bo, LI Yong-hui, HE Ji-yu, YANG Rong-jie
Chinese Journal of Explosives & Propellants, 2019, 42(5): 460-464.

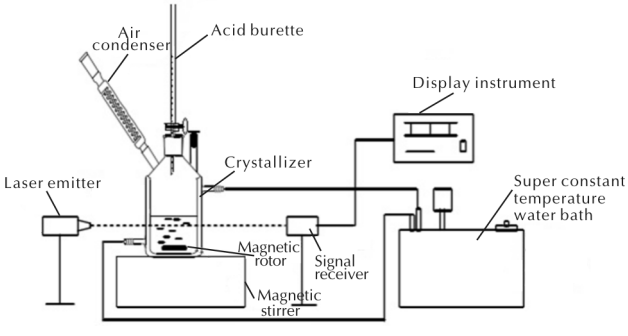
Adsorption Kinetics and Thermodynamics of ADN on Activated Carbon



The mass fraction of ADN and AN in the mother liquor of ADN were determined by reverse high performance liquid chromatography (HPLC). The adsorption kinetic of ADN on three kinds of activated carbons were investigated by quasi-first-order adsorption kinetic model, quasi-second-order adsorption kinetic model and intra-particle diffusion model, respectively, and the adsorption thermodynamics of ADN on activated carbon AC was conducted by Langmuir and Freundlich adsorption isotherm models.

PAN Yong-fei, WANG Ying-lei, LIU Wei-xiao, ZHAO Bao-dong
Chinese Journal of Explosives & Propellants, 2019, 42(5): 465-472.

Solubility and Crystallization of FOX-7 in DMSO-H_2O, DMSO-EtOH and DMSO-ACE Binary Mixed Solvents



The solubility of FOX-7 in four pure solvents (DMSO, H_2O, EtOH, ACE) and three binary mixed solvents (DMSO-H_2O, DMSO-EtOH, DMSO-ACE) were determined by using a laser dynamic monitoring technique. The Apelblat model, Yaws model van't Hoff model were adopted to correlate the experimental solubility data. The morphology of the product crystallized in the DMSO-ACE (volume ratio of 2∶1) system is uniform and spherical.

ZHAO Xin-hua, CAO Duan-lin, WANG Jian-long, CHEN Li-zhen, ZHANG Yue-yang, ZHOU Cheng
Chinese Journal of Explosives & Propellants, 2019, 42(5): 473-479.

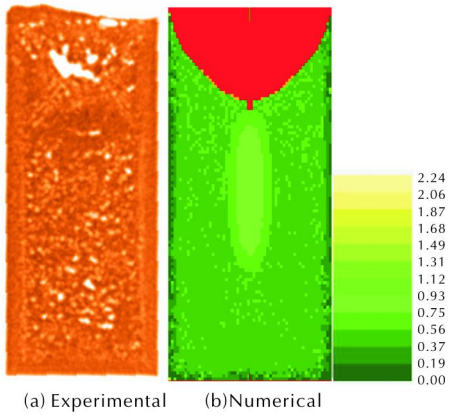
Preparation and Characterization of Emulsion Matrix with Low Temperature Resistance

The storage stability of emulsion matrix of emulsion explosive at low temperature was explored based on formulation optimization. The effects of water content, emulsifier content and kinds of antifreeze agents on the low temperature resistance of emulsion matrix were investigated. The detonation velocity, sacrificial distance and intensity of the emulsion explosive were tested according to National Standard Explosive Test Methods, respectively.

QI Xiu-fang, WANG Jie, HE Jun-rong, CHEN Li-he, TANG Jie

Chinese Journal of Explosives & Propellants, 2019, 42(5): 480-484.

Numerical Simulation and Experimental Study of Microporosity of DNTF during Solidification Process



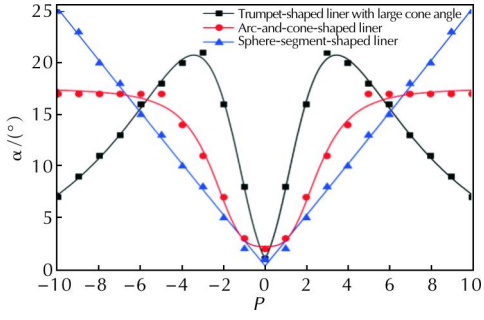
(a) Experimental (b)Numerical

The microporosity of DNTF solidification process was simulated by the advanced porosity module embedded in the ProCAST software and the numerical results were compared with the industrial CT test photos.

LIU Rui-peng, JIA Xian-zhen, WANG Yong-shun

Chinese Journal of Explosives & Propellants, 2019, 42(5): 485-489.

Formation Characteristics of Trumpet-shaped Liner with Large Cone Angle Based on Explosively Formed Penetrator (EFP)

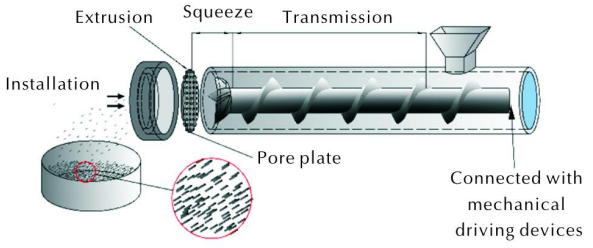


The trumpet-shaped liner with large cone angle was proposed to develop a liner structure suitable for EFP warhead. The difference in collapse process for the horn liner with large cone angle and the traditional arc-cone liner and hemispherical liner was analyzed.

WANG Ya-jun, LI Wei-bing, LI Wen-bin, WANG Xiao-ming, WANG Gui-lin

Chinese Journal of Explosives & Propellants, 2019, 42(5): 490-496.

Preparation of Agglomerated Boron Particles by Extrusion-spheronization Method

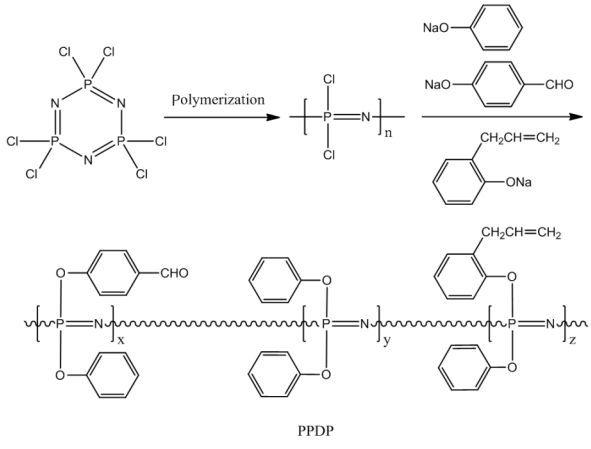


ZHANG Huai-long, WU Rui-qiang, XIAO Le-qin, ZHOU Wei-liang, LONG Yi-qiang

Chinese Journal of Explosives & Propellants, 2019, 42(5): 497-503.

The extrusion-spheronization method was used to prepare the agglomerated boron powder with microcrystalline cellulose (MCC), 3,3-bis (azidomethyl) oxetane and tetrahydrofuran copolyether (PBT) and gycidyl azide polymer (GAP) as binders, respectively. Properties of the agglomerated boron particles, such as morphology, size distribution, bulk density and so on, were also investigated.

Study of Aldehyde/allyl-aryloxypolyphosphazene-based Inhibition Materials for Insertion Solid Propellant (Ⅰ): Synthesis, Vulcanization Characteristics and Mechanical Properties

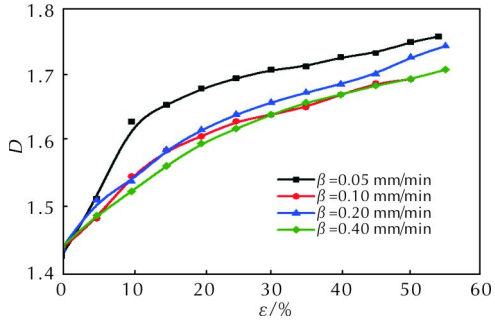


CAO Ji-ping, XIAO Xiao, WEI Le, ZHAO Feng-qi, YANG Shi-shan

Chinese Journal of Explosives & Propellants, 2019, 42(5): 504-510.

Four aldehyde/allyl-aryloxypolyphosphazenes (PDPP) were synthesized using hexachlorocyclotriphosphzene, phenol, 4-hydroxybenzaldehyde and 2-allylphenol as the starting materials. The polymers were characterized by FT-IR and gel permeation chromatography. The aryloxypolyphazene-based inhibition formulas for inserting charge of solid propellant were prepared via. compounding and vulcanization. The vulcanization characteristics were analyzed, and their mechanical properties at +50℃, −40℃ and +20℃ were determined via the static strain test and dynamic mechanical thermal analyses.

Damage Behavior of GAP Solid Propellant by In-situ Tensile SEM Method

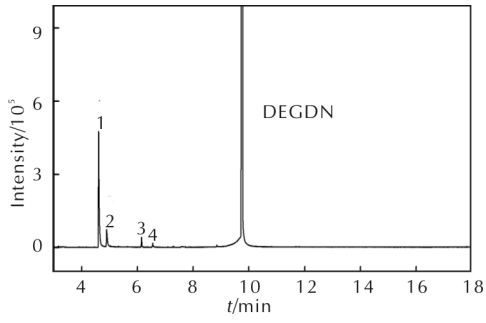


YANG Qiu-qiu, CAI Ru-lin, XU Sheng-liang, ZHANG Jian, HUANG Zhi-ping, ZHOU Ming-chuan

Chinese Journal of Explosives & Propellants, 2019, 42(5): 511-515.

The tensile fracture behavior of GAP solid propellant was observed by in-situ tensile SEM method. The microstructure damage first occurs in the concentrated distribution area of AP particles with large particle size, then the fracture and debonding of small amount of adhesive matrix between adjacent AP particles starts. The effect of different tensile rates on the fracture process was investigated by calculating the fractal dimensions of the images.

Qualitative and Quantitative Analysis of Organic Impurities in Diethylene Glycol Dinitrate

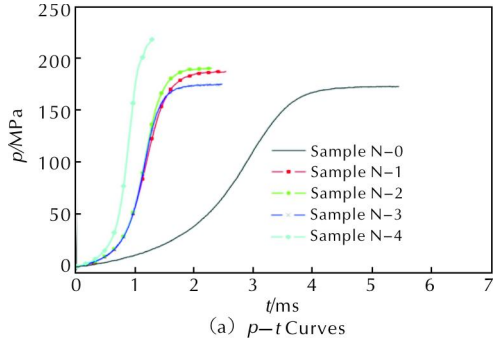


CHEN Shuang, KANG Ying, HU Yin, SUO Zhi-rong, MENG Yu-fu, NING Yan-li

Chinese Journal of Explosives & Propellants, 2019, 42(5): 516-520.

The gas chromatography-tandem mass spectrometric method was established to analyze organic impurities in diethylene glycol dinitrate (DEGDN). The organic impurities in DEGDN were qualitatively and quantitatively determined.

Preparation and Performances of Molded Combustible Cartridge Cases Modified by NGEC



(a) p—t Curves

LI Zhong-shan, TIAN Shu-chun, ZHOU Yi, SHAO Zi-qiang, ZHOU Xiao-hong, YUAN Xiao-li, GUO Bing-yi

Chinese Journal of Explosives & Propellants, 2019, 42(5): 521-525.

Nitric acid ester of cellulose glycidyl ether (NGEC) was used to replace part of nitrocellulose (NC) or lignocellulose in the formulation, and five combustible cartridge samples were prepared. The mechanical properties and combustion properties were studied.

Experimental Study on the Thermal Effect of TNT Explosion in Tunnel

ZHANG Yu-lei, LI Zhi-rong, ZHANG Jun-feng, PAN Wen, WANG Sheng-qiang

Chinese Journal of Explosives & Propellants, 2019, 42(5): 526-530.

Two different qualities of TNT grains were detonated in long and straight tunnel, and the histories of thermal response temperature at different distances from explosion center were obtained by using WRe 5/26 thermocouple.