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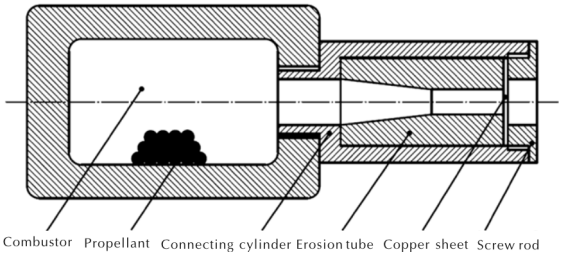
Contents

Research Progress on Reducing Erosivity of Gun Barrel

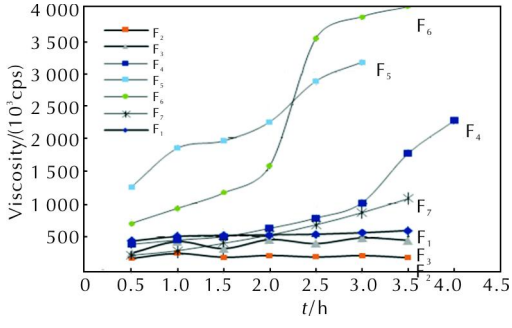


Aiming at the request of reducing erosivity of gun barrel , the generation process and mechanism , test methods and the main influence factors of gun barrel erosion were analyzed . The latest research progress on the reducing erosivity of gun barrel was introduced , including thermal factor control , chemical factor control and mechanical factor control . The inhibitive mechanism of erosion reducing additives was discussed . The research and application of erosion reducing additives was discussed with emphasis , including internal and external erosion reducing additives of gun propellant .

WEI Ding ,WANG Qiong-lin ,YAN Wen-rong ,ZHANG Jiang-bo ,ZHAO Yu-hua ,LIU Yi

Chinese Journal of Explosives & Propellants ,2020 ,43(4) : 351-361 .

Composite Solid Rocket Propellant Based on GAP Polyurethane Matrix with Different Binder Contents

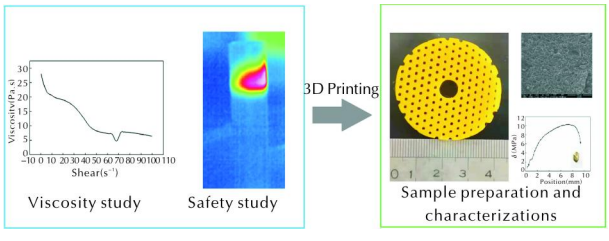


Different GAP-based CSRP samples with different binder contents were prepared and compared with that of conventional HTPB propellant . The crosslinker mixture of trimethylol propane (TMP) and butane diol (BD) was used in the GAP matrix beside the addition of dibutyltin dilaurate (DBT-DL) to ensure cross-linking and curing completion of the prepared CSRP . The viscosity and hardness of all prepared formulations were monitored continuously during the curing process . The mechanical characteristics of cured samples were tested . The burning rate at operating pressure and specific impulse were measured , while the theoretical specific impulse (I_{sp}) was calculated by ICT code and compared with the measured results .

Islam K . Boshra , Ahmed Elbeih , GUO Lin , Mohamed G . Zaki

Chinese Journal of Explosives & Propellants ,2020 ,43(4) : 362-367 .

3D Printing Method of Gun Propellants Based on Vat Photo-polymerization

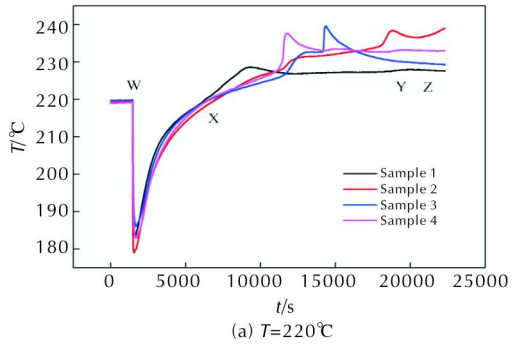


3D Vat photopolymerization technology for gun propellants was developed . The preliminary tests including viscosity , printing safety , mechanical strength were carried out . Gun propellants with multi-perforated geometry were fabricated and exhibited .

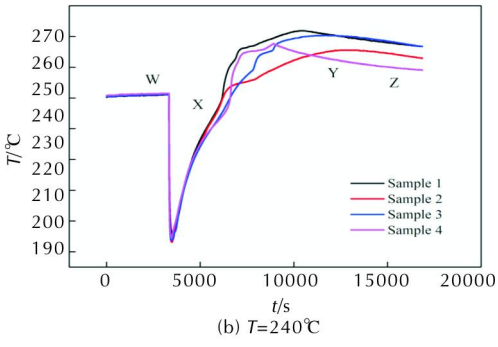
HU Rui , YANG Wei-tao , JIANG Zai-xing , YU Xian-feng , WANG Qiong-lin

Chinese Journal of Explosives & Propellants ,2020 ,43(4) : 368-371 .

Preparation and Properties of Heat-resistant Ammonium Nitrate Fuel Oil Explosive



(a) T=220℃



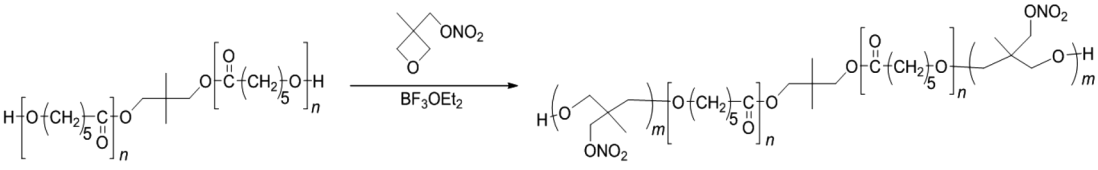
(b) T=240℃

LIU Wei, GUO Zi-ru, WANG Yang, GAO Zhong-guo, FANG Qi, HE Zhi-wei, SONG Jia-wang, LIU Feng

Chinese Journal of Explosives & Propellants, 2020, 43(4): 372-377.

The effects of additive A, B and C on the thermal stability of ANFO were studied by C80 micro-calorimeter and a simple constant temperature testing setup with large sample quantities developed by authors. The formulation of heat-resistant ANFO depended on the detonation velocity of the samples.

Synthesis and Characterization of Triblock PNIMMO-PCL-PNIMMO Energetic Binder

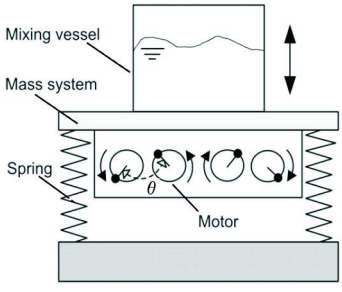


WANG Xiao-chuan, MO Hong-chang, LU Xian-ming, XU Ming-hui, LU Hong-lin, ZHANG Qian, LIU Ning

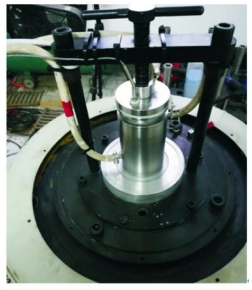
Chinese Journal of Explosives & Propellants, 2020, 43(4): 378-382.

Triblock PNIMMO-PCL-PNIMMO energetic binder was synthesized by ring opening polymerization of (3-nitratomethyl-3-methyloxetane) (NIMMO). Its structure and properties were studied by FT-IR, ^{1}H NMR, ^{13}C NMR, GPC, DSC and TGA.

Energy Conversion Characteristics of Resonance Acoustic Mixer Used for 100 g Level Manufacture of Propellants and Explosives



(a) Schematic diagram

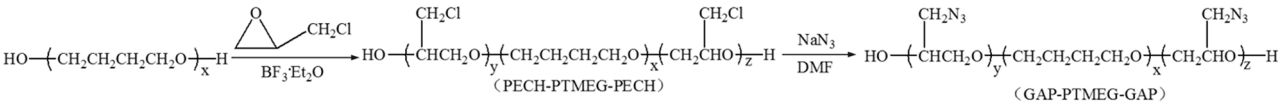

(b) Picture of RAM

CHEN Song, MA Ning, XIE Zhong-yuan, QIN Neng, ZHANG Zhe, SUN Xiao-peng, WANG Xiao-feng

Chinese Journal of Explosives & Propellants, 2020, 43(4): 383-387.

Taking Comp.B, cast PBX explosive, melt-cast PBX explosive and HTPE propellant as objects, the relationship between input energy and acceleration was obtained through repeated start-stop resonance acoustic mixer and by changing acceleration, vacuum and mixing mass.

Synthesis and Characterization of GAP-PTMEG-GAP Triblock Copolyether

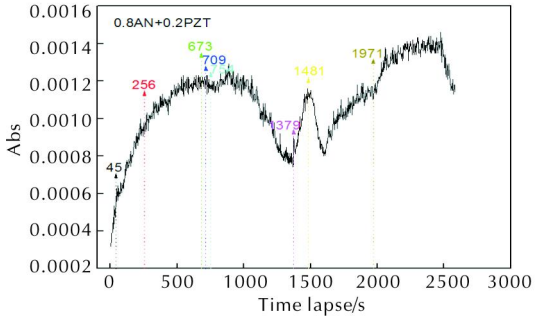


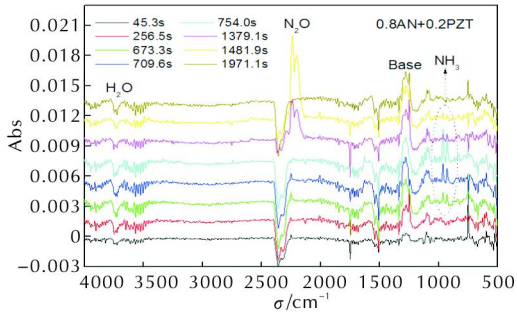
MO Hong-chang , XU Ming-hui , LIU Ning , LU Xian-ming , LIU Meng , WANG Wei

Chinese Journal of Explosives & Propellants ,2020 ,43(4) :388-391 .

Triblock copolyether PECH-PTMEG-PECH was synthesized by the cationic ring-opening polymerization of epichlorohydrin with polytetrahydrofunan ether glycol (PTMEG) as macroinitiator and boron-trifuoride ethylether complex ($BF_3 \cdot OEt_2$) as the catalyst , then GAP-PTMEG-GAP was prepared by the azidation of PECH-PTMEG-PECH . The copolyether was characterized by IR , ^1H NMR , ^{13}C NMR , GPC and DSC .

Effect of Potassium 5 ,5′-Azotetrazolate on Phase Transformation and Thermal Decomposition of Ammonium Nitrate



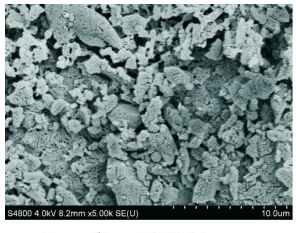


WANG Yi , SONG Xiao-lan , LI Feng-sheng

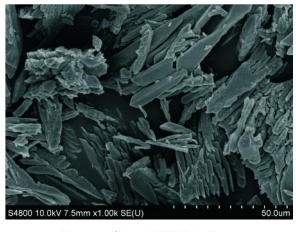
Chinese Journal of Explosives & Propellants ,2020 ,43(4) : 392-398 .

Potassium 5 ,5′-azotetrazolate (PZT) was synthesized with 5-amino-1H-tetrazol (5-ATZ) as the precursor , which successfully inhibits the phase transformation of ammonium nitrate (AN) in ambient temperature and promotes the thermal decomposition of AN in mechanism .

Massive Preparation and Characterization of Superfine PETN by Mechanical Ball Milling Method



Superfine PETN-M



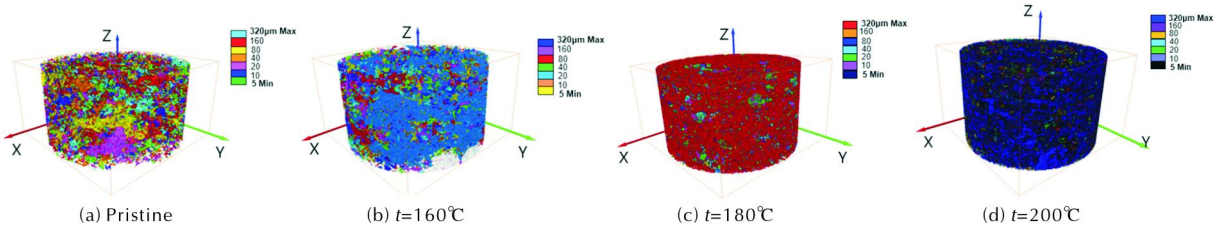
Superfine PETN-R

GUO Shuang-feng , DONG Jun , HAO Ga-zi , LIU Qiao-e , GAO Xiang-dong

Chinese Journal of Explosives & Propellants ,2020 ,43(4) :399-405 .

Superfine PETN powders with good dispersity and controlled particle sizes between 1-20 μm were successfully prepared by the mechanical ball-milling method and vacuum freeze drying technique . The morphology and structure of superfine PETN samples were characterized by SEM , XRD and FTIR . The thermal decomposition characteristics were analyzed by a TG /DSC simultaneous thermal analyzer , and the impact sensitivity and friction sensitivity were tested .

Experimental Study on Thermal Damage Characterization of HMX Based PBX after High-temperature Treatment



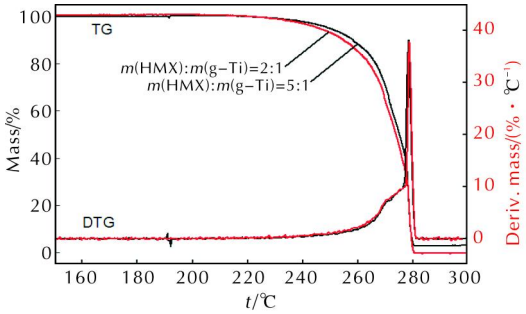
(a) Pristine (b) t=160℃ (c) t=180℃ (d) t=200℃

SHAO Zhu-ge,LIU Ru-qin,WU Yan-qing,HUANG Feng-lei

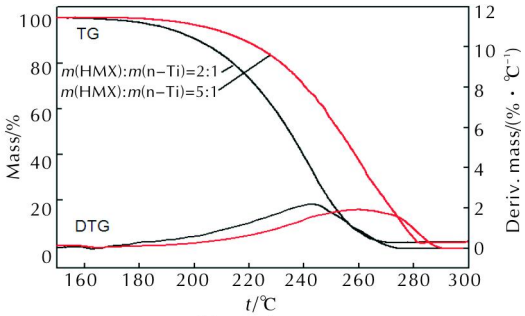
Chinese Journal of Explosives & Propellants,2020,43(4): 406-412.

The effect of high temperature(160-200℃) on the thermal damage of HMX based PBX was studied by using micro-CT nondestructive characterization method. The changes of physical parameters(true density, mass, size) before and after heating were also measured. A microscopic theoretical reference is provided for studying explosives ignition and the changes of mechanical properties subjected to high-intensity thermal insult.

Catalytic Decomposition Kinetics of HMX in Solid Phase with Two Nano Metal Powders



(a) HMX/g-Ti



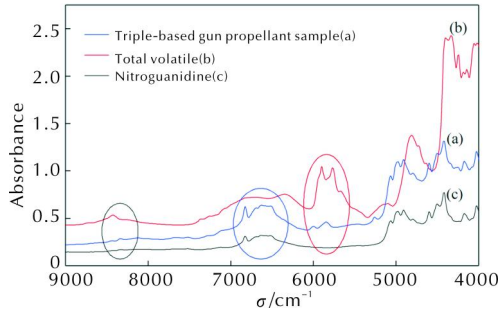
(b) HMX/n-Ti

LIU Wen-liang, GU Yan, YU Si-long, ZHANG Lin-jun

Chinese Journal of Explosives & Propellants,2020,43(4): 413-418.

The effects of nano metal powders (Ti, Zr) and normal metal powders (Ti, Zr) on the thermal decomposition of HMX were investigated by DSC and TG, and the isothermal kinetic parameters were obtained by iso-TG tests. Isothermal kinetics and kinetic compensation effect were discussed.

Rapid Detection Method for the Total Volatile Content in Drying Process of Triple-based Gun Propellant

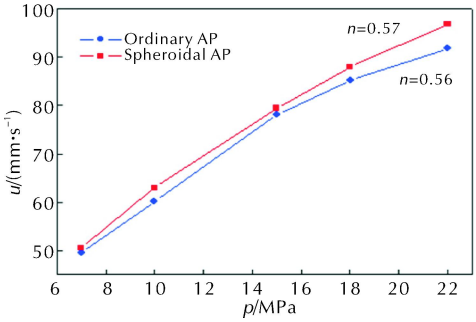


WANG Yun-yun, DENG Guo-dong, ZHANG Gao-feng, ZHANG Zhi-fang, CUI Li-ming, LI Xin-xin, WANG Xu-dong

Chinese Journal of Explosives & Propellants,2020,43(4): 419-423.

NIR spectroscopy was applied for rapidly determining the total volatile (alcohol ketone solvent) content of triple-based gun propellant during drying process. The efficient wavenumber regions for model development and the optimal spectral pretreatment methods for analysis were investigated.

Application of Spheroidal Ultrafine AP in AP-CMDB Propellant

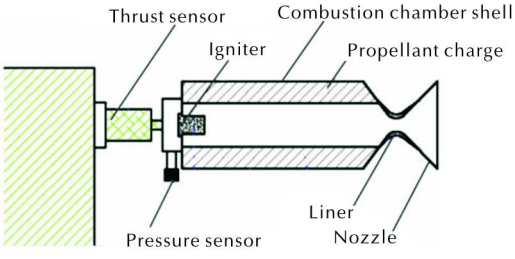


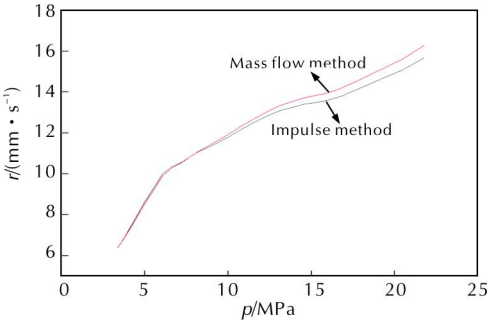
ZHANG Zheng-zhong, YU Hong-jian, GUO Xiao-de, LI Duo, DENG Chong-qing, LEI Hong-bing, ZHU Jie, CHEN Yi-bin

Chinese Journal of Explosives & Propellants, 2020, 43(4): 424-427.

The AP-CMDB propellants with ordinary and spheroidal ultrafine AP were prepared by solvent-extrusion method. The microstructures of the propellants were conducted by scanning electronic microscope. The densities, mechanical properties, combustion performances and mechanical sensitivities of the propellants were investigated.

Research on Burning Rate Measurement by Mass Flow Rate Method Based on Working Principle of Solid Rocket Motor



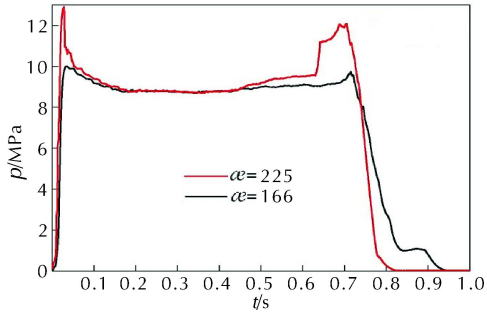


WANG Ying-hong, ZHANG Hao, ZHU Qing-long, XUE Zhao-rui, YANG Hong

Chinese Journal of Explosives & Propellants, 2020, 43(4): 428-432.

In order to obtain the burning rate of propellant under multiple pressure conditions in a single engine test, the dynamic burning rate test method of solid propellant-mass flow rate method is proposed. The burning rate results of double lead-2 (SQ-2) propellant obtained by the mass flow rate method and compared with that of the impulse method; the effects of characteristic velocity and nozzle throat diameter changes on the burning rate test results by the mass flow rate method were analyzed.

Experimental Study on Free Loading of Rocket Motor with Large Aspect Ratio

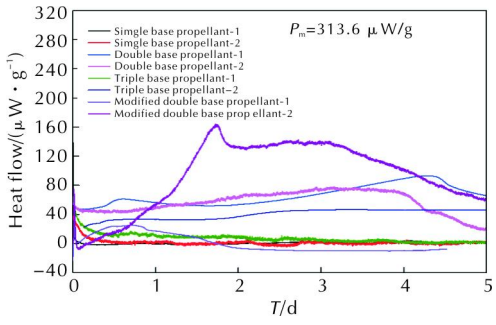


ZHENG Wei, CHEN Jun-bo, PEI Jiang-feng, MA Liang, WANG Jiang-ning, SONG Xiu-duo, GENG Chao-hui

Chinese Journal of Explosives & Propellants, 2020, 43(4): 433-436.

In order to solve the cracking problem of free loading propellant grains with large aspect ratio in solid rocket motor at 50℃ or 60℃, the factors that influence the working stability of free loading screwed extrued CMDB propellant grains with large aspect ratio were investigated by solid rocket motor test. The factors include initial aerate parameter, the thickness of bracket, and inner hole coating.

Evaluation of Safe Storage Life of Nitrate Propellant with Microcalorimetry

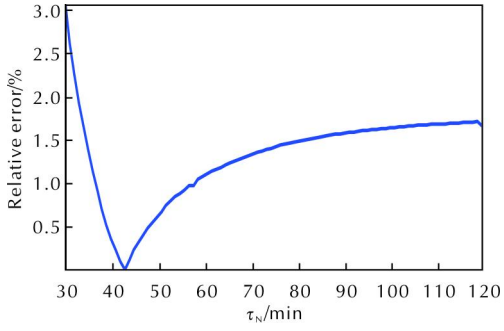


ZHOU Jing, DING Li, ZHU Yan-long, AN Jing, HUANG Meng

Chinese Journal of Explosives & Propellants, 2020, 43(4): 437-441.

Based on the "time-temperature equivalence" relationship obtained for microcalorimetry methed in NATO STANAG 4582 standard improved, a widely applicable method for rapid prediction of the safe storage life of nitrate propellant by microcalorimetry was established. It takes only 4.01 days to evaluate the safe storage life of propellant during its 10-year storage at 25 ℃ without sample pretreatment.

Steady Identification Method of Explosion Heat Measurement by Isothermal Calorimeter

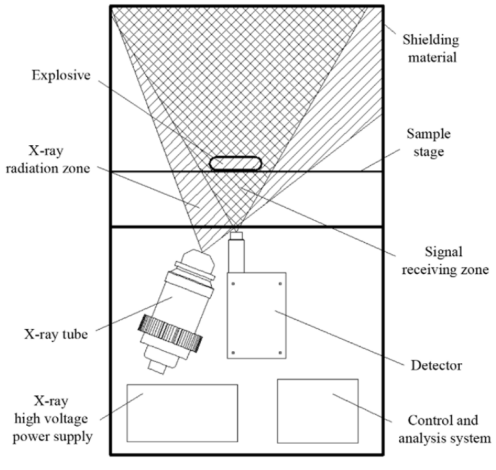


YANG Jie, HE Yuan-ji, ZHAO Hong-wei, CHEN Hua, HAN Xiu-feng, ZHAN Jun

Chinese Journal of Explosives & Propellants, 2020, 43(4): 442-450.

A solution of identifying explosion heat based on prefault data was proposed. Initially, the heat transfer equation of calorimeter based on the hypothesis of explosive transient response was established, and the change rule of water temperature in inner barrel was obtained after solving. Based on the thought of system identification, the system identification method was obtained.

Study on the Influence Factors of Tracer Security Inspection of Granular ANFO Explosive Matrix



ZHANG Guo-liang, WANG Xu-guang, WANG Yin-jun, LU Wan, YANG Li-feng

Chinese Journal of Explosives & Propellants, 2020, 43(4): 451-456.

By using the energy spectrum detection method, the security test of granular ANFO explosive was carried out by detecting the characteristic X-ray of tracer elements. Then the effects of tracer content, explosive quality, medium material and detection distance on the security inspection were studied. The tracer content increased from 0.01% to 0.1%, and the medium materials of air, cloth, paper, wood, foam, copper, iron and aluminum were selected.