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Perchlorate



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[Reduced Smoke Propellant Binder Residue as a Fuel Source: Feedstock Processing](#)

Apr 1997 83 pages

[Technology](#)

Authors: [Kathryn F. Miks](#); [Richard J. Scholze](#); [CONSTRUCTION ENGINEERING RESEARCH LAB \(ARMY\) CHAMPAIGN IL](#)

With an estimated 8.8 million lb of reduced smoke propellant targeted for demilitarization, recovery and beneficial reuse of propellant ingredients would reduce or minimize the quantity of waste requiring disposal. Recycling of ammonium **perchlorate** (AP), the primary propellant ingredient, has been established. Reuse of the AP-depleted binder residue has been studied on a limited basis; however, only aluminized Class 1.3 propellants have been evaluated. This study identifies and evaluates alternate uses of Class 1.3 reduced smoke (nonaluminized) propellant binder residue, with a focus on use as ...

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[Reduced Smoke Propellant Binder Residue as a Fuel Source](#)

Apr 1997 64 pages

Authors: [Kathryn F. Miks](#); [Richard J. Scholze](#); [CONSTRUCTION ENGINEERING RESEARCH LAB \(ARMY\) CHAMPAIGN IL](#)

With an estimated 8.8 million lb of reduced smoke propellant targeted for demilitarization, recovery and beneficial reuse of propellant ingredients would reduce or minimize the quantity of waste requiring disposal. Recycling of ammonium **perchlorate** (AP), the primary propellant ingredient, has been established. Reuse of the AP-depleted binder residue has been studied on a limited basis; however, only aluminized Class 1.3 propellants have been evaluated. This study identifies and evaluates alternate uses of Class 1.3 reduced smoke (nonaluminized) propellant binder residue, with a focus on use as ...

Full Text

[Recovery of Pyrotechnic Ingredients Using Supercritical Fluids](#)

Jan 21, 1998 16 pages

Authors: [Glenn T. Hong](#); [APHIOS CORP WOBURN MA](#)

Many pyrotechnics contain valuable resources which could be used in commercial applications, for example metals (e.g. magnesium, aluminum); metallic salts of copper, strontium, and barium; oxidizer (e.g. sodium nitrate, potassium **perchlorate**); binders such as viton, and dyes which have reclaimed value. The Navy is seeking technology that can recover the valuable ingredients from pyrotechnic flares and smoke munitions in an environmentally acceptable manner. This Phase I program studied the recovery of constituents from a Magnesium-Teflon-Viton (MTV) pyrotechnic material. The use of near ...

Full Text

[Development of Methods to Account for HCl and Cl₂ from Open Burning and Characterization of Emissions from the Open Burning of Three Selected Propellants](#)

Sep 1996 71 pages

Authors: [James L. Wilcox](#); [Ben Entezam](#); [Michael J. Molenaar](#); [Thomas R. Shreeve](#); [ARMY DUGWAY PROVING GROUND UT](#)

An important class of propellant, explosive, and pyrotechnic (PEP) material that requires disposal permits is the chlorine-containing **perchlorate** explosives and propellants. Characterization of the recovery of HCl and Cl₂ is necessary to the development of emission factors for these materials. While characterization of emissions for many energetic materials (EMs) has proven feasible, chlorine-containing PEP materials pose a special challenge. Methods to account for chlorine emissions in PEP materials from open burning (OB) have eluded scientists except in small-scale bench tests.

Full Text

[Photoreductions in Aqueous Semiconductor Suspensions and Properties of Modified Polyacrylonitrile Films](#)

Dec 14, 1998 78 pages

Authors: [Robert L. Calhoun Jr](#); [AUBURN UNIV AL](#)

... ions exhibit properties typical of polymeric semiconductors. PAN-based semiconducting materials were made from textile fibers. The photochemical activity of the modified fibers was tested by attempting the photoreduction of CH₃Cl in aqueous degassed suspensions of ground fibers and sodium **perchlorate**. The photo-experiment was conducted similar to the experiments involving R-11 and TiO₂. Unfortunately, a byproduct of the process that forms the semiconducting fibers, OH(-), proved inseparable from the fibers and is a confirmed interference ion to determination of reaction products. Therefore, ...

Full Text

[Effects of Ammonium Dinitramide in Human Liver Slices: An EPR/Spin Trapping Study](#)

Sep 1995 32 pages

Authors: [L. Steel-Goodwin](#); [K. W. Dean](#); [D. M. Pace](#); [A. J. Carmichael](#); [ARMSTRONG LAB BROOKS AFB TX OCCUPATIONAL AND ENVIRONMENTAL HEALTH DIRECTORATE](#)

Ammonium dinitramide (NH₄NNO₂ ADN) is a high energy oxidizer currently under study by the US Air Force as a replacement for ammonium **perchlorate** (AP). ADN is believed to be more environmentally safe than AP. EPR/spin trapping studies with the spin trap N-tert-butyl-a-phenyl nitron (PBN 10mM) for 5 min in the presence of

Full Text ADN yielded an overlapping spin adduct EPR spectra. It consisted of a 1:2:2:1 quartet initially which was computer simulated using hyperfine coupling constants, $a_n = a_h = 1.42$ mT. After 60 min another spectra was also formed consisting of a triplet of doublets with ...

Effects of Ammonium Dinitramide on Preimplantation Embryos in Sprague-Dawley Rats and B6C3F1 Mice

Mar 1996 26 pages

Authors: [Linda J. Graeter](#); [Robin E. Wolfe](#); [Edwin R. Kinkead](#); [Carlyle D. Flemming](#); [MANTECH-GEOCENTERS JOINT VENTURE DAYTON OH](#)

Full Text The Department of Defense is considering replacing ammonium **perchlorate** (AP) with ammonium dinitramide (ADN) in rocket propellants and explosives. Previous studies performed at the Toxicology Division have shown that ADN is a female reproductive toxicant, causing implantation failure in Sprague-Dawley rats when administered during the preimplantation period of gestation. The purpose of this follow-up study was to identify the mechanism(s) associated with implantation failure following exposure to ADN. In Phase I, mated female rats were treated with 2.0 grams/liter (g/L) ADN in their drinking ...

Restoration on the Industrial Base for Ammonium Perchlorate Production

Jan 20, 1995 12 pages

Authors: [Paul J. Granetto](#); [Salvatore R. Guli](#); [Bobbie S. Wan](#); [Arsenio M. Sebastian](#); [Marc A. Pederson](#); [INSPECTOR GENERAL DEPT OF DEFENSE ARLINGTON VA](#)

Full Text The primary audit objective was to determine whether DoD payments for the restoration of the industrial base for production of ammonium **perchlorate** were appropriate and properly administered. We also evaluated internal controls applicable to the primary audit objective.

Combustion Mechanisms of Heterogeneous Solid Propellants

Feb 2000 311 pages

Authors: [E. W. Price](#); [S. R. Chakravarthy](#); [R. K. Sigman](#); [R. Jeenu](#); [J. M. Freeman](#); [GEORGIA INST OF TECH ATLANTA SCHOOL OF AEROSPACE ENGINEERING](#)

Full Text The bulk of the research on this contract was concerned with the mechanisms that cause plateau burning of ammonium **perchlorate**/hydrocarbon (AP/ HC) propellants. The long range goal is to identify the steps in the combustion process that dominate overall burning, and in particular to understand which of these steps in the combustion process lead to plateau burning. Burning alone, matrixes (mixture of binder, fine AP, and catalysts) almost always burn slower than the bimodal propellant at all pressures. The improved burning with a catalyst is probably due to both increased surface layer ...

Reuse of Ammonium Nitrate - Wet Air Oxidation

Sep 1999 96 pages

Authors: [Stephen W. Maloney](#); [CONSTRUCTION ENGINEERING RESEARCH LAB \(ARMY\) CHAMPAIGN IL](#)

Full Text Ammonium nitrate (AN) is a possible replacement for ammonium **perchlorate** as an oxidizer in solid rocket motors potentially generating large amounts of AN to be recycled or reused. AN requires phase stabilization before it can be used, so small amounts of potassium dinitrimide (KDN) are added to create phase stabilized ammonium nitrate (PSAN). Reuse alternatives would either require separating the KDN or destroying it. AN is commonly used as a fertilizer (80 percent of AN produced) and an oxidizer. Owing to the high demand and wide availability of AN for its most common use, the commercial ...

The Gravimetric Determination of Hydrogen in Molybdenum Metal

Jan 1965 12 pages

Authors: [Ross D. Gardner](#); [William H. Ashley](#); [Paul Bergstresser](#); [LOS ALAMOS SCIENTIFIC LAB ALBUQUERQUE NM](#)

Full Text ... gravimetric method for the determination of hydrogen has been modified and adapted to the measurement of hydrogen in molybdenum metal. The sample is burned in oxygen at 1100 C. Fused magnesium oxide sand is used to absorb the molybdenic oxide produced and prevent its sublimation in the combustion tube. The water produced by oxidation of the hydrogen present is absorbed in anhydrous magnesium **perchlorate** and weighed. An average recovery of 99.1% with a standard deviation of 8 ppm was obtained for the analysis of 62 samples containing known amounts of hydrogen in the 10 to 500 ppm range.

Analysis of the Accidental Explosion at PEPCON, Henderson, Nevada, May 4, 1988

Nov 1988 62 pages

Authors: [Jack W. Reed](#); [SANDIA NATIONAL LABS ALBUQUERQUE NM](#)

Full Text Several hours of fire and numerous explosions destroyed the Pacific Engineering Company plant in Henderson, Nevada, that manufactured ammonium **perchlorate** (AP) for rocket fuel. This incident began about 1130 PDT on May 4, 1988, with a fire in their Batch House that grew out of control and caused a first large explosion at about 1153 PDT. The final and largest explosion occurred about 1157 PDT. Damages to the surrounding community were surveyed and interpreted as airblast overpressures versus distances, which allowed an estimate of 1-kiloton nuclear free-air-burst for the equivalent explosion ...

Sea Water Immersion of Gem II Propellant

Mar 23, 1998 8 pages

Authors: [C. I. Merrill](#); [J. D. O'Drobinak](#); [AIR FORCE RESEARCH LAB EDWARDS AFB CA](#)

Full Text ... propellant were released. While large amounts of propellant were consumed in burning fragments and ground impact explosions, considerable amounts of unburned propellant fell onto the land and into the Atlantic ocean. It was quickly found that propellant attacked by sea water became mushy, and ammonium **perchlorate** (AP) crystallized on propellant surfaces if it was allowed to dry. Concerns were raised that propellant washing ashore might present fire and/or explosive hazards. In response to these concerns, a program was initiated to investigate the effects of sea water on GEM II propellant as a ...

The Synthesis and Characterization of Methylene Bisoxamine CH₂-(O-NH₂)₂ Salts

Sep 20, 2000 3 pages

Authors: [Kerri Tollison](#); [Greg Drake](#); [Toma Hawkins](#); [Adam Brand](#); [Milton McKay](#); [AIR FORCE RESEARCH LAB EDWARDS AFB CA SPACE AND MISSILE PROPULSION DIV](#)

... capable of yielding both mono- and di-protonated species, depending on the stoichiometry used in its reactions with acidic materials. We have reinvestigated this highly energetic material, and have synthesized and fully characterized a large family of new salts, including species paired with the nitrate, **perchlorate**, dinitramide and nitroformate anions. All of the salts were characterized by vibrational (IR, Raman), multinuclear nmr (1H, 13C) spectra, differential scanning calorimetry (DSC) studies, and elemental analyses. Safety testing, including friction and impact tests, were carried out ...

[Full Text](#)

[TTCP Report for May Chan AFRL/PRSP Energetic Ingredients Work for Fiscal Year 2002](#) Nov 6, 2002 3 pages

Authors: [AIR FORCE RESEARCH LAB EDWARDS AFB CA SPACE AND MISSILE PROPULSION DIV](#)

... , and the diaminoguanidinium nitrocyanimide. Most of the salts were either impact/friction sensitive or had thermal stability problems. This work is currently being written up into a full manuscript for publication. A new class of energetic ionic liquids based on 1- alkyl-4-amino-1,2,4-triazolium cations have been synthesized. They have been subsequently paired with energetic anions including the nitrate, **perchlorate**, dinitramide, and nitrocyanimide. A majority of these materials were recovered in high yield and purity, with melting points below room temperature and high decomposition onsets.

[Full Text](#)

[The Synthesis and Characterization of New Energetic Salts](#) Oct 30, 2000 5 pages

Authors: [Greg Drake](#); [Kerri Tollison](#); [Tom Hawkins](#); [Adam Brand](#); [Milton McKay](#); [AIR FORCE RESEARCH LAB EDWARDS AFB CA PROPULSION DIRECTORATE WEST](#)

... the synthesis, characterization, initial small scale safety testing (impact and friction), and some initial thermal stability studies of all these salts. It was realized that there are several, easily synthesized, nitrogen heterocycles that could be paired with anions including the nitrate, **perchlorate**, and dinitramide anions to form highly energetic salts. The four heterocycle systems are 1,2,4-triazole; 4-amino-1,2,4-triazole; 3,4,S-triamino- 1,2,4-triazole; and 1,2,3-triazole (Figure 1). All of these heterocycles are either commercially available or are easily synthesized in high yield from ...

[Full Text](#)

[Simulations of Energetic Materials for Rocket Propulsion: Obtaining More "Bang for the Buck"](#) Apr 29, 2002 5 pages

Authors: [Dan C. Sorescu](#); [Donald L. Thompson](#); [Jerry Boatz](#); [AIR FORCE RESEARCH LAB EDWARDS AFB CA PROPULSION DIRECTORATE WEST](#)

Powderized aluminum has long been used as an energetic ingredient in rocket propellant formulations, comprising approximately 15-20% of some conventional ammonium **perchlorate** solid propellant formulations. However, the performance of aluminum is reduced by the rapid formation of an aluminum oxide overcoat on aluminum particles prior to combustion, which also inhibits efficient burning. Furthermore, formation of the oxide overcoat severely reduces the potential advantages of using high surface-to-volume-ratio ultrafine aluminum particles, which would otherwise have highly desirable properties ...

[Full Text](#)

[Synthesis, Characterization, and Theoretical Considerations of 1,2- bis\(oxyamino\)ethane Salts](#) Jun 24, 2003 19 pages

Authors: [Greg Crake](#); [Tom Hawkins](#); [Leslie Hall](#); [Kerri Tollison](#); [Adam Brand](#); [ENGINEERING RESEARCH AND CONSULTING INC\(ERC INC\) EDWARDS AFB CA](#)

... scanning calorimetry (DSC); elemental analysis; and initial safety testing (impact and friction sensitivity) . Theoretical calculations on the neutral, monoprotonated, and doubly protonated species of ethylene bisoxamine were carried out using xxxx level of theory for the lowest energy structure and these theoretical results compared with the experimentally observed bond distances and vibrational (ir, Raman) frequency values. The single crystal x-ray diffraction study was carried out on the mono- **perchlorate** salt revealing a high degree of hydrogen bonding with an unexpected structure.

[Full Text](#)

[Nano/HEDM Technology: Late Stage Exploratory Effort](#) Oct 2003 40 pages

Authors: [Jeffrey C. Bottaro](#); [Mark Petrie](#); [Paul E. Penwell](#); [Allen L. Dodge](#); [Ripu Malhotra](#); [SRI INTERNATIONAL MENLO PARK CA CHEMISTRY LAB](#)

... out in water/potassium acetate buffer, and proceeds in 90% yield; due to the small enthalpy of this oxidation, scale up and heat dissipation do not present a problem. The density of hydroxyl ammonium 5-nitrotetrazole-2-oxide is 1.82 g/cc; its enthalpy of formation is +40 kcal/mole. Finally, a practical pathway to 1-alkoxy-5-amino tetrazoles has been developed; it is hoped that this will enable the synthesis of 5-nitrotetrazole-1 ,3-bis-N-oxides, a family of unprecedented materials with excellent heats of formation and oxygen balance that rivals ammonium **perchlorate** and ammonium dinitramide.

[Full Text](#)

[Burn Rate Mechanisms. Volume 2. A Model for Ammonium Nitrate Propellant Combustion](#) Feb 1990 129 pages

Authors: [M. W. Beckstead](#); [BRIGHAM YOUNG UNIV PROVO UT DEPT OF CHEMICAL ENGINEERING](#)

... detrimental to both plant and animal life dependent on the concentration levels it achieves as it reaches the ground. In addition, at higher elevations, the HOI can react with the protective layer of ozone causing a degradation of some of the ozone. The HO comes from the AR (ammonium **perchlorate**) which is the oxidizer in the solid propellant for the 5PM boosters. The SRM propellant contains approximately 70% AP which generates slightly more than 21 weight percent HG in the exhaust gases. For these reasons it is desirable to find a replacement for the AP to eliminate the HCl in the rocket ...

[Full Text](#)

[Computational Studies of Ionic Liquids](#) Feb 12, 2004 13 pages

Authors: [Jerry Boatz](#); [AIR FORCE RESEARCH LAB EDWARDS AFB CA PROPULSION DIRECTORATE](#)

... structures of the 1,5-diamino-1,2,3,4-tetrazolium cation have been computed at the B3LYP(3)/6-311G(d,p) and MP2/6-311G(d,p) levels of theory. Relative energies have been refined at the B3LYP(3), MP2, and CCSD(T) levels, using the 6- 311G(2df,p) and aug-cc-pvtz basis sets. Isomers 2(4H) and 3(3H) are essentially degenerate

[Full Text](#)

at all levels of theory. B3LYP predicts isomer 5(1H) to ring open to form an azide (NH₂NHC(N₃)-NH₂, CCSD (T)/6-311G(2df,p)//MP2/6-311G(d,p) calculations predict structure 2 to be the most stable isomer, in agreement with the X-ray crystal structure of the **perchlorate** salt.

[Navy Training Lands Sustainability: Initiation Decision Report](#)

Jun 2004 191 pages

Authors: [NAVAL FACILITIES ENGINEERING SERVICE CENTER PORT HUENEME CA](#)

... relation to current and projected Navy problems. It was concluded, however, that investments that assist in transition of those technologies in the early stage of development to individual sites will increase the likelihood of success. Improved capabilities are needed in the areas of **perchlorate**, munition constituents toxicity data for risk assessment, coral reef assessments, training impact quantification, munition constituents field detection, and monitoring and mitigating releases from ranges. Advancing technologies in these areas will support the readiness of the warfighter and Navy Ranges ...

Full Text

[Annual Report to Congress - Fiscal Year 2000, from the Strategic Environmental Research and Development Program](#)

Mar 2001 370 pages

Authors:

... include: (1) new technologies capable of detecting unexploded ordnance (UXO) with high detection rates to significantly reduce the cost of DoD site characterization and cleanup; (2) new technologies to remediate and/or contain groundwater contaminated with explosives and ammonium **perchlorate**; (3) advances to achieve the long-term sustainability of DoD testing and training ranges, including adaptive management of ecosystems and techniques to assess the potential release of energetics pollutants; and (4) the development of less toxic energetic compounds and munitions and a nonhazardous chemical ...

Full Text

[Annual Report to Congress - Fiscal Year 2002, from the Strategic Environmental Research and Development Program](#)

Mar 2003 355 pages

Authors:

... Prevention, and Unexploded Ordnance (UXO). Section II describes significant accomplishments achieved during FY 2002 within each of the Thrust Areas. Highlights of these accomplishments include: (1) new technologies to remediate and/or contain groundwater contaminated with explosives and ammonium **perchlorate**; (2) new technologies capable of detecting UXO with high detection rates to significantly reduce the cost of DoD site characterization and cleanup; (3) advances to achieve the long-term sustainability of DoD testing and training ranges, including techniques to assess the risk posed by ...

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[Field Demonstration and Validation of a New Device for Measuring Water and Solute Fluxes NASA LC-34 SITE](#)

Feb 2006 173 pages

Authors: [Kirk Hatfield](#); [Michael D. Annable](#); [P. S. Rao](#); [FLORIDA UNIV GAINESVILLE](#)

... Naval Surface Warfare Center at Indian head, Maryland. The projects at Hill, NASA, and Borden include the objectives of evaluating the flux meter as an innovative technology for direct in situ measurement of cumulative water and contaminant flux for DNAPLs and compiling field data to transition the technology from the innovative testing phase to regulatory/end user acceptance and stimulated commercialization. The Port Hueneme project evaluated MTBE flux with similar objectives while the Indian Head project demonstrated the borehole flux meter to measure water and **perchlorate** contaminant flux.

Full Text

[Field Demonstration and Validation of a New Device for Measuring Water and Solute Fluxes at Naval Base Ventura County \(NBVC\), Port Hueneme, CA](#)

Jul 2006 113 pages

Authors: [Kirk Hatfield](#); [Michael D. Annable](#); [P. S. Rao](#); [FLORIDA UNIV GAINESVILLE](#)

... direct in situ measurement of cumulative water and contaminant flux for DNAPLs and compiling field data to transition the technology from the innovative testing phase to regulatory/end user acceptance and stimulate commercialization. The Indian head project demonstrated the PFM could measure water and **perchlorate** contaminant flux. The focus of the NASA site was to demonstrate and validate the PFM, as a tool for measuring groundwater and contaminant fluxes at the Launch Complex 34 site (LC 34) where NASA was demonstrating bioaugmentation to enhance the removal of trichloroethylene (TCE) using ...

Full Text

[Field Demonstration and Validation of a New Device for Measuring Groundwater and Perchlorate Fluxes at IHDIV-NSWC, Indian Head, MD](#)

Jul 2006 138 pages

Authors: [Kirk Hatfield](#); [Michael D. Annable](#); [P. S. Rao](#); [FLORIDA UNIV GAINESVILLE](#)

The use of contaminant flux and contaminant mass discharge as robust metrics for assessment of risks at contaminated sites and for evaluating the performance of site remediation efforts has gained increasing acceptance within the scientific, regulatory and user communities. The Passive Flux Meter (PFM) is a new technology that directly addresses the DoD need for cost-effective long-term monitoring, because flux measurements can be used for process control, for remedial action performance assessments, and for compliance purposes. However, the use of innovative technologies can be slow to gain ...

Full Text

[Characterization and Fate of Gun and Rocket Propellant Residues on Testing and Training Ranges: Interim Report 1](#)

Jan 2007 221 pages

Authors: [Thomas F. Jenkins](#); [Judith C. Pennington](#); [Guy Ampleman](#); [Sonia Thiboutot](#); [Michael R. Walsh](#); [Emmanuela Diaz](#); [Katerina M. Dontsova](#); [Alan D. Hewitt](#); [Marianne E. Walsh](#); [Susan R. Bigl](#); [Susan Taylor](#); [Denise K. MacMillan](#); [Jay L. Clausen](#); [Dennis Lambert](#); [Nancy M. Perron](#); [Marie C. Lapointe](#); [Sylvie Brochu](#); [Marc Brassard](#); [Rob Stowe](#); [Roccio Farinaccio](#); [ENGINEERING RESEARCH AND DEVELOPMENT CENTER HANOVER NH COLD REGIONS RESEARCH AND ENGINEERING LAB](#)

... to experimentally assess off-site transport of residues. Estimates of residue deposition are presented for the

firing of 60- and 81-mm mortars and 105-mm howitzers. Experimental results are provided for propellant residue accumulation at antitank rocket, mortar, artillery, and small arms ranges at several installations. Results from soil column experiments on the transport of nitroglycerin, nitroguanidine, and diphenylamine also are presented with resulting transport property estimates. Also, an experiment to assess the deposition of ammonium **perchlorate** from Mk58 rocket motors is described.

[Full Text](#)

[A Study of Flame Physics and Solid Propellant Rocket Physics](#)

Oct 2007 12 pages

Authors: [John Buckmaster](#); [BUCKMASTER RESEARCH URBANA IL](#)

... , the use of a genetic algorithm to optimally define false-kinetics parameters in propellant combustion modeling, the calculation of fluctuations above a burning propellant and the effect of these fluctuations on the turbulent chamber flow, the 1-dimensional combustion of fine aluminum and ammonium **perchlorate** in fuel binder, the combustion of model propellant packs of ellipses and ellipsoids, and the packing of pellets relevant to igniter modeling. Other topics are the instabilities of smolder waves, premixed flame instabilities in narrow tubes, and flames supported by a spinning porous plug ...

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[Technical Report for the Period 1 January 1963 to 30 June 1963](#)

Aug 23, 1963 69 pages

Authors: [EXPLOSIVES RESEARCH AND DEVELOPMENT ESTABLISHMENT WALTHAM ABBEY \(UNITED KINGDOM\)](#)

The four hydrazine perchlorates, viz. hydrazine **perchlorate** and its hemihydrate, and hydrazine diperchlorate and its dihydrate have been made in quantities of a few hundred grams from hydrazine and "Analar" grade sixty per cent perchloric acid. The monoperochlorate presents little difficulty; the extreme impact sensitiveness which has been reported (with F.I. worse than lead azide) has not been found even on material shown by the Karl Fischer test to be anhydrous. The dihydrate of hydrazine diperchlorate is also easy to obtain by mixing the cooled constituents. It is best dehydrated by low ...

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[An Investigation of the Explosive Hazards of Ammonium Perchlorate/Polyurethane Rubber Propellants in the Uncured and Cured Conditions](#)

Sep 1960 24 pages

Authors: [J. K. Clark](#); [P. D. Verschoyle](#); [EXPLOSIVES RESEARCH AND DEVELOPMENT ESTABLISHMENT WALTHAM ABBEY \(UNITED KINGDOM\)](#)

[Full Text](#)

[Holographic Polymer Dispersed Liquid Crystal \(HPDLC\) Transmission Gratings Formed by Visible Light Initiated Thiol-Ene Photopolymerization \(Postprint\)](#)

Oct 2006 9 pages

Authors: [Jeremy M. Wofford](#); [Timothy J. Bunning](#); [Lalgudi V. Natarajan](#); [Vincent P. Tondiglia](#); [Richard L. Sutherland](#); [Stephen A. Siwecki](#); [Pamela F. Lloyd](#); [AIR FORCE RESEARCH LAB WRIGHT-PATTERSON AFB OH MATERIALS AND MANUFACTURING DIRECTORATE](#)

We report on the initial development of a visible initiator for thiol-ene photopolymerization using the 647 nm radiation from a Krypton ion laser. The photoinitiator system consists of the dye oxazine 170 **perchlorate** and the co-initiator benzoyl peroxide. Electron transfer occurs between the singlet excited state of the oxazine dye and benzoyl peroxide with subsequent decomposition of the peroxide yielding benzoyl oxy radicals capable of free radical initiation. We demonstrate that this photoinitiation system enables holographic patterning of HPDLC gratings as initial Bragg transmission ...

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[Aluminum Agglomeration and Trajectory in Solid Rocket Motors](#)

Aug 30, 2007 89 pages

Authors: [DOUGLAS COATS](#); [E. C. Hylin](#); [Deborah Babbitt](#); [James A. Tullos](#); [Merrill Beckstead](#); [Michael Webb](#); [I. L. Davis](#); [Anthony Dang](#); [SOFTWARE AND ENGINEERING ASSOCIATES INC CARSON CITY NV](#)

... combustion issues have never been modeled in a complete motor prediction model. What is being proposed here has never been successfully done and would greatly increase the design tools available to the motor design community. The overall goal of this innovation is to provide a multi-physics based computer code which will accurately predict the entire flight of aluminum particles from the propellant surface through the nozzle exit plane together with a prediction of the effective properties of the binder, ammonium **perchlorate**, and aluminum particles which together constitute a solid propellant.

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