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boron



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[Advanced Rocket Propulsion Technologies Boron Vapor Source for HEDM](#)

Jun 2003 33 pages

Authors: [Paul C. Nordine](#); [CONTAINERLESS RESEARCH INC EVANSTON IL](#)

Full Text

The research reported here is directed to the development of a **boron** vapor source for application in HEDM research. ... of transparent solid p_{H2} with high concentrations of **boron** dopant species, up to 5 molar %, (ii) a ... AFRL/PRSP, Edwards Air Force Base. The **boron** vapor source was fabricated and tested. ... C02 laser beam heating and melting of the **boron** samples was shown to yield intrinsic control of ... melting point, and a well-controlled **boron** flux. The **boron** vapor flux obtained with the apparatus is ... HEDM solids at rates of 100 micrometers/ hour at **boron** concentrations of 1.4 mol %, and at much higher ...

[Promising Thermal Source of Boron Atoms](#)

Jun 2, 1999 19 pages

Authors: [J. Harper](#); [C. W. Larson](#); [AIR FORCE RESEARCH LAB EDWARDS AFB CA SPACE AND MISSILE PROPULSION DIV](#)

Full Text

... high flux thermal source of pure **boron** atoms. **Boron** is packed into a central channel of ... Successful argon matrix isolation experiments indicate that the **boron** cannon will be an effective way to produce pure **boron** ... used carbon as a container in which to heat **boron**, have been heavily contaminated with carbon ... design exploits the difference in vapor pressures of **boron** and carbon at a given temperature. The design, ... being optimized. Because of the higher flux of **boron**, hard to detect species such as B₂C, ... carbon monoxide (CO) is a thorough scavenger of **boron** atoms. When large amounts of CO are present, ...

[Ablative and Insulating Properties of Outgassed Boron Nitride and Boron Nitride Composite](#)

Oct 1966 22 pages

Authors: [Arthur F. Okuno](#); [NATIONAL AERONAUTICS AND SPACE ADMINISTRATION MOFFETT FIELD CA AMES RESEARCH CENTER](#)

Full Text

Hot-pressed **boron** nitride that had been outgassed in vacuum ablated with negligible spalling when exposed to a jet ... nitrogen at enthalpies up to 26 MJ/kg. A composite of **boron** nitride and phenolic resin, produced in an attempt ... the heats of ablation to approximately half those of hot-pressed **boron** nitride. The insulation efficiencies of the composite, pyrolytic **boron** nitride, **boron** nitride, and phenolic nylon, were studied at cold-wall convective heating rates of 1.4 ... temperature rise of 167 deg K, the composite was twice as effective as either pyrolytic **boron** nitride or hot-pressed **boron** nitride. ...

[Boron Investigation Survey, March Air Force Base, California](#)

Jul 1992 65 pages

Authors: [John G. Garland III](#); [ARMSTRONG LAB BROOKS AFB TX](#)

Full Text

... Laboratory conducted a field survey to investigate the source of **boron** in the March AFB CA wastewater treatment plant effluent. The survey measured **boron** contributions from drinking water, domestic sources, and ... plant over the same 10 days. **Boron** results at the regulatory discharge point averaged 0. ... 1.84 mg/l. The report presents bulk **boron** sample results from a variety of soaps and ... into industrial activity generating high **boron** levels, discouraging the use of boron-containing products by ... , and domestic users and negotiating with the regulating agency for permitting **boron** at a higher level. ...

[Influence of Boron Additions on Physical and Mechanical Properties of Arc-Melted Tungsten and Tungsten-1 Percent Tantalum Alloy](#)

Feb 1966 23 pages

Authors: [Peter L. Raffo](#); [William D. Klopp](#); [NATIONAL AERONAUTICS AND SPACE ADMINISTRATION CLEVELAND OH LEWIS RESEARCH CENTER](#)

Full Text

... tungsten and a tungsten -1 percent tantalum alloy were investigated. **Boron** additions significantly refined the arc-melted grain size of tungsten. The 1-hour recrystallization temperature was initially increased by small **boron** additions (approx. 0.01 atomic percent **boron**), after which it decreased continuously with increasing **boron** content. High-temperature tensile tests showed that the **boron** additions ... initial rapid rise in strength followed by a leveling off of the strength-composition curve. **Boron** in solid solution was postulated to be the cause of the rapid increase in strength.

[Shock Response of Boron Carbide](#)

Apr 2001 47 pages

Authors: [Dattatraya P. Dandekar](#); [ARMY RESEARCH LAB ABERDEEN PROVING GROUND MD](#)

Boron carbide is of interest because of its potential application in protective systems both for personnel and ... undertaken to determine tensile/spall strength of **boron** carbide under plane shock wave ... all available shock compression data on **boron** carbide materials obtained from different sources. ... principal conclusions are: (1)

[Full Text](#) the tensile/spall strength of **boron** carbide when shocked between 2 and 15 (... existing shock compression data indicates that **boron** carbide tends to suffer a gradual loss ... investigated, and (4) a general equation of state for **boron** carbide in its ambient phase is formulated ...

[New Low Temperature Processing for Boron Carbide/Aluminum Based Composite](#)

Jun 1, 1990 44 pages

[Armor](#)

Authors: [Aleksander J. Pyzik](#); [P. D. Williams](#); [Ann McCombs](#); [DOW CHEMICAL CO MIDLAND MI ADVANCED CERAMICS LAB](#)

[Full Text](#) The developed **Boron** Carbide/Aluminum based materials are a promising alternative for the use in lightweight armor application. The ... The ballistic efficiency of B4C materials, relative to hot-pressed **boron** carbide, was found to be directly related to the initial **boron** carbide content, the B-C-A1 phases formed in situ, and their continuity. The highest improvement of ... A1 cermet depend mostly on the concentration and continuity of the **boron** carbide phase. Colloidal processing and post ... Keywords: Lightweight armor, Cermets, Rapid Omnidirectional Compaction, Dispersion, Aluminum alloys, **Boron** carbide.

[A Cluster Beam Study of Boron Oxide Chemistry With HF](#)

Dec 26, 1994 38 pages

Authors: [J. Smolanoff](#); [A. Lapicki](#); [S. Anderson](#); [STATE UNIV OF NEW YORK AT STONY BROOK DEPT OF CHEMISTRY](#)

[Full Text](#) ... reactant. Reactant compositions were varied from pure **boron** to stoichiometric oxide, with and without added hydrogen. **Boron** oxide clusters react with HF at about 50% efficiency and the collision energy dependence suggests ... on the cluster, thereby reducing the reactivity. Pure **boron** clusters react by addition of HF, followed by elimination ... clusters, suggesting that there may be activation barriers for **boron** surface-HF reactions as well. In contrast to the situation for the oxides, addition of hydrogen to the pure **boron** clusters generally increases the reactivity with HF. (jg)

[Gas Phase Studies of Boron, Silicon, and Aluminum -- Relationship to Carbon-Carbon](#)

Jun 27, 1995 24 pages

[Composition](#)

Authors: [R. Damrauer](#); [V. M. Bierbaum](#); [M. S. Gordon](#); [M. Krempp](#); [M. Stephan](#); [COLORADO UNIV AT DENVER](#)

[Full Text](#) Work on a number of **boron** hydride anions and cations has been carried out using the unique ... base with diborane has allowed the preparation of a number of anionic **boron** hydride clusters. Many of these including B2H3- have been ... of gas phase acidity has been measured for several **boron** hydride species by reacting their corresponding conjugate base with a series of reference acids. Nevertheless, the **boron** hydride anions have proved to be surprisingly unreactive, particularly considering their low-valency. As a result, studies on simple **boron** hydride cations like BH2+ were undertaken. This cation ...

[Boron/Aluminum Skins for the DC-10 AFT Pylon](#)

May 1975 151 pages

Authors: [S. Y. Elliott](#); [MCDONNELL DOUGLAS CORP LONG BEACH CA DOUGLAS AIRCRAFT DIV](#)

[Full Text](#) Four **boron**/aluminum aft pylon "boat tail" skins are designed and fabricated and three of Inspection and tests of the exposed skins will establish the ability of the **boron**/aluminum composite to withstand long time flight service conditions ... , and tension fatigue properties of the oriented 11 ply **boron**/aluminum laminates and this information together with a stress ... same sized mechanical fasteners as are used for the present titanium skins. The **boron**/aluminum skins measure approximately 20.32 x 170 ... 1.56Kg (3.45 lb) weight of the constant thickness **boron**/aluminum skin is 26% less than the chemically ...

[INVESTIGATION INTO THE TUNGSTEN-RICH REGIONS OF THE BINARY SYSTEMS](#)

Jul 1963 93 pages

[TUNGSTEN-CARBON, TUNGSTEN BORON AND TUNGSTEN-BERYLLIUM](#)

Authors: [H. J. Goldschmidt](#); [E. A. Catherall](#); [W. M. Ham](#); [D. A. Oliver](#); [B S A GROUP RESEARCH CENTRE BIRMINGHAM \(UNITED KINGDOM\)](#)

[Full Text](#) This report deals with the solid solubility of **boron** and of beryllium in tungsten, together with the attendant problems concerning the tungsten rich borides and beryllides in ... supplementary data are given on the W-C system, following the previous investigation. The study of the solubility of **boron** in tungsten shows this to be approximately 0.2 atomic %B at 2500 C, decreasing with temperature. The atomic nature of this W-W2 B forms a eutectic system, the eutectic temperature being about 2600 C. A high **boron boron** compound WB BEEN OBSERVED. In the tungsten-beryllium system which presented some ...

[Selected Mechanical and Physical Properties of Boron Filaments](#)

Jan 1966 42 pages

Authors: [Harvey W. Herring](#); [NATIONAL AERONAUTICS AND SPACE ADMINISTRATION HAMPTON VA LANGLEY RESEARCH CENTER](#)

[Full Text](#) Results are presented from an investigation to characterize **boron** filament with respect to selected mechanical and physical properties. The investigation of 12 different filaments included examination by metallographic ... to 2500 deg F (1644 deg K) in argon, air, and vacuum. The study was primarily concerned with the properties of individual **boron** filaments produced by the deposition of **boron** on the surface of a fine tungsten substrate wire from a vapor composed of hydrogen and a **boron** halide compound. These filaments exhibited an average room-temperature strength of 350 ksi (2.42 GN/sq meters) ...

[High Pressure Boron Ignition and Combustion](#)

Sep 1, 1996 49 pages

Authors: [R. L. Burton](#); [H. Krier](#); [ILLINOIS UNIV AT URBANA DEPT OF AERONAUTICAL AND ASTRONAUTICAL ENGINEERING](#)

[Full Text](#) The high potential energy release of **boron** makes it a prime candidate for a high enthalpy fuel or as a fuel additive to solid propellant ... to remove a combustion-retarding oxide layer from the particles, a high vaporization temperature for the pure **boron** substrate, and slow condensation kinetics, have generally precluded the use of **boron** for energetic fuel applications at these pressures. This report summarizes experiments which measure an order of ... at higher pressures than are possible in the shock tube. Endwall emission spectra of BO2 are

recorded for comparison with **boron** ignition models.

[Boron Oxide Oligamer Collision-Induced Dissociation: Thermochemistry, Structure, and Implications for Boron Combustion](#)

Aug 8, 1996 23 pages

Authors: [Dilrukshi Peiris](#); [Adam Lapick](#); [Scott L. Anderson](#); UTAH UNIV SALT LAKE CITY DEPT OF CHEMISTRY

Full Text

This report presents a collision induced dissociation (CID) study of small **boron** oxide cations, (BnOm)(+), motivated by a need for more accurate and reliable structural and thermodynamic information on both neutral and ionic **boron** oxides. This work compliments ongoing ab initio calculations by Page and co-workers, and provides many points of comparison between experiment and theory. In addition, the results of our CID study are important in interpretation of **boron** oxide cluster chemistry work in our lab.

[Cluster Beam Study of Boron Oxide and Hydrogenated Boron Oxide Ion Cluster Reactions with Water](#)

Aug 8, 1996 19 pages

Authors: [Adam Lapicki](#); [Dilrukshi M. Peiris](#); [Jason N. Smolanoff](#); [Scott L. Anderson](#); UTAH UNIV SALT LAKE CITY DEPT OF CHEMISTRY

Full Text

Reactivity of thermalized **boron** oxide and hydrogenated **boron** oxide ion clusters in the mass range up to 95 amu, has been studied with water (D2O). Primary reactions are identified, with some information regarding reaction mechanisms as well. The cross section data is converted to surface reaction ... interactions are quite important in determining combustion product distributions. The effects of cluster structure on reactivity is examined and compared with analogous results for reaction with HF. The oxide chemistry is also compared with that for pure **boron** cluster ions reacting with HF and D2O.

[Particle Size and Surface Area Analysis of Amorphous and Crystalline Boron](#)

Dec 10, 1997 33 pages

Authors: [Jane K. Rice](#); NAVAL RESEARCH LAB WASHINGTON DC MOLECULAR DYNAMICS SECTION

Full Text

Surface areas were measured and scanning electron microscopy (SEM) photographs were obtained from seven **boron** particle samples used in recent **boron** particle combustion experiments. Some significant differences were seen between the manufacturer claimed particle sizes and the distributions obtained from the SEM photographs ... than were measured. Further data on the purity of the samples are necessary to determine whether the phase or purity of the **boron** particle has an effect on the efficiency of **boron** particle combustion.

[Characterization of Boron Atom Aggregation](#)

Jun 26, 2005 38 pages

Authors: [John P. Maier](#); BASEL UNIV (SWITZERLAND)

Full Text

... years June 2002- May 2005 were the investigations of the spectroscopic properties of **boron** species their aggregation and reactions in matrices ranging from ... the lack of spectroscopic knowledge on the electronic transitions of the polyatomic **boron** molecules and their ions. Thus it was clear ... purpose of the spectral identification and characterization of polyatomic **boron** molecules. a world-wide unique apparatus, combining mass-selection (using a ... including the unsuccessful ones. Because the electronic spectra of the triatomic **boron** species were identified in 5 K neon matrices an ambitious project ...

[Quick Reaction Evaluation of Materials and Processes. Delivery Order 0010: Bonded Boron Patch Repair Evaluation](#)

Sep 2006 62 pages

Authors: [Nick J. Jacobs](#); DAYTON UNIV OH RESEARCH INST

Full Text

... , performed in the early 1990s, was the first widespread application of a bonded **boron** composite repair on a critical structure. This program involved the evaluation of the residual strength and integrity of the bonded **boron** repairs from aircraft that were decommissioned and to be scrapped. A ... residual strength tests were performed, including 54 original bonded **boron** composite repaired specimens, 4 new bonded repair specimens, and 9 ... events at high stresses. The results of the project indicate that the bonded **boron** repair provided significant residual strength after 10 years of ...

[Boron Nitride Sputter Erosion Measurements by Cavity Ring-Down Spectroscopy \(Preprint\)](#)

Sep 6, 2007 11 pages

Authors: [Azer P. Yalin](#); [Lei Tao](#); [Naoji Yamamoto](#); [Timothy B. Smith](#); [Alec D. Gallimore](#); AIR FORCE RESEARCH LAB EDWARDS AFB CA PROPULSION DIRECTORATE

Full Text

... EP) devices from the point of view of both lifetime assessment and contamination effects. In many Hall thrusters erosion of **boron** nitride (BN) is of primary interest. In this contribution we introduce the use of cavity ring-down spectroscopy (CRDS) as a diagnostic for measurement of sputtered BN. The measurement approach is based upon probing sputtered **boron** atoms in the region of 250 nm. We report proof of principle CRDS measurements of sputtered **boron** atoms from both **boron** and BN targets. The measurements are obtained with pulsed CRDS in a diagnostic chamber consisting of ...

[Air-Augmented Combustion of Boron and Boron-Metal Alloys.](#)

Jun 1971 107 pages

Authors: [Henry T. -S. Hsia](#); UNITED TECHNOLOGY CENTER SUNNYVALE CA

Full Text

High speed cinematography was used to study the combustion characteristics of powdered **boron**, and of compounds of **boron** and magnesium, lithium, or aluminum, all of which were LiF-doped or undoped. An optical burner apparatus was used operating on CO-O2-air at ... compounds gave ignition delay times in the range of 0-8 msec and burning times of 2-15 msec, both considerably shorter than the corresponding times for elemental **boron**. X-ray diffraction analyses of the residues collected in the exhaust from MgB12 and LiB2 combustion indicated a high degree of oxidation. Wet chemical analysis of the MgB12 ...

[Studies of the Ignition and Combustion of Boron Particles for Air - Augmented Rocket](#)

Oct 1974 106 pages

Applications

Authors: [Merrill K. King](#); [Andrej Macek](#); [ATLANTIC RESEARCH CORP ALEXANDRIA VA COMBUSTION AND PHYSICAL SCIENCE DEPT](#)

... the present work has been to characterize the nature of the primary exhaust from fuel-rich motors containing **boron**, and to study its ignition and combustion characteristics, especially as compared to the known information for pure **boron**. Section II of the present report describes (a) the rocket-motor firing program in which the condensed exhaust (... . Finally, Sections VI and VII report the results of modeling studies describing the ignition of single **boron** particles in hot gas streams and propagation of flames in boron-oxygen-nitrogen dust clouds.

Full Text**Studies of the Effect of Hivelite and Other Boron Compounds on Nitramine**

Dec 1988 52 pages

Decomposition by Pyrolysis GC-FTIR (Fourier Transform Infrared)

Authors: [Pamela J. Kaste](#); [ARMY BALLISTIC RESEARCH LAB ABERDEEN PROVING GROUND MD](#)

... (cyclotrimethylene trinitramine, or RDX, and cyclotetramethylene tetranitramine, or HMX) and three **boron** compounds (the potassium and tetramethylammonium salts of the B12H12-2 anion and NaBH4). ... have been studied in order to determine which reaction products of the nitramines are modified by the **boron** compounds. In addition to the permanent gas products typically observed, larger molecular weight species ... The product distributions suggest that the rate of energy release is greater in the nitramine/**boron** systems than that of either borohydride or nitramine alone, and that decomposition occurs at ...

Full Text**The Characterization of Boron/Aluminum Composite as an Orthotropic Elastic-Plastic**

Jun 1985 110 pages

Material

Authors: [C. T. Sun](#); [J. F. Doyle](#); [D. Kenaga](#); [PURDUE UNIV LAFAYETTE IN SCHOOL OF AERONAUTICS AND ASTRONAUTICS](#)

Preliminary testing showed that **Boron**/aluminum displayed nearly linear elastic behavior up to failure when stressed in the fiber direction, but proved to be ... the fibers irrespective of the initial orientation of the crack. An in-depth study of the room temperature tensile behavior of **boron**/aluminum composite was conducted. This behavior was accurately described using an orthotropic elastic-plastic constitutive model. An investigation into the crack-tip plastic zones in **boron**/aluminum was conducted both experimentally and analytically, and the results help explain the fatigue growth pattern. ...

Full Text**Processing Boron and Boron Carbide Thin Films for Protective Coatings and Device**

Sep 14, 1993 10 pages

Fabrication

Authors: [Peter Dowben](#); [SYRACUSE UNIV NY DEPT OF PHYSICS](#)

The fabrication of **boron** and **boron** carbide heterojunction devices is based upon the success, thus far, of fabricating boron-carbide heterojunctions in the laboratory of Professor Dowben. We have pioneered the use of heavy boranes, carboranes, and phosphaboranes to make doped layers and semiconductors.

Full Text**Shock Initiation of Crystalline Boron in Oxygen and Fluorine Compounds**

Aug 1994 135 pages

Authors: [Herman Krier](#); [Rodney L. Burton](#); [S. R. Pirman](#); [ILLINOIS UNIV AT URBANA DEPT OF MECHANICAL AND INDUSTRIAL ENGINEERING](#)

The ignition delay and combustion of amorphous and crystalline **boron** particles is investigated at elevated temperatures and pressures for wet, dry, and fluorine-containing atmospheres. ... vapor and sulfur hexafluoride, reduce the ignition delay time for amorphous and sub-micron crystalline **boron** when compared to oxygen. For 20 microns particles, H2O and SF6 reduce the ignition temperature limit ... report also presents reviews of previous chemical and physical models that have attempted to explain why **boron** powder is relatively difficult to ignite. Ignition of metal powder, Shock tube initiation

Full Text**New Reagents for CVD and CVI of Carbon Containing Boron and Other Oxidation**

Aug 25, 1995 304 pages

Inhibitors

Authors: [W. J. Lackey](#); [J. A. Hanigofsky](#); [G. B. Freeman](#); [B. N. Beckloff](#); [J. S. Lewis](#); [GEORGIA INST OF TECH ATLANTA](#)

... to be used for the deposition of carbon containing one or more of the oxidation inhibitors **boron** and silicon, (2) determine the feasibility of the forced flow-thermal gradient CVI process for the rapid fabrication of carbon-carbon composites, and (3) understand the CVD of SiC and **boron** carbide and codeposition of these two phases since these materials have potential as oxidation ... process and a thorough kinetics and deposit microstructure knowledge base was established for the CVD of SiC, **boron** carbide, and codeposition of these materials. A novel technique for monitoring the progression ...

Full Text**Boron Filaments**

Sep 1964 21 pages

Authors: [Robert M. Witucki](#); [ASTRO RESEARCH CORP CARPINTERIA CA](#)

The combination of properties of elemental **boron** filaments make these unique among all other continuous filamentary materials. The presently known filament characteristics indicate great potential for many special applications pertaining to space flight, as well as for ... temperature, about 2040 deg C, the low density, about 2.35 g/cc, and the considerable retention of strength at temperatures to 1000 deg C. Although present strength-to-weight ratio for **boron** filaments is similar to that for glass filaments there is real potential for increasing the **boron** filament strength significantly. jg p5

Full Text**Tensile Creep of Boron/Epoxy and Boron/Epoxy-Reinforced 7075-T6 Aluminum Alloy**

May 1972 64 pages

Authors: [daniel j. chwirut](#); [NATIONAL BUREAU OF STANDARDS GAITHERSBURG MD](#)

Tensile creep tests were performed on twelve specimens of 0 degrees unidirectional **boron**/epoxy and on twenty-four specimens of 7075-T6 aluminum alloy reinforced with 0 degrees unidirectional **boron**/epoxy. An

[Full Text](#) analytical procedure for predicting the creep properties of composite-reinforced metals is presented. Agreement between calculated and experimental creep curves varies with test temperature. These discrepancies between experiment and analysis are probably not due to an error in the analysis itself, but rather to uncertainty in the residual stresses in the specimens.

[Theoretical Buckling Loads of Boron/Aluminum and Graphite/Resin Fiber- Composite Anisotropic Plates](#)

Dec 1971 40 pages

Authors: [Christos C. Chamis](#); NATIONAL AERONAUTICS AND SPACE ADMINISTRATION CLEVELAND OH LEWIS RESEARCH CENTER

[Full Text](#) ... to simple and combined in-plane loading. The plates are made from fiber composite material of boron/aluminum or high-modulus graphite/resin. The results are presented in nondimensional form as buckling load against fiber orientation angle for various plate aspect ratios. The results indicate that buckling loads of boron/aluminum plates are independent of fiber direction if the plate aspect ratios are greater ... loads are independent of aspect ratio for plates with aspect ratios greater than about 2. Boron/aluminum composite plates can resist buckling loads more efficiently than graphite/resin ...

[Study of Surface Processes During Growth of Epitaxial Boron Nitride](#)

Jul 1, 1996 8 pages

Authors: [D. W. Greve](#); CARNEGIE-MELLON UNIV PITTSBURGH PA DEPT OF ELECTRICAL AND COMPUTER ENGINEERING

[Full Text](#) The surface reactions of diborane and ammonia with the Ni(100) substrate have been studied. Diborane decomposes to boron on the surface and upon annealing forms a Ni₂B phase on the surface. Under appropriate conditions, BN can be formed when the surface is doped with both diborane and ammonia. The boron nitride so formed has been identified as the hexagonal phase of boron nitride. Additional studies on other substrates are planned in order to look for circumstances in which cubic BN can be formed.

[Boron Atom Matrix Chemistry](#)

Oct 1996 3 pages

Authors: [Lester Andrews](#); VIRGINIA UNIV CHARLOTTESVILLE DEPT OF CHEMISTRY

[Full Text](#) ... B₂H₆. It is clear that molecular hydrogen is complexed to BH and BH₃ in these experiments. Pulsed laser ablated boron atoms have been reacted with NH₃, CH₃NH₂ and NO to form novel boron insertion products which have been trapped in solid argon for infrared spectroscopic study. This work makes two important contributions. First, laser ablated boron atoms are shown to be highly reactive. Second, the importance of isotopic substitution for matching experimental observed and theoretical calculated frequencies for ...

[Effects of High Temperature Treatment on Curl And Microstructure of Heavily Boron Doped Silicon](#)

Apr 17, 1997 115 pages

Authors: [Denise M. Bruce](#); AIR FORCE INST OF TECH WRIGHT-PATTERSON AFB OH

[Full Text](#) ... and curling behavior of heavily boron-doped silicon structures. Cantilever structures were created from p++ boron diffused silicon wafers. The post-diffusion high temperature 'anneal' treatment temperature was varied ... anneal temperature using an optical profiler. Bulk sections from the wafers were analyzed to obtain boron concentration using secondary ion mass spectroscopy (SIMS) and to obtain the ... , with an apparent transition temperature of about 1050 deg C. SIMS analysis confirmed that boron concentration becomes more uniform through the wafer thickness with increasing anneal temperature. ...

[Chemistry Involving the Preparation, Isolation, and Immobilization of Nanocrystalline and/or Microcrystalline Boron Arsenide, Boron Phosphide, & Boron Antimonide](#)

Dec 1997 3 pages

Authors: [Richard L. Wells](#); DUKE UNIV DURHAM NC DEPT OF CHEMISTRY

[Full Text](#) During this report period, publications 1 and 2 (see below) appeared in print (the contents of the papers were reported in two previous "Interim Technical Reports"). Michael Lube prepared the adduct Cl₃B.Sb(SiMe₃)₃, the third Lewis acid-base adduct of boron and antimony to be structurally characterized. This adduct along with Br₃B.Sb(SiMe₃)₃ and I₃B.Sb(SiMe₃)₃ are the subject of publication 3 (see below) with the manuscript being written by Michael. Based on the various data obtained, it appeared that the black powders obtained from the thermolysis of these adducts were a mixture of ...

[Modifying Hydroxyapatite Nucleating Peptides to Form Novel Boron Ceramics](#)

Aug 2003 20 pages

Authors: [Robert E. Stone II](#); ARMY SOLDIER AND BIOLOGICAL CHEMICAL COMMAND NATICK MA SOLDIER SYSTEMS CENTER

[Full Text](#) ... efforts to modify the Hydroxyapatite nucleating peptide (HANP) isolated from Corynebacterium matruchotti to nucleate boron as opposed to calcium. The literature reports that boron-binding proteins utilize a His and Ser complex to bind boron in their active sites. Using computer modeling, modifications were designed that changed the ... coli and expressed. The expressed peptides were then tested for their ability to nucleate boron ceramics with no success. Two of the modified peptides were synthesized chemically and examined using circular ...

[Optical Boron Nitride Insulator Erosion Characterization of a 200 W Xenon Hall Thruster](#)

May 2005 11 pages

Authors: [William A. Hargus Jr](#); [Joshua Strafaccia](#); AIR FORCE RESEARCH LAB EDWARDS AFB CA SPACE AND MISSILE PROPULSION DIV

[Full Text](#) Vacuum ultraviolet emission (137.9 nm) of boron neutrals sputtered from a 200 W xenon Hall thruster boron nitride insulator is evaluated as a diagnostic for real-time evaluation of thruster insulator erosion. Three Hall thruster plasma control variables are examined: ion energy (discharge potential), ion flux (propellant flow), and plasma conductivity (magnetic field strength). The boron emission, and hence the insulator erosion rate, varies linearly with ion energy and ion flux. A minimum erosion rate appears ...

[Crossed Molecular Beams Investigations on the Dynamics and Energetics of Elementary Boron Reactions with Unsaturated Hydrocarbons](#) Mar 17, 2005 12 pages

Authors: [Ralf I. Kaiser](#); [HAWAII UNIV AT MANOA HONOLULU DEPT OF CHEMISTRY](#)

Full Text

We have demonstrated the capability to carry out crossed molecular beams reactions of **boron** atoms with unsaturated hydrocarbons (here allene). It should be recalled that the AFOSR Grant FA9550-05-1-0124 under which the experiments have been conducted was intended as a starter grant to get the experimental setup complete, the **boron** source optimized, and first data on **boron** atom reactions. Effective 8/1/2005, the crossed beams experiments as outlined under 'Objective' are continued under AFOSR grant W91 INF-05-I-0448. In addition, we have finalized the design ...

[Crossed Molecular Beams Investigations on the Dynamics and Energetics of Elementary Boron Reactions with Unsaturated Hydrocarbons](#) Mar 17, 2006 12 pages

Authors: [Ralf I. Kaiser](#); [HAWAII UNIV AT MANOA HONOLULU DEPT OF CHEMISTRY](#)

Full Text

We have demonstrated the capability to carry out crossed molecular beams reactions of **boron** atoms with unsaturated hydrocarbons (here allene). It should be recalled that the AFOSR Grant FA9550-05-1-0124 under which the experiments have been conducted was intended as a starter grant to get the experimental setup complete, the **boron** source optimized, and first data on **boron** atom reactions. Effective 8/1/2005, the crossed beams experiments as outlined under 'Objectives' are continued under AFOSR grant W911NF-05-1-0448. In addition, we have finalized the design ...

[THE SPECTROCHEMICAL DETERMINATION OF BORON IN MOLYBDENUM.](#) Apr 1963 8 pages

Authors: [James H. Muntz](#); [AIR FORCE MATERIALS LAB WRIGHT-PATTERSON AFB OHIO](#)

Full Text

A method for the spectrochemical determination of **boron** in molybdenum is described. The method provides for the determination of **boron** in the 50 to 500 ppm range by a carrier distillation technique with a precision of plus or minus 10%. (Author)

[Advanced Composites Data for Aircraft Structural Design. Volume I: Material and Basic Allowable Development - Boron/Epoxy.](#) Aug 1970 280 pages

Authors: [Leslie M. Lackman](#); [George H. Arvin](#); [Edward O. Dickerson](#); [Robert B. Meadows](#); [NORTH AMERICAN ROCKWELL CORP LOS ANGELES CA LOS ANGELES DIV](#)

Full Text

... and the assessment of existing micromechanics techniques for the prediction of composite lamina characteristics. All efforts in this program were relative to a specific **boron**/epoxy composite material system known commercially as Narmo Rigidite 5505. A procurement and a process specification were established during the ... for standard mechanical properties and elastic constants at both room temperature and 350 F. A test program to determine the effects of nuclear blast on **boron**/epoxy laminates is described and test data are presented. An evaluation is presented to show the degree of validity of ...

[Air-Augmented Combustion of Boron and Boron-Metal Compounds.](#) Jan 15, 1971 68 pages

Authors: [Henry T. -S. Hsia](#); [UNITED TECHNOLOGY CENTER SUNNYVALE CA](#)

Full Text

The report discusses the ignition delay times, burn times or rates and combustion efficiencies of doped and undoped **boron** and compound of **boron** with aluminum, magnesium, and lithium. A literature survey has been conducted for information on the properties and combustion of aluminum, magnesium and lithium borides. An optical burner apparatus has been modified and calibrated for the present investigation. Eight borides have been obtained or prepared for this program, were analyzed for purity on the basis of chemical, spectrographic, or X-ray data. (Author)

[Investigation of the Sensitivity, Selectivity, and Reversibility of the Chemically-Sensitive Field-Effect Transistor \(CHEMFET\) to Detect Nitrogen Dioxide, Dimethyl Methylphosphonate, and Boron Trifluoride](#) Sep 1993 261 pages

Authors: [Neal T. Hauschild](#); [AIR FORCE INST OF TECH WRIGHT-PATTERSON AFB OH SCHOOL OF ENGINEERING](#)

Full Text

... temperature. Copper phthalocyanine and lead phthalocyanine were used as thin films to detect the following challenge gases: nitrogen dioxide, dimethyl methylphosphonate, **boron** trifluoride, methanol, carbon monoxide, vinyl chloride, and trichloroethylene. Tests revealed that copper phthalocyanine was the most sensitive to dimethyl methylphosphonate and **boron** trifluoride, whereas lead phthalocyanine was the most sensitive to the remaining challenge gases. The CHEMFET was selective to the binary challenge gas ...

[Model for Liquid Boron Oxide Droplet Gasification in H/O/C/F Combustion Environments](#) Nov 11, 1992 57 pages

Authors: [R. C. Brown](#); [C. E. Kolb](#); [R. A. Yetter](#); [F. L. Dryer](#); [H. Rabiitz](#); [AERODYNE RESEARCH INC BILLERICA MA](#)

Full Text

This report presents a model for the gasification of liquid **boron** oxide droplet in high temperature H/O/C/F environments. The model includes a detailed gas phase reaction mechanism, multi-component molecular diffusion, and heterogeneous gas-surface reactions. The gas phase reaction mechanism consists of 103 reversible ... the addition of fluorine accelerates the gasification process relative to B/H/O/C systems. The degree of enhancement, however, depends upon the temperature and composition of the surrounding gas and the droplet diameter. **Boron**, Kinetic model, Sensitivity analysis, Combustion.

[Novel Molecular Sources for Dispersing Boron in Carbon-Carbon Composites](#) Nov 7, 1993 68 pages

Authors: [Philip S. Chen](#); [Ward C. Stevens](#); [ADVANCED TECHNOLOGY MATERIALS INC DANBURY CT](#)

... of carbon-carbon composites is key to extending the applications of this material system into higher temperature regimes. While molecularly dispersed **boron**, through addition of carborane, helps to provide oxidation protection to phenolic derived carbon, the moisture affinity of the boria seriously Substitution of furfuryl and pitch as the resin precursors significantly improved the moisture resistance of the carbon matrix material by stabilizing the **boron** at low temperatures and minimizing premature boria formation. Carborane addition to a commercial furfuryl/pitch blend (Kaiser Code88A) ...

[Full Text](#)

[The Structure and Reactivity of Boron and Carbon Surfaces](#)

Feb 22, 1995

6 pages

Authors: [Michael Trenary](#); ILLINOIS UNIV AT URBANA DEPT OF CHEMISTRY

... by this grant focused on three areas: First, we have explored the surface chemistry associated with reactions of O₂, D₂O, B₂O₂ and B₂O₃ with **boron** thin films grown on Ta(110) through the thermal decomposition of diborane. These reactions were studied mainly with the techniques of X-ray photoelectron spectroscopy ... at 1000 K to CO(g). Although we also observe the desorption of B₂O₂(g) from the surface, we determined that the B₂O₃ is reduced in the process to elemental **boron**. Third, we finished some experiments during the first few months of the grant on the oxidation of the LaB₆(100) surface. jg

[Full Text](#)

[The Development of Thermally Stable Adhesives for Titanium Alloy and Boron Composite Structures](#)

Jul 1971

66 pages

Authors: [R. W. Vaughan](#); [R. J. Jones](#); [J. F. Creedon](#); [J. W. Goodman](#); TRW SYSTEMS GROUP REDONDO BEACH CA

This final report describes the work performed to develop thermally stable adhesives for bonding titanium alloy and **boron** composite substrates. TRW A-type polyimide technology was employed as a basis for a series of adhesive formulations evaluated for bonding titanium alloy 6A14V and **boron**/polyimide composites. It was shown that copolymeric blends of an A-type polyimide and amide-imide resin provided superior adhesive properties at elevated and cryogenic temperatures than state-of-the-art adhesives. Data ...

[Full Text](#)

[A 4-Flap Design with Graphite and Boron Composites](#)

Oct 1968

12 pages

Authors: [A. V. Hawley](#); [M. Ashizawa](#); MCDONNELL DOUGLAS CORP LONG BEACH CA DOUGLAS AIRCRAFT DIV

The design and development of an A-4 landing flap is described. The flap was initially selected as a suitable component for obtaining flight experience with **boron** filaments. The existing production aluminum flap was redesigned utilizing **boron** skins supported by a full depth honeycomb core, while retaining some of the basic component aluminum parts for interchangeability reasons. A second flap design, utilizing graphite as the composite reinforcement ...

[Full Text](#)

[Shear Moduli of Boron Filaments](#)

Jul 1966

15 pages

Authors: [Harvey W. Herring](#); [V. G. Krishna](#); NATIONAL AERONAUTICS AND SPACE ADMINISTRATION HAMPTON VA LANGLEY RESEARCH CENTER

The shear moduli of **boron** filaments were determined by a dynamic torsion-pendulum method and a static torque-twist method. A detailed description of the equipment and techniques involved in the two experimental methods is included. Similar vapor deposition processes were used by two different manufacturers to produce the **boron** filaments used in the study.

[Full Text](#)

[Erosion Characteristics and Optical Properties of State-of-the-Art, Erosion-Resistant Coatings on Infrared Windows: Boron Phosphide, Gallium Phosphide, and Zinc Sulfide on Multispectral Zinc Sulfide](#)

May 1996

67 pages

Authors: [Daniel C. Harris](#); NAVAL AIR WARFARE CENTER WEAPONS DIV CHINA LAKE CA

Optical properties and rain and sand erosion resistance of the following infrared window materials were measured: (1) Barr & Stroud **boron** phosphide coating on multispectral zinc sulfide, (2) Barr & Stroud gallium phosphide coating (with a thin outer layer of **boron** phosphide) on multispectral zinc sulfide, (3) Raytheon zinc sulfide coating on multispectral zinc sulfide, (4) Texas Instruments bulk gallium phosphide, (5) polycrystalline magnesium fluoride, and (6) single-crystal ...

[Full Text](#)

[Weak Interactions of Boron, Aluminum, and Carbon Atoms: Experiment](#)

Dec 12, 1997

16 pages

Authors: [Paul J. Dagdigian](#); JOHNS HOPKINS UNIV BALTIMORE MD DEPT OF CHEMISTRY

A primary goal of this project has been the characterization of non-bonding interactions of the **boron** atom, in its ground and, resonance-excited electronic states with the hydrogen molecule and rare gases. These interaction potentials are critical ingredients in the theoretical modeling of cryogenic media doped with isolated **boron** atoms. Since electronic spectroscopy is the primary diagnostic tool in the experimental investigation of such doped cryogenic matrices, knowledge of the interaction between the matrix ...

[Full Text](#)

[Low Temperature Processing of Boron Carbide Cement Composite for Tough, Wear Resistant Structures](#)

Dec 15, 1997

11 pages

Authors: [Kristen J. Law](#); [Erik P. Luther](#); TPL INC ALBUQUERQUE NM

This SBIR project has developed a low temperature polymer ceramic composite consisting of **boron** carbide layers bonded by cement, laminated with polymer sheets. The porosity of the ceramic was minimized by in situ hydrolysis of cement. The material has a ... low as 150 deg C depending on the polymer used. The wear properties of the composite have been shown to compare favorably to those of partially sintered **boron** carbide. Applications for this material have been identified in several industrial settings including duct, chute and hopper linings. There is also a possible application as a satellite ...

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