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Electron Assisted Deposition of Cubic Boron Nitride by RF Magnetron Sputtering Apr 30, 1999 16 pages

Authors: Yonhua Tzeng; Hongbin Zhu; AUBURN UNIV AL DEPT OF ELECTRICAL ENGINEERING

Full Text

Cubic **boron** nitride (cBN) is deposited on silicon by means of radio- frequency (RF) magnetron sputtering in nitrogen using a hexagonal **boron** nitride target with the assistance of a simultaneous electron bombardment of the growing surface. Unlike most thin-film deposition processes for cBN, intentional bombardment of the growing surface by ion beams within specific ranges in energy and flux is not required for this process to achieve high purity cBN films. With electrons bombarding the growing surface at a current density of 140 mA/sq cm or higher, pure (according to FTIR spectra) cBN films are ...

Matrix Isolation of Boron and Carbon Vapor. Control of Cluster Formation During Preparation and Annealing Mar 15, 2000 10 pages

Authors: C. W. Larson; J. Harper; J. D. Presilla-Marquez; AIR FORCE RESEARCH LAB EDWARDS AFB CA SPACE AND MISSILE PROPULSION DIV

Full Text

The formation and recombination of small **boron**/carbon clusters were studied by quantitative Fourier transform infrared (FTIR) spectroscopy. Samples were prepared by evaporation of powder mixtures from a resistively heated oven (3000 K) and isolated at 10 K in solid argon C3 and BC2 disappeared entirely over the course of several annealings. Yields of all the larger clusters (BiCnj, II> 4 J = 0, 1, 2) increased during annealing. Clusters within >4 are linear, with the **boron** atoms of the J = land 2 clusters capping the ends of carbon chains; B(2)C(nn-2) cluster are inert.

Isolation of Boron and Carbon Atoms in Cryogenic Solids Aug 21, 2003 15 pages

Authors: C. W. Larson; AIR FORCE RESEARCH LAB EDWARDS AFB CA PROPULSION DIRECTORATE

Full Text

Outline: Theoretical Isp of cryogenic solid propellants composed of the atoms, dimers and trimers of lightweight elements isolated in solid para hydrogen. Consequences of condensation; Spectroscopic studies of **Boron**/Carbon clusters by matrix isolation spectroscopy; Development of stable, hi-flux **boron** atom source for preparation of cryogenic solid HEDM (under auspices of Small Business Innovative Research (SBIR) program; First optical spectrum of B3 (under auspices of International Research Initiative of the Air Force Office of Scientific Research).

Cobalt Doping of Semiconducting Boron Carbide Using Cobaltocene Mar 2007 100 pages

Authors: Lonnie Carlson; AIR FORCE INST OF TECH WRIGHT-PATTERSON AFB OH

Full Text

... dependent surface photovoltage effect is not compelling evidence for the majority carrier type but does suggest an increase in the carrier concentration in semiconducting **boron** carbides with cobaltocene fragment doping. Using cobaltocene to introduce dopants into a orthocarborane (closo-1,2-dicarbadecaborane) derived film, deposited by plasma enhanced chemical vapor deposition, a semiconducting **boron** carbide homojunction diode has been fabricated. This diode has potential applications in neutron detection, direct neutron power conversion, and as a ...

COMBUSTION OF ELEMENTAL BORON May 1, 1962 18 pages

Authors: Jr. Henderson U. V.; Harry P. Woods; TEXACO EXPERIMENT INC RICHMOND VA

Full Text

Studies of the reaction between elemental **boron** and fluorine gas continued in both the low-pressure microbalance apparatus and in the time-of-flight mass spectrometer. Corrosive failure of the mass-spectrometer apparatus prevented obtaining the refined data hoped for in the 800 to 1600 deg K temperature range, although the data available do indicate that at these temperatures BF was the principal species formed on the surface AND THAT THE REACTION APPARENTLY CHANGED TO A LOWER ACTIVATION ENERGY MECHANISM WHEN THE TEMPERATURE WAS RAISED TO ABOUT 800 deg K. Rates obtained in the 525 to 630 deg K ...

The Effect of Carbon and Boron on the Friction Behavior of Ti-Implanted 52100 Bearing Steel at Low Sliding Speeds May 1982 33 pages

Authors: Russell A. Jeffries; Robert N. Bolster; Irwin L. Singer; GEO-CENTERS INC NEWTON UPPER FALLS MA

Full Text

... resistant surface may be reduced by more than 50%. Transmission electron microscopy of dual implants of carbon and titanium each at a dose of 2 x 10 to the 17th power showed that the surface was still crystalline and typical for a martensitic material. In contrast, friction testing of samples implanted with titanium and **boron**, another interstitial species forming wear resistant species (i.e., TiB2)) , did not produce surfaces which were wear resistant nor substantially reduce the friction. Auger analysis in conjunction with ion milling was used to compare

compositions of implanted surfaces.

Atomically Resolved Structure and Bonding of Delta-Doped Boron Layers on Si(001) May 27, 1994 10 pages

Authors: Y. Wang; R. J. Hamers; WISCONSIN UNIV-MADISON DEPT OF CHEMISTRY

Full Text

... of diborane on Si(OO1). STM images reveal a number of boron-induced reconstructions which arise from ordered arrangements of three structural subunits. Based on the symmetry of the STM images and the bonding locations of the observed features with respect to the Si(OO1) lattice, a structural model is proposed with accounts for the observed STM features. The principal structural subunit is shown to be an ordered arrangement of four **boron** atoms at substitutional sites in the first bulk-like silicon layer, which is then capped with ordered arrangements of silicon dimers and dimer vacancies.

Effects of Fabrication and Joining Processes on Compressive Strength of Boron/Aluminum and Borsic/Aluminum Structural Panels Apr 1978 56 pages

Authors: Dick M. Royster; H. R. Wiant; Robert R. McWithey; NATIONAL AERONAUTICS AND SPACE ADMINISTRATION HAMPTON VA LANGLEY RESEARCH CEN TER

Full Text

Methods for forming and joining **boron**/aluminum and Borsic/aluminum to themselves and to titanium alloys have been studied at the NASA Langley Research Center. The present study was conducted to determine the effects of joining and fabrication methods on panel compressive strengths for composite skin and titanium skin panels with composite stringers. The stringers and panel skins were joined by high strength bolts, by spo welding, by diffusion bonding, by polyimide adhesive bonding, or by brazing. The test results show that hot and cold forming of metal-matrix composite stringers did not ...

Diffusion Bonded Boron/Aluminum Spar-Shell Fan Blade Jun 1980 112 pages

Authors: C. E. Carlson; J. L. Cutler; W. J. Fisher; J. V. Memmott; UNITED TECHNOLOGIES CORP WINDSOR LOCKS CT HAMILTON STANDARD DIV

Full Text

The Diffusion Bonded **Boron**/Aluminum Spar-Shell Fan Blade Program consisted of a design and a process development tasks intended to demonstrate composite blade application in large high-bypass ratio turbofan engines. The design task included selection of a representative airfoil model; a preliminary design effort, which included parametric studies of component materials and geometries, leading to the selection of two candidate designs, subject to NASA Project Manager approval, for detail designing; and a detail design effort on two designs which would lead to pertinent structural property ...

Changes in Boron Fiber Strength Due to Surface Removal by Chemical Etching Apr 1976 22 pages

Authors: Robert J. Smith; NATIONAL AERONAUTICS AND SPACE ADMINISTRATION CLEVELAND OH LEWIS RESEARCH CEN TER

Full Text

The effects of chemical etching on the tensile strength of commercial **boron**/tungsten (B/W) fibers were investigated. Fibers with as-received diameters of 203, 143, and 100 microns (7.98, 5.64, and 3.95 mils) were etched to diameters as small as 43 microns (1.7 mils). The etchings generally resulted in increasing fiber tensile strength with decreasing fiber diameter. And for the 203-microns (7.98-mil) fibers there was an accompanying significant decrease in the coefficient of variation of the tensile strength for diameters down to 89 microns (3.5 mils). Heat treating the 203-microns- (7.98-mil- ...

Preparation of Boron Trifluoride for Use in Neutron Counters 1948 6 pages

Authors: W. Hodges; M. I. Lloyd; B. Weinstock; LOS ALAMOS SCIENTIFIC LAB ALBUQUERQUE NM

Full Text

Boron trifluoride is used as the filling gas in ionization chambers and in proportional counters used for counting neutrons. The predominant reaction in these chambers is the (n-alpha) reaction on B(10) with thermal neutrons. Since the performance of counters filled with BF3 is strongly dependent on the quality of the gas, an understanding of this dependence is helpful. While this subject is by no means completely understood, the following discussion summarizes some general information pertinent to this question.

Studies of Surface Processes during Growth of Epitaxial Boron Nitride Jul 29, 1997 27 pages

Authors: D. W. Greve; CARNEGIE-MELLON UNIV PITTSBURGH PA DEPT OF ELECTRICAL AND COMPUTER ENGINEERIN G

Full Text

Cubic **boron** nitride has proven to be a challenging semiconductor to grow epitaxially. In large part this is due to its chemical similarity to diamond in that the hexagonal (or graphic) sp2-bonded phase often forms at ambient conditions rather than the sp3- bonded form. in this contract, we have investigated the possible formation of sp3-bonded forms of BN on particularly suitable substrates. Both Ni(100) and AlN have been studied. A careful study of the Ni(100) surface has shown that the hexagonal phase is formed when diborane and ammonia react thermally (without ionic bombardment). Work on ...

Vapor Pressure of Oxides of Lithium, Beryllium, Boron, Silicon and Lead Apr 26, 1960 7 pages

Authors: An N. Nesmeyanov; L. P. Firson; JOINT PUBLICATIONS RESEARCH SERVICE ARLINGTON VA

Full Text

In connection with the development of vacuum metallurgy and vacuum technology as well as a number of other industrial fields, the behavior of metallic oxides at high temperatures under vacuum is of great interest, in particular the oxides of lithium, beryllium, **boron**, silicon and lead. Valuable data on the thermodynamic properties of these substances can be obtained from determinations of vapor pressure equilibrated with corresponding condensation phases.

Design and Fabrication of a Boron Aluminum Composite Wing Box Test Specimen Jul 1973 150 pages

Authors: GENERAL DYNAMICS/CONVAIR SAN DIEGO CA SPACE SCIENCE LAB

This report summarizes the design, analysis, fabrication and testing of a wing box specimen utilizing **boron**

Full Text

aluminum as the primary structural material. The primary purpose of the program was to demonstrate the feasibility of utilizing boron-aluminum in a major aircraft structural component. The wing section selected is typical of many aircraft wing structures and simulated an integral wing fuel tank section capable of withstanding internal pressure in addition to the basic bending and torsion loads. The wing section was not intended to typify any specific aircraft nor was it intended ...

Characterization of Boron Atom Aggregation May 30, 2001 5 pages

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

Full Text

This report results from a contract tasking Institut fur Physikalische Chemie as follows: The contractor will investigate growth formation of **boron** clusters using mass selected beams produced from a cesium sputter source. These experimental results will be compared with theoretical analysis conducted by the Propulsion Directorate at Edwards AFB, CA. A technical report discussing the results obtained and analysis to the theoretical studies will be delivered at the completion of this 12 month study.

Kinetics of Boron Carbon HEDM May 28, 1999 16 pages

Authors: C. W. Larson; AIR FORCE RESEARCH LAB EDWARDS AFB CA SPACE AND MISSILE PROPULSION DIV

Full Text

The objective of this research is the development and characterization of a **boron** atom source.

Isolation of Boron and Carbon Atoms in Cryogenic Solids Aug 13, 2003 9 pages

Authors: C. W. Larson; AIR FORCE RESEARCH LAB EDWARDS AFB CA PROPULSION DIRECTORATE

Full Text

Boron and carbon atoms, and their dimmers and trimers were isolated in solid argon by co-condensation of their vapors onto a substrate maintained at 10 K. Growth and disappearance of various clusters with 3 to 12 atoms that occurred during annealing was studied by quantitative Fourier Transform Infrared Spectroscopy. The annealing experiments indicated that the initially formed solids contained about 80% B and C atoms and BC molecules. At 5 mole percent atom concentration these High Energy Density Materials (HEDM) could be applied in propulsion where they are capable of producing about 25% ...

The Use of Boron Nitride for Improved Cold-Cathode Electron Field Emission Technology May 30, 2004 16 pages

Authors: Jon Van Noord; Brian Gilchrist; Roy Clarke; Pedro A. Encarnacion; Hannah Goldberg; ELECTRODYNAMIC APPLICATIONS INC ANN ARBOR MI

Full Text

The emission characteristics of nanostructured **boron** nitride emitter arrays have been investigated for improved cold-cathode field emission technology. The performance has been evaluated in the presence of several gases (Air, water vapor, oxygen, and Xe) that are likely to be encountered in ion- propulsion applications in low-earth orbit. The emission performance is found to be insensitive to all gases and pressures tested except for oxygen where a 30% decrease in the emission yield is observed in the presence of oxygen but complete recovery is observed after exposure to ultrahigh vacuum. A ...

Etching Characteristics and Surface Analysis of Molecular Bean Epitaxy Grown P-Type Aluminum Gallium Nitride With Boron Trichloride/Chlorine Gases in Inductively Coupled Plasma (ICP) Dry Etching Nov 2004 21 pages

Authors: Fred Semendy; Phillip Boyd; Unchul Lee; ARMY RESEARCH LAB ADELPHI MD SENSORS AND ELECTRON DEVICES DIRECTORATE

Full Text

Dry etching of magnesium doped p-type aluminum gallium nitride grown by molecular beam epitaxy (MBE) has been carried for the first time by inductively coupled plasma (ICP) system via the **boron** trichloride/chlorine (BCl3/Cl2) gas system with variations in chuck power, ICP power, chlorine (Cl2) ratio in Cl2/BCl3 and process pressure. Processed samples were cleaned by standard techniques, depths were measured, and etching rates and selectivity were calculated. Surface morphology of the etched samples was analyzed by atomic force microscopy (AFM) and scanning electron microscopy (SEM). Etching ...

First-Principles Study of the Stability and Electronic Properties of Sheets and Nanotubes of Elemental Boron Dec 1, 2005 7 pages

Authors: Kah C. Lau; Ranjit Pati; Ravindra Pandey; Andrew C. Pineda; AIR FORCE RESEARCH LAB KIRTLAND AFB NM SPACE VEHICLES DIRECTORATE

Full Text

The structural and electronic properties or sheets and nanotubes or **boron** are investigated using density functional theory. The calculations predict the stability or a novel reconstructed {1 2 2 1} sheet over the idealized triangular {1 2 1 2} sheet. Nanotubes formed by wrapping the half-metallic {1 2 2 1} sheet show a curvature-induced transition in their electronic properties. Analysis of the charge density reveals a mixed metallic- and covalent-type of bonding in the reconstructed {1 2 2 1} sheet and the corresponding nanotubes, in contrast to metallic-type bonding in the idealized {1 2 1 ...

Quick Maintenance for High Voltage Equipment with the New Not Toxic Boron Nitride Powder (BN100) Superior Thermal Conductive and Lightweight Filler Jul 13, 2005 29 pages

Authors: Fabrizio Boer; VIA ROMBO 35 RIVOLI(TO) (ITALY)

Full Text

... cost of high graded components, can well reduce the margin of profit of Industry when repairing must occur. The BN100 superior thermal conductive and lightweight filler technology is a new filler technology, that not only lets Users a full access for maintenance because cure-free being compounded by loose **Boron** Nitride powder mechanically compressed and without resin, but also permits to much increase the thermal dissipation because of a K value of about 10 W/mK. Under this ESA contract we have demonstrated that hot spot temperatures can drop as much as 20 degrees - 50 degrees depending on ...

Differential Sputter Yields of Boron Nitride, Quartz, and Kapton Due to Low Energy Xe+ Bombardment (Preprint) Jul 2007 16 pages

Authors: A. P. Yalin; B. Rubin; S. R. Domingue; Z. Glueckert; J. D. Williams; AIR FORCE RESEARCH LAB EDWARDS AFB CA PROPULSION DIRECTORATE

Full Text

In this contribution we present results of differential sputter yield measurements of **boron** nitride, quartz, and kapton due to bombardment by xenon ions. The measurements are made using a sputtering diagnostic based on a quartz crystal microbalance (QCM). The QCM measurement allows full angular resolution, i.e. differential sputtering yield measurements are measured as a function of both polar angle and azimuthal angle. Measured profiles are presented for 100, 250, 350 and 500 eV Xe+ bombardment at 0?, 15?, 30? and 45? angles of incidence. We fit the measured profiles with Modified Zhang ...

Total and Differential Sputter Yields of Boron Nitride Measured by Quartz Crystal Microbalance and Weight Loss (Preprint) Sep 20, 2007 14 pages

Authors: Binyamin Rubin; James L. Topper; Azer P. Yalin; AIR FORCE RESEARCH LAB EDWARDS AFB CA PROPULSION DIRECTORATE

Full Text

We present results of differential sputter yield measurements of HBC and HBR grades of **boron** nitride due to bombardment by xenon ions. Total sputter yield measurements are made using a weight loss approach. Differential sputter yield measurements (of condensable components) are made using a quartz crystal microbalance (QCM). The QCM measurement allows full angular resolution, i.e. differential sputtering yield measurements are measured as a function of both polar angle and azimuthal angle. Measured profiles are presented for 100, 250, 350 and 500 eV Xe+ bombardment at 0-degree, 15-degree, ...

Basic Solutions to Carbon/Carbon Oxidation: Science and Technology Apr 14, 1998 239 pages

Authors: Ian R. Harrison; T-c. Chung; Carlo Pantano; Ljubisa Radovic; Peter Thrower; PENNSYLVANIA STATE UNIV UNIVERSITY PARK

Full Text

... of this study was to gain a fundamental understanding of the role of **boron** in carbon oxidation. Boron-doped carbons were synthesized ... by these techniques was critical in determining the effect of **boron** on carbon oxidation. XPS was utilized in this work to ... boron-doped graphite. All of the aforementioned standards contain **boron** in a unique bonding environment and thus their ... a complete conversion of B1s binding energies to **boron** chemical environments which has not been ... It was clearly established that a chemical shift for substitutional **boron** in graphite exists at 186.5 eV with a FWHM of ...

Basic Solutions to Carbon/Carbon Oxidation: Science and Technology May 13, 1994 49 pages

Authors: Tan R. Harrison; T-c Chung; Ljubisa Radovic; Carlo Pantano; Peter A. Thrower; PENNSYLVANIA STATE UNIV UNIVERSITY PARK

Full Text

... oxidation. In particular, one primary thrust is the development of **boron** containing carbons through pyrolysis ... understanding of the oxidation mechanisms in carbons and **boron** containing carbons is being sought. Several new **boron** containing precursors have been synthesized, which can be converted to B/C materials ... monomer (vinylcatecholborane.) Approximately 68% of the original **boron** is retained after pyrolysis yielding a product ... been hydroborated to contain large amounts of **boron**. Model compounds have been used ... latter two cases, direct analysis for % **boron** is not yet available. Preliminary TGA ...

Boron-Induced Reconstructions of Si(001) Investigated by Scanning Tunneling Microscopy Dec 20, 1994 15 pages

Authors: Yajun Wang; Robert J. Hamers; WISCONSIN UNIV-MADISON DEPT OF CHEMISTRY

Full Text

... Si(001) has been investigated using scanning tunneling microscopy. STM images show that **boron** induces several related reconstructions, arising from ordered arrangements of simple structural subunits. These boron-induced atomic rearrangements order even at very low **boron** exposures, leading to a striking spatial segregation of **boron** on the surface. Similar reconstructions are observed using diborane and decaborane as **boron** precursors. Annealing at 1000 Kelvin for 90 seconds substantially improves the surface ordering, without significant diffusion of **boron** from the surface to the bulk.

An Evaluation of Three Partially Volatile Neutron Shields for High- Performance Shipping Casks Feb 1981 42 pages

Authors: H. J. Rack; H. S. Pearson; SANDIA CORP ALBUQUERQUE NM

Full Text

... been evaluated. The results indicate that silicone based rubbers, impregnated with elemental **boron** or **boron** carbide, Boro-silicone 236 and Bisco NS-I respectively are more thermally ... of the silicone based rubbers. The compressive strengths of the borated beechwood and **boron** carbide impregnated silicone rubber were substantially more sensitive to test temperature than was the compressive strength of the **boron** impregnated silicone rubber. Finally the compressive strengths and energy absorbing capability of the **boron** impregnated silicone rubber is not affected by prior thermal exposure at 425 K ...

Development of Large Diameter Carbon Monofilament Jan 1973 42 pages

Authors: B. A. Jacob; R. D. Veltri; UNITED AIRCRAFT RESEARCH LABS EAST HARTFORD CT

Full Text

... process selected involved chemical vapor deposition using **boron** trichloride, methane and hydrogen gases and a conventional **boron** type reaction in which the substrate is resistively heated. Amorphous carbon-boron alloys ... in which the average composition of the deposit was 75 w/o **boron** and 25 w/o carbon. When this high an amount of **boron** is attained, it is suspected that the deposit reacts more readily with the impurities present on the surface of the carbon substrate. ... . The modulus of the monofilament appears to be linearly dependent upon the percent of **boron** in the monofilament. jg p6

Photoassisted Chemical Vapor Deposition for Packaging and Fabrication of Wide-Band Gap Semiconducting Devices Oct 31, 1997 13 pages

Authors: Marjorie A. Langell; Peter A. Dowben; Natale J. Lanno; NEBRASKA UNIV LINCOLN

Full Text

... have been made in the fabrication and in the performance characteristics of **boron** carbide-based, wide-band gap semiconductor devices. During this grant, working **boron** carbide transistors, tunnel junctions and homojunction diodes were fabricated. ... reported in either academic laboratories or in industry. Protocols for **boron** carbide substrate fabrication were optimized and the **boron** carbide thin films were deposited on a wide variety of substrates, including Si(111), ... gaps of up to 4.0 eV with temperature stability to 250 C. The **boron** carbide material was successfully doped both n-type and ...

AASERT Support of Research in Refractory III-V Semiconductors 1999 3 pages

Authors: Gary W. Wicks; ROCHESTER UNIV NY

Full Text

... and GaN does not form a several-monolayer-thick Ga2O3 surface layer. 2. **Boron** can be incorporated into GaAs up to concentrations of several percent. Some of the **boron** incorporates on the growth III site, increasing the bandgap; some incorporates on the growth V site as a double acceptor. 3. **Boron** can be substitutionally incorporated into GaN and AlN up ... percent. Lattice constant shrinks and bandgaps increases with increasing **boron** concentrations, but material quality degrades. 4. **Boron** Nitride grown by MBE is fine grain polycrystalline. 5. GaN and AlN can be grown crack-free ...

Filament Composite Material Landing Gear Program, Volume I. Aug 1972 234 pages

Authors: BENDIX CORP SOUTH BEND IND ENERGY CONTROLS DIV

Full Text

The objective of this program was to explore the utility of **boron** composite materials in aircraft landing gear construction. The contract work statement required the design, fabrication and test of a **boron** composite material landing gear assembly interchangeable in both geometry and ... main landing gear of the A-37B aircraft. The use of Borsic- aluminum and **boron** epoxy materials was explored. Hardware designs were evolved for both materials. One full size landing gear assembly was tested. This assembly was composed of a **boron** epoxy outer cylinder, inner cylinder and side brace. All ...

Glass-, Boron-, and Graphite-Filament-Wound Resin Composites and Liners for Cryogenic Pressure Vessels Feb 1968 18 pages

Authors: Morgan P. Hanson; NATIONAL AERONAUTICS AND SPACE ADMINISTRATION CLEVELAND OH LEWIS RESEARCH CEN TER

Full Text

... experimental investigation was conducted to determine the tensile strength properties of glass, **boron**, and graphite composites at 75, -320, and - 423 degrees F ... were made of Naval Ordnance Laboratory (NOL) rings. Tensile strengths of **boron** filaments were determined at 75 and -320 F (297 and 77 ... about 29 percent higher at cryogenic temperatures than at ambient temperature. **Boron** and graphite composite strengths were essentially the same in the ... strength in glass composites also increased from 75 to -320 F (297 to 77 K); **boron** and graphite showed no significant change within the temperature range ...

Effect of Metalloid Impurities on Grain Boundary Stability in Tantalum May 1996 27 pages

Authors: Genrich L. Krasko; ARMY RESEARCH LAB ABERDEEN PROVING GROUND MD

Full Text

... environment. The 'environment- sensitive' embedding energies were calculated for hydrogen, **boron**, carbon, nitrogen, oxygen, phosphorus, and sulphur, as a function of ... a GB, carbon has the lowest energy (followed by nitrogen and **boron**) and, thus, would compete with the other impurities for the site on the ... tantalum by the 10th-12th plane off the GB. Carbon, nitrogen, and **boron** somewhat dampen the deformation wave (making the oscillations less than in ... with carbon being the most stable. Thus, carbon, nitrogen, and **boron** may be thought of as being cohesion enhancers, while oxygen, phosphorus, and ...

Lithium Borides - High Energy Materials Feb 28, 2000 127 pages

Authors: Koop Lammertsma; Tracy P. Hamilton; ALABAMA UNIV IN BIRMINGHAM DEPT OF CHEMISTRY

Full Text

... is investigated. The ab initio calculations show that mixed clusters of **boron** and lithium prefer to have an electronegative **boron** atom at the middle, surrounded by positively charged lithium. The bonding is ionic, and not very directional. There is ... by the lithium atoms to form nonclassical structures. Upon replacement of **boron** by aluminum, the clusters are more metallic and quite different. The aluminum ... the energy of pure lithium clusters), up to around 6 or 7 lithium. After that, the **boron** atom is saturated and further lithium addition has the same ...

High Energy Metallic Mechanical Alloys for New Explosives and Incendiary Devices with Controllable Explosion Parameters Dec 6, 2001 37 pages

Authors: Emil Shtessel; Edward Dreizin; NEW JERSEY INST OF TECH NEWARK

Full Text

... experimental information, combustion products were also collected and analyzed. The results have clearly shown that the combustion behavior of pure **boron** and aluminum powders can be dramatically improved by alloying these materials with Ti and Mg, respectively. Preliminary results also indicate improved **boron** combustion when **boron** is alloyed with Mg. Alloying **boron** with Al showed no such improvement, however. The improvements in the ignition and combustion parameters are found to be significant even though quite coarse mechanical alloy ...

A Study of Low Density, High Strength High Modulus Filaments and Composites Jul 1966 28 pages

Authors: J. A. Alexander; R. G. Shaver; J. C. Withers; GENERAL TECHNOLOGIES CORP SPRINGFIELD VA

... of metal and ceramic. In order to fabricate the filament composites, continuous **boron**, and batch **boron** carbide, and silicon carbide filaments were synthesized at GTC. Electrodeposited nickel was reinforced by both 4

Full Text

v/o tungsten wire and 20-30 v/a **boron** filament in aligned configuration. Tensile testing of these composites yielded tensile strengths in ... . calculated by adding the volume-weighted tensile strengths of the components. This effect was most pronounced with the **boron** filament. Sapphire whisker composites of powder metallurgically produced Al-6Si_matrix and electrodeposited nickel ...

Palladium-Boron Alloys and Methods for Making and Using Such Alloys May 19, 2000 16 pages

Authors: Miles; DEPARTMENT OF THE NAVY WASHINGTON DC

Full Text

... composition and methods of making and using same are provided. In one aspect, the invention comprises an alloy comprising palladium and **boron** the **boron** being in solid solution in the palladium and the alloy having a two-phase structure, wherein each phase of the two-phase structure has the ... within the spaces between the larger phase crystals. The composition is carefully prepared by a process wherein palladium and an amount of **boron** sufficient to place the **boron** in solid solution, but insufficient to combine with the palladium, are placed together and repeatedly arc melted, cooled and turned ...

BETA-SILICON CARBIDE AND ITS POTENTIAL FOR DEVICES May 15, 1963 24 pages

Authors: W. E. Nelson; F. A. Halden; STANFORD RESEARCH INST MENLO PARK CA

Full Text

P-type crystals were grown using **boron** and aluminum additions to the silicon melts. Some difficulty arose as a result of compensation by impurities in the **boron** employed, but doping levels obtained using aluminum additions appeared quite uniform and amenable to control. Satisfactory results are anticipated for **boron** when higher purity, zone-refined rod form is used. Ohmic contacts were obtained on low resistivity (0.1 to 1.0 ohm-cm) n-type silicon carbide by soldering gold wires directly to the crystals. A ...

Filament Composite Material Landing Gear Program, Volume II. Aug 1972 280 pages

Authors: BENDIX CORP SOUTH BEND IND ENERGY CONTROLS DIV

Full Text

The objective of this program was to explore the utility of **boron**/epoxy composite materials in aircraft landing gear construction. The design, fabrication and test of a **boron** composite material landing gear assembly interchangeable in both geometry and performance with the main landing gear of A.37B aircraft. This report describes the fabrication and processing of **boron** composites. The processing procedures associated with the design trial specimens and prototype components designed during this program are described. (P.S.-PL)

Fuels Combustion Research Oct 31, 1987 37 pages

Authors: Frederick L. Dryer; Irvin Glassman; Forman A. Williams; PRINCETON UNIV NJ DEPT OF MECHANICAL AND AEROSPACE ENGINEERING

Full Text

... and carbon monoxide. Kinetics steps leading to these intermediates are given. Combustion property observations of isolated **boron** slurry droplets were extended to in-house **boron**/JP-10 slurries with and without surfactants. The experimental results revealed that stabilizing agents are responsible fo rthe violent disruption of the primary slurry ... of the formation of the impermeable shell and subsequent disruption phenomena. Keywords: Born slurry combustion; **Boron** cloud combustion; Slurry fuels; Jet engine fuels.

Pseudomorphic Stabilization of Diamond on Non-Diamond Substrates: Heteroepitaxially Grown Diamond on a c-BN(111) Surface Feb 8, 1993 14 pages

Authors: L. Wang; A. Argoitia; J. S. Ma; J. C. Angus; P. Pirouz; CASE WESTERN RESERVE UNIV CLEVELAND OH

Full Text

A continuous diamond film with a thickness of about 10 microns was grown on (111) faces of single crystal cubic **boron** nitride (c-BN) by hot- Filament chemical vapor deposition (CVD). The morphology and microstructure of the diamond film were investigated by scanning ... relationship with respect to the substrate. Indirect evidence from scanning electron microscopy indicates that parallel epitaxy was achieved over the entire **boron** terminated face of the c-BN crystal, which had linear dimensions of approximately 400 microns....Diamond, Cubic **Boron** Nitride, Heteroepitaxy Chemical Vapor Deposition.

The Interaction of Group IIIA Atoms with Small Molecules Jan 6, 1995 24 pages

Authors: Paul J. Dagdigian; Millard H. Alexander; JOHNS HOPKINS UNIV BALTIMORE MD DEPT OF CHEMISTRY

Full Text

A collaborative theoretical and experimental investigation of the non-bonding interactions of the **boron** atom with the hydrogen molecule and other species has been carried out. Additionally, bimolecular collisions of electronically excited **boron** atoms and non-bonding interactions of other boron- containing species, namely BM and the isovalent ... experimental component of this program has been in the spectroscopy of weakly bound complexes of atomic **boron**, while those from the concurrent theoretical work has involved the elucidation of potential energy surfaces of ...

Final Report for Contract AT-30-1-Gen-127 (United Carbon Products Company, Inc.). Part 2. Technical May 20, 1949 21 pages

Authors: Lynn Brooks; George T. Sermon; TECHNICAL INFORMATION SERVICE (AEC) OAK RIDGE TN

Full Text

... per day of high purity graphite. Graphite having a total ash content of 600 ppm and a **boron** content of <0.6 ppm was purified so that the total ash was 410 ppm and the **boron** was <10 ppm < 0.10 ppm. The processing was carried out in electric granular carbon resistance furnaces. The purification was ... use of carbon tetrachloride with nitrogen introduced into the heated zone up to 2000 deg C, the removal of **boron** is accomplished by the use of a fluorinated hydrocarbon such as difluoro-dichloro-methane (i.e. "F-12") at temperatures above 2000 deg ...

Multi-Fiber Composites Apr 1976 118 pages

Authors: R. C. Novak; UNITED TECHNOLOGIES RESEARCH CENTER EAST HARTFORD CT

... resin matrix composites having improved resistance to foreign object damage in gas turbine engine fan blade

Full Text

applications. Materials evaluated include epoxy matrix graphite/glass and **boron**/glass hybrids, thermoplastic matrix **boron**/glass hybrids, and superhybrids consisting of graphite/epoxy, **boron**/aluminum, and titanium alloy sheets. Static, pendulum impact, and ballistic impact test results are reported for all materials. Superhybrid blade-like specimens are ...

Tough Ceramics from Fibrous Monoliths Aug 25, 1997 66 pages

Authors: John W. Halloran; MICHIGAN UNIV ANN ARBOR DEPT OF MATERIALS SCIENCE AND ENGINEERING

Full Text

... 250-micron "cells" of a strong polycrystalline ceramic, such as silicon carbide or silicon nitride, separated by "cell boundaries" from materials, such as **boron** nitride, which promote crack deflection and delamination. These materials show graceful failure in flexure, with strengths around 350 MPa and ... manufacture. We have demonstrated successful fibrous monoliths with silicon carbide, silicon nitride, and alumina, using weak interfaces of graphite or **boron** nitride. The **boron** nitride systems are resistant to oxidation. Their room temperature properties are unaffected by exposure at 1400 deg C.

Physical Chemistry of Energetic Nitrogen Compounds Jun 26, 2000 26 pages

Authors: Robert D. Coombe; DENVER UNIV CO DEPT OF CHEMISTRY

Full Text

... of the rate of energy transfer between vibrationally excited nitrogen and chlorine azide and development of a model for the chain decomposition of chlorine azide, the deposition of **boron** nitride and gallium nitride thin films from **boron** and gallium azide precursors, the identification of NNBN as the product of **boron** triazide decomposition and a likely building block for BN films, and the observation of thermal energy charge transfer in the near-resonant laser sputtering of zinc ...

MOVPE Reactor for Deposition of Wide Band Gap Semiconductors Apr 20, 2001 5 pages

Authors: James H. Edgar; KANSAS STATE UNIV MANHATTAN

Full Text

A metalorganic vapor phase epitaxy reactor was constructed to study the epitaxy of BxGa1-xN and BxAl1-xN on 6H-SiC substrates. The solubility of **boron** in AlN and GaN was shown experimentally to be very low, less than 3 at %. This low solubility of **boron** in the group III nitrides was consistent with thermodynamic arguments based on the structure of the binary compounds involved. Adding **boron** to GaN increased its energy band gap up to the point of two phases forming. Unfortunately, even small additions of diborane ...

Physical Chemistry of Energetic Nitrogen Compounds Feb 28, 2003 24 pages

Authors: Robert D. Coombe; DENVER UNIV CO DEPT OF CHEMISTRY

Full Text

... were determined at room temperature. In a second part of the research, the deposition of BN films from the dissociation of **boron** triazide was investigated using plasma-assisted deposition methods. These experiments produced stable, dense, and adherent BN ... good chemical characteristics. The films were found to be amorphous, though, a result thought to be associated with self-assembly of **boron** triazide dissociation fragments into PN nanoparticles in the gas phase. This hypothesis was supported by IR analysis of the constituents of a **boron** triazide/argon plasma trapped in a low temperature matrix.

Silicon Carbide Substrates for GaN Research and Development Dec 2002 31 pages

Authors: Marek Skowronski; CARNEGIE-MELLON UNIV PITTSBURGH PA DEPT OF MATERIALS SCIENCE AND ENGINEERING

Full Text

... and secondary ion) and transport methods. The dominant impurities in crystals grown from commercial SiC charge are nitrogen and **boron**. Nitrogen concentrations decrease toward the tail while that of **boron** and aluminum increase. The Fermi level in all crystals started at being pinned to nitrogen donor level in the seed end of the boule and dropped to the shallow **boron** acceptor level at the tail end. The middle part exhibited either a narrow or wide band of high-resistivity material, depending primarily ...

Defects in Ion-Implanted Silicon Carbide Jul 1, 2004 5 pages

Authors: Mulpuri V. Rao; GEORGE MASON UNIV FAIRFAX VA

Full Text

... diodes made with aluminum and phosphoms implantations exhibited higher reverse leakage current compared to those made by nitrogen and **boron** implantations. In all samples implanted with nitrogen a defect complex involving nitrogen and a point defect (introduced by the ... band. Phosphoms implant-native defect related peaks are observed at 0.6 and 0.7 eV above the valence band. In all **boron** implanted samples, a prominent electrically active **boron** related D-center defect is seen at 0.62 eV above the valence band. In aluminum implanted samples an intrinsic vacancy related defect is seen at 0. 78 eV ...

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