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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 ENGINEERIN G

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 an 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.

THE OXIDATION OF TETRABORANE Jun 1961 117 pages

Authors: Kenneth H. Ludlum; STEPHEN E. WIBERLEY; WALTER H. BAUER; RENSSELAER POLYTECHNIC INST TROY NY

Full Text

... the reaction erratically and in some cases prevented explosion. The partial oxidation of tetraborane was brought about by the slow addition of O to tetraborane in the IR gas reaction cell. A reaction occurred which produced **diborane**, partial oxidation product, H, and boric acid anhydride. Mixtures of tetraborane and **diborane** to which O was slowly added reacted similarly. Argon had no effect on the system under the conditions studied.

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

The local geometric and electronic structures of boron-induced reconstructions produced by thermal decomposition of **diborane** and decaborane on Si(001) has been investigated using scanning tunneling microscopy. STM images show that boron induces several related reconstructions, ... 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 ...

COMBUSTION CHEMISTRY OF HIGH ENERGY PYROPHORIC FUELS May 26, 1969 116 pages

Authors: Charles A. Andrade; MARTIN MARIETTA AEROSPACE ORLANDO FL; MARTIN MARIETTA AEROSPACE ORLANDO FL

Full Text

... of the fundamental processes in supersonic combustion. Part One describes a branching chain mechanism constructed for oxy-diborane mixtures diluted in argon. Included in this postulated mechanism is the production of hydroxyl as an ignition intermediate. A spectrograph was used to view the oxy **diborane** system through the end plate of a single pulse shock tube. Hydroxyl and several boron intermediates were identified, qualitatively verifying both mechanism and equilibrium calculations. Ignition induction measurements were performed up to 950K behind the reflected shock wave. These measurements ...

Kinetics of Some Metal Atom and Metal Fluoride Oxidation Reactions Relevant to Air Force Technology Development Mar 1981 20 pages

Authors: William Felder; AEROCHEM RESEARCH LABS INC PRINCETON NJ

Full Text

... Experiments on aluminum monoxide (A10) reactions indicate that the O-A10 bond strength is probably greater than 126 kcal per mol. Magnesium atoms appear to react with molecular oxygen at 1900 K. Tests of means to vaporize elemental boron are reported. Thermal and microwave discharge dissociation of **diborane** and boron trichloride produce small quantities of atomic boron; these methods appear more suitable for generating boron monohalides or boron monoxide (in the presence of molecular oxygen). The accuracy of kinetic measurements on metal atoms at elevated temperatures is the subject of two of ...

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

Scanning tunneling microscopy has been used to study the formation of delta-doped layers by thermal decomposition 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 ...

Atomic Structure and Bonding of Boron-Induced Reconstructions on Si(001) Dec 20, 1994 17 pages

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

Full Text

Scanning tunneling microscopy and tunneling spectroscopy have been used to investigate the local structural and electronic properties of boron- induced reconstructions on Si(001). Thermal decomposition of **diborane** produces three ordered reconstructions, which arise from ordered arrangements of three structural subunits, with a local boron coverage of 1/2 monolayer. A structural model is proposed which 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, ...

The Structure and Reactivity of Boron and Carbon Surfaces Feb 22, 1995 6 pages

Authors: Michael Trenary; ILLINOIS UNIV AT URBANA DEPT OF CHEMISTRY

Full Text

Research funded by this grant focused on three areas: First, we have explored the surface chemistry associated with reactions of O2, D2O, B2O2 and B203 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 and mass analyzed thermal desorption. We find that both O2 and D2O form a B2O3-like oxide on the surface but that the oxide desorbs mainly as B2O2. Second, we have studied the reaction of B2O3 and O2 with graphitic carbon deposited on the Pt(111) surface. Although B2O3 ...

Gas Phase Studies of Boron, Silicon, and Aluminum -- Relationship to Carbon-Carbon Composition Jun 27, 1995 24 pages

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 features of flowing afterglow-selected ion flow tube (FA- SIFF) technology. Reaction of strong base with **diborane** has allowed the preparation of a number of anionic boron hydride clusters. Many of these including B2H3- have been examined in terms of their reaction chemistry (FA- SIFF) and structure (ah initio computation). The fundamental thermodynamic property of gas phase acidity has been measured for several boron hydride species by reacting their corresponding conjugate base with a series of ...

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

... 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 AlN substrates is less complete but so far no evidence for formation of the sp3-bonded phase has emerged.

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

Authors: James H. Edgar; KANSAS STATE UNIV MANHATTAN

Full Text

... 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** greatly reduced the growth rate (at 1000 degrees Celsius) and the crystal quality of the deposits. This furnace is continuing to be used to study the epitaxy of GaN and AlN.

Infrared Spectra of Aluminum Hydrides in Solid Hydrogen: Al2H4 and Al2H6 Mar 20, 2003 43 pages

Authors: Xuefeng Wang; Lester Andrews; Simon Tam; Michelle E. DeRosa; Mario E. Fajardo; VIRGINIA UNIV CHARLOTTESVILLE DEPT OF CHEMISTRY

Full Text

... absorptions for Al(sub 2)H(sub 6) in the infrared spectrum of the solid hydrogen sample. These seven vibrational frequencies include terminal Al-H(sub 2) and bridge Al-H-Al stretching and AlH(sub 2) bending modes, which are accurately predicted by quantum chemical calculations for dibridged Al(sub 2)H(sub 6), a molecule isostructural with **diborane**. Annealing these samples to remove the H(sub 2) matrix decreases the sharp AlM (sub 3) and Al(sub 2)H(sub 6) absorptions and forms broad 1720 plus or minus 20 and 720 plus or minus 20 /cm bands, which are due to solid (AlH(sub 3))n formed on the CsI ...

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