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Aluminum Oxide

Surface Analysis of Anodized Aluminum Panels that have been Painted, Bead Blasted, Cleaned, and Treated with a Chemical Conversion Coating, Tri-Service Committee on Corrosion

Authors: John J. Jusko; OGDEN AIR LOGISTICS CENTER HILL AFB UT

... an aircraft undergoes for repainting. This process consisted of stripping the original paint down to the anodized aluminum by bead blasting with polyethyl methacrylate (PMMA), cleaning the surface, corrosion removal, followed by a ... ; however, areas with slight amounts of PMMA were also detected. The high resolution scans of the aluminum peaks showed that the chemical states of aluminum changed with the chemical conversion coating time. That is, the surface aluminum changed from an unoxidized aluminum to a mixture of an oxide and a possible complex oxyfluoride surface at longer coating times.

THE CELLULAR STRUCTURE OF THICK-LAYERED ANODIC OXIDE FILMS

Authors: N. D. Tomashov; F. P. Zalivalov; FOREIGN TECHNOLOGY DIV WRIGHT-PATTERSON AFB OH

The purpose of the report was in the determination of the quantitative interconnection between the thickness of the barrier layer of oxide film and the dimensions of the oxide cells. For objects of research there were chosen specimens of aluminum of AVOOO (99.99% Al) which were then anodically oxidized (anodized) in 4-n ... , 25, and 27 v. The temperature of the electrolyte during the anodizing was maintained at about ~ 2. The dimensions of the oxide cells are determined from photographs obtained with the electron microscope EM-3 with the aid of collodion and ...

MATTEING OF ALUMINUM AND ITS ALLOYS

Authors: S. I. Shames; FOREIGN TECHNOLOGY DIV WRIGHT-PATTERSON AFB OH

The report covers a study of film formation kinetics and the properties of anodic oxide films produced in an oxalic acid electrolyte with the titanium salt TiO(KC2O4)2. 2H2O on aluminum AD-1 and Al alloys AMsM and D16-T (unclad). Samples were wiped with benzene, chemically degreased (bath compositions ... ; abrasive and friction wear, hardness, volume resistivity and dielectric strength characteristics of these films were better than for standard oxide films produced in sulfate or oxide baths.

REFRACTIVE INDEX OF OPTICAL MATERIALS IN THE INFRARED REGION

Authors: A. J. Moses; HUGHES AIRCRAFT CO CULVER CITY CA ELECTRONIC PROPERTIES INFORMATION CENTER

Refractive index data and some extinction coefficients are provided for the infrared region for the following materials: silicon, germanium, zinc sulfide, cadmium telluride, zinc selenide, silica, calcium fluoride, magnesium fluoride, aluminum oxide, magnesium oxide, aluminum, gold and silver. The dependence of these optical constants on wavelength, temperature, crystal form, film preparation technique, radiation and other factors is included.

Hot Isostatic Pressing of Ceramic Powder Compacts

Authors: J. K. McCoy; A. J. Markworth; BATTELLE COLUMBUS DIV OH

The densification of aluminum oxide in hot isostatic pressing has been studied in detail. Methods for calculating maps of densification rate as function of temperature and applied pressure have been developed. A new mechanism, interface-reaction-controlled grain-boundary diffusion, has been found which describes the densification of high-purity, fine-grained (grain radius of 0.7 micrometers) aluminum oxide powder at temperatures up to 1423 K. Theoretical models have been developed for this mechanism for both the initial and final stages of densification. Standard ...

Measurements of Sub-Micron AL2O3 Particles in Rocket Plumes

Authors: John K. Vaughn; NAVAL POSTGRADUATE SCHOOL MONTEREY CA

... the edges of plumes for solid propellant rocket motors using various propellants and motor geometries. The average values obtained for the aluminum oxide particles were a Sauter mean diameter of O.30+ or -.02 microns, ... 1.64 + or -.04 and standard deviation of 1.52+ or -.12 for the assumed monomodal, log-normal size distribution. The results indicated that the small aluminum oxide particles in the plume edge were gamma-AL2O3, independent of propellant composition, motor operating conditions and nozzle geometry. The good correlation ...

http://www.stormingmedia.us/search.php?q=Aluminum+Oxide&search_x=11&search_y=... 4/30/2010
A Ceramic Fracture Model for High Velocity Impact

The objectives of this research program were to develop, implement, and demonstrate a failure model for aluminum oxide ceramic under impact loading. A comprehensive test program for Coors AD-85 was conducted ... types of experiments provided a basis for the development of the ceramic failure model. A phenomenological damage-based failure model for compressive fracture of impacted aluminum oxide was developed with emphasis placed on predicting fragment sizes of failed ceramic. Test data suggested a fragment size correlation with loading rate. A ...

Development of Materials for Spectral Hole Burning Applications

It was intended to evaluate growth of europium-doped yttrium aluminum oxide (Eu:Y3Al5O12, Eu:YAG) and europium-doped yttrium silicate (Eu:Y2SiO5, Eu:YSO) crystals to characterize these crystals for spectral hole-burning application. After ... is insufficient for choosing a crystal for spectral hole burning application. It is necessary to explore other rare-earth doped mixed oxide crystals and carry out more characterization. Spectral hole burning, Yttrium aluminum oxide crystals, Heat exchanger method, Crystal growth, Dephasing time.

Stratospheric Ozone Reactive Chemicals Generated by Space Launches Worldwide

We report quantities of inorganic chlorine compounds and aluminum oxide particles (Al2O3) deposited in the stratosphere and troposphere by solid rocket propelled launch vehicles. Totals are presented by launch vehicle type, ... H-1 and H-2). Whereas inorganic chlorine compounds released by solid rockets are directly related to stratospheric ozone depletion, much uncertainty surrounds reactivity of aluminum oxide particulate. We also compare current and future effects of space launch on stratospheric ozone depletion with those of Ozone ...

Effects of pH, Surface Area, and Background Matrices on the Removal of Lead from Aqueous Solutions Using Activated Alumina

Precipitation and ion exchange have been used. These methods often do not yield sufficient removal of lead and can be expensive due to the high costs of required chemicals. Aluminum oxide, Al2O3, has been shown to sorb lead from aqueous solutions by concentrating lead at the particle surfaces. Sorption of lead using aluminum oxide (alumina) is effected by many factors, including pH, available surface area, and background compounds or matrices. Each of these variables significantly impacts both the rate of ...

Sampling Efficiency Measurement Methods for Aerosol Samplers

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Performance Characterization Methods of Aerosol Samplers

... using the following methods: (1) monodisperse fluorescent/nonfluorescent PSL microspheres with fluorometric analysis or Counter analysis, (2) polydisperse solid aluminum oxide particles with Aerodynamic Particle Sizer (APS) analysis or Counter Multisizer Analysis; (3) liquid fluorescent oleic acid particles with ... are generated using a Collison nebulizer, sonic nozzle, Ink Jet Aerosol Generator (IJAG), and puffers. Aluminum oxide particle aerosols are generated using a sonic nozzle. Fluorescent oleic acid particle aerosols are generated using a ...

Effects of Differing Carbon Nanotube Field-effect Transistor Architectures

... (SWCNTFETs) were fabricated with varying device architectures. Variations on the standard back-gated architecture included varying the gate oxide material and thickness, changing source and drain contact metallization, suspending the carbon nanotubes to minimize interaction with the gate oxide, and fabricating a topgated architecture employing a thin layer of aluminum oxide (Al2O3) as the gate oxide. Devices were characterized and compared to each other based on the CNTFET properties of noise, hysteresis, sub-threshold slope, and ...

Metal Slurry Droplet and Spray Combustion

Analytical and numerical studies on n-octane and aluminum metal slurry droplet combustion and metal slurry ... in spray combustion calculations. An analytical model describes the combustion of aluminum particles in air. The
Development and Control of Porosity in Al2O3/AIPO4 Coatings

Authors: Lorraine F. Francis; MINNESOTA UNIV MINNEAPOLIS DEPT OF CHEMICAL ENGINEERING AND MATERIALS SCIENCE

This report describes a new method for low temperature preparation of porous ceramic coatings. A reaction between aluminum oxide and phosphoric acid is used to bind particles together and control porosity. Porous ceramic coatings ... by the relative amount of acid and hence relative amount of aluminum phosphate reaction product. The addition of aluminum chloride to the dispersion led the formation of fine aluminum hydroxide precipitates which react with phosphoric acid at lower temperatures to form aluminum phosphate; these fine reaction products help to bind the ...
Advanced Zinc Phosphate Conversion and Pre-Ceramic Polymetallosiloxane Coatings for Corrosion Protection of Steel and Aluminum, and Characteristics of Polyphenyletheretherketone-Based Materials

Authors: T. Sugama, N. R. Caciello; BROOKHAVEN NATIONAL LAB UPTON NY DEPT OF APPLIED SCIENCE

Processing of Nanocrystalline Nitrides and Oxide Composites

Authors: Jackie Y. Ying; MASSACHUSETTS INST OF TECH CAMBRIDGE DEPT OF CHEMICAL ENGINEERING

Structure and Properties of Aluminum Nitride and AlON Ceramics

Authors: James W. McCaulley; ARMY RESEARCH LAB ABERDEEN PROVING GROUND MD WEAPONS AND MATERIALS RESEARCH DIRECTORATE

Adhesion of HVOF Sprayed Diamond-Containing Nanostructured Composite Coating

Authors: Maxim V. Kreiteliev; Ion Nemerenco; NATIONAL ACADEMY OF SCIENCES MINSK (BELARUS) DEPT OF MECHANICS AND TRIBOLOGY

MACHINING OF REFRACTORY MATERIALS

Authors: Michael Field; William P. Koster; John V. Gould; Norman Zlatin; NETCUT RESEARCH ASSOCIATES INC CINCINNATI OH

Secondary Electron Emission of Certain Ceramics and Antidynatron Coatings

Authors: Yu. G. Malynin; ARMY FOREIGN SCIENCE AND TECHNOLOGY CENTER CHARLOTTEVILLE VA

Supersonic Pyrolysis Jets for Diamond Film Deposition

Authors: Peter Chen; HARVARD UNIV CAMBRIDGE MA DEPT OF CHEMISTRY

Template-Synthesis of Infrared-Transparent Metal Microcylinders: Comparison of Optical Properties with the Predictions of Effective Medium Theory
Controlled Heterogeneous Nucleation of Melt-Textured YBa2Cu3O6+x by Addition of Al2O3

Particles

Authors:  Yan L. Chen; Lijie Zhang; Helen M. Chen; Martin P. Harmer; LEHIGH UNIV BETHLEHEM PA

alumina particles, it was found that nucleation and growth of 123 occurred exclusively at the particles. A reaction sequence for the formation of the Ba6y2A14015 is put forward, together with a discussion of the possible nucleation mechanisms for the 123. Yttrium Barium Copper Oxide(YBCO), Peritectic, Melt-texturing, Nucleation, Barium Yttrium Aluminum Oxide (Ba6y2A14015)

Processing and Characterization of Porous Oxide Coatings

Authors: Lorraine F. Francis; MINNESOTA UNIV MINNEAPOLIS DEPT OF CHEMICAL ENGINEERING AND MATERIALS SCIENCE

The goals of this research project were to develop processing methods for fabrication of porous oxide coatings with a range of pore contents and to develop characterization methods for porous coatings. Research focused on controlling porosity in coatings prepared ... into three categories: (1) characterization of macroporous coatings and (3) porosity in alumina phosphate coatings. Two categories of results concern the development of new processing methods for ceramic coatings and the scientific understanding of ...
Factors Effecting the Performance of Diagonal Conducting Wall Open Cycle MHD Generators

Authors: Y. C. L. Wu, L. Crawford, R. Shanklin, J. Muehlhauser, D. Molnar; TENNESSEE UNIV SPACE INST TULLAHOMA

... the generator power output decreases by 15 percent over the entire load spectrum. Other studies involving gross generator behavior include an examination of the effect resulting from the addition of aluminum oxide and other combustion materials on the walls of the generator. No deterioration of performance was noted during this process. The addition of the powdered aluminum improved the generator performance. During the course of the experimental study, it was found that both the injector head and ...

Grain Boundary Segregation and Stress Corrosion Cracking of Aluminum Alloys

Authors: J. A. Green, R. K. Viswanadham, T. S. Sun, W. G. Montague; MARTIN MARIETTA LABS BALTIMORE MD

Auger electron spectroscopy and chemical depth profiling by sputtering were employed to obtain the grain boundary segregation profiles of various aluminum alloys. Samples of both commercial (7075, 7050, and 7049) and high purity alloys based on the Al-Zn-Mg ternary in different heat treatments were examined ... in Mg and Zn. In commercial alloys, however, the grain boundaries are depleted in the minor elements Fe, Cu and Si. AES spectra of oxide films formed on Al-Zn-Mg alloys indicate that the enhanced segregation along the grain boundaries results in a film rich in Mg. It is postulated ...

Scanning Photoacoustic Microscopy of Aluminum with Aluminum Oxide, Roughness Standards and Rubber

Authors: R. L. Thomas, L. D. Favro, P. K. Kuop, D. N. Rose, D. Bryk; WAYNE STATE UNIV DETROIT MI

Thermal wave imaging of coated samples, surface geometries of homogeneous samples, and dispersed particles in rubber samples are presented and discussed. Preliminary results of color-encoding of images are encouraging. Further photothermal (infrared radiation) detection studies of the coated graphite samples are recommended, along with more detailed study of numerical analysis of surface roughness applications. Preparation of rubber samples containing layer defects is also recommended.

X-Ray Diffraction Studies of Evaporated Gold Thin Films Deposited on Aluminum Nitride Substates

Authors: Clifford B. Munns; NAVAL POSTGRADUATE SCHOOL MONTEREY CA

X-ray diffraction was utilized to determine the root mean square (r.m.s.) strains and average particle sizes in evaporated gold thin films on aluminum nitride substrates as a function of substrate surface condition prior to deposition. The substrate treatments evaluated were surface roughness, presence of an oxide layer on the substrate surface and vacuum conditions used during deposition. The Warren-Averbach method was utilized to obtain the r.m.s. strains and particle sizes ...

Adherend Surface Effects on Epoxy Cure by NMR

Authors: Paul T. Inglefield; CLARK UNIV WORCESTER MA

... on the different products and different kinetics which result from the presence of an active surface. The major system considered is that based on the diglycidyl ether of bisphenol A cured with primary amines, in particular 4,4' diamidophenyl sulfone. Aluminum oxide is used as a high surface area model of aluminum adherend surfaces. The NMR experiments utilize line narrowing techniques to yield resolved spectra of the solid materials. 13C and 15N NMR are used to identify the ...

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Application of Aluminum, Copper and Gold Electrodes in AC Polymer Light Emitting Devices

Authors: H. L. Wang, P. Huang, A. G. MacDiarmid; Y. Z. Wang; D. D. Gebler; OHIO STATE UNIV COLUMBUS DEPT OF PHYSICS

... M/EB/P/E/ITO, where M=Al, Cu or Au, EB=polyaniline (emeraldine base), P=poly(2,5-dihexadecanoyloxy phenylene vinylene pyridyl vinylene) or PPV-PPV, and ITO = indium-tin oxide glass, show electroluminescent properties in both forward and reverse bias modes. In the absence of emeraldine base, in the case of aluminum and copper, electroluminescence is observed only in the forward bias mode; in the case of gold no electroluminescence is observed in either forward or reverse bias ...

Ion Beam Enhanced Deposition as Alternative Pretreatment for Adhesive Bonding of Aircraft Alloys

Authors: Gerhardus H. Koch; Arnold H. Deutchman; CORTEST COLUMBUS TECHNOLOGIES OH

Surface treatment of aluminum alloys based on wet chemical processes is subject to increasing regulations. The objective of the work described in this paper was to demonstrate the feasibility of applying a non-chemical technique to generate an aluminum oxide surface with adhesive bonding properties comparable to that generated with the traditional technique. This paper describes the use of ion beam enhanced deposition which...
meets the objective of this work.

**Application of the Depth-of-Penetration Test Methodology to Characterize Ceramics for Personnel Protection**

Authors: Thomas J. Moynihan; Shun-Chin Chou; Audreyk L. Mihanin; ARMY RESEARCH LAB ABERDEEN PROVING GROUND MD

The report adapts this technique to evaluate armor ceramics for personnel protection using the caliber .30 armorpiercing M2 (APM2) and armor-grade aluminum alloy 5083 (Al 5083), MIL-A-46027, as the backing material. Penetration of the APM2 into monolithic Al 5083 was determined over a range of velocities. Several thicknesses of boron carbide (B4C), silicon carbide (SiC), and aluminum oxide (Al2O3) were tested to determine ballistic performance as a function of ceramic areal density. Projectile cores were recovered and analyzed. Postmortem condition of the cores was...

**Pulsed Motor Firings**

Authors: Fred S. Blomshield; NAVAL AIR WARFARE CENTER WEAPONS DIV CHINA LAKE CA

Combustion stability additives like zirconium carbide (ZrC), aluminum oxide (Al2O3), and zirconium orthosilicate (ZrSiO4) have long been known to suppress combustion instability in reduced smoke, composite propellant solid rocket systems. Often, as little as 0.5% ... , the 3% propellant used before will be used again, except 3% HMX will be used in one formulation and 3% ultra fine aluminum or ALEX will be used in another. The emphasis here is to examine the combustion response changes. This paper will present the results of...

**Oxidation Processes on Aluminum and Rhodium**

Authors: Andrew M. Rappe; PENNSYLVANIA UNIV PHILADELPHIA DEPT OFCHEMISTRY

... monolayers. We have completed the first major theoretical study of Pt chemisorbed on alumina. We contrast Pt nanoparticle and layer adsorption, focusing on how oxide defects influence the Pt growth, and the CO chemisorption properties on the nanoparticles. We have completed the first major theoretical study of Pt chemisorbed on alumina, computationally demonstrating that thiols strongly inhibit O2 chemisorption on Al.

**Temporal Evolution of the LIBS Spectrum of Aluminum Metal in Different Bath Gases**

Authors: Thuyan N. Piehler; Frank C. Deluca Jr.; Chase A. Munson; Barrie E. Hornar; Andrzej W. Miziorka; ARMY RESEARCH LAB ABERDEEN PROVING GROUND MD WEAPONS AND MATERIALS RESEARCH DIRECTORATE

The spectral emission of gas phase aluminum (Al) and AI oxide was measured during and immediately after exposure of a bulk Al sample to a laser-induced spark produced by a focused, pulsed laser beam (Nd:YAG, 10 ns pulse duration, 35 mJ/pulse lambda = 1064 nm). The spectral emission was measured as a function of time after the onset of the laser pulse. and was also measured in different bath gases (air, N2, O2. and He).

**Using Plasticity Values Determined From Systematic Hardness Indentation Measurements for Predicting Impact Behavior in Structural Ceramics: A New, Simple Screening Technique**

Authors: James W McCauley; Trevor E Wilamiewicz; ARMY RESEARCH LAB ABERDEEN PROVING GROUND MD

... alone measured at a single load. In this work, several methods for curve fitting hardness-load data have been compared for both Knoop and Vickers hardness on several ceramic materials: aluminum oxide (Al2O3), silicon carbide, aluminum oxide and boron carbide. A power-law equation (H = kF^{exp c}) is shown to fit the Knoop data quite well. A plot of log10 (HK) vs. log10 (F) yielded easily comparable straight lines, whose slope and intercept...

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