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Materials Sciences

December 15, 2005 Volume 05, Number 25

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General

Examination of the Effects of Be Grain Size
R. Cook.
Lawrence Livermore National Lab., CA. 21 Nov 2000, 22p, UCRL-ID-142049. Sponsored by Department of Energy, Washington, DC. Product reproduced from digital image. Order this product from NTIS by: phone at 1-800-553-NTIS (U.S. customers); (703)605-6000 (other countries); fax at (703)605-6900; and email at orders@ntis.gov. NTIS is located at 5285 Port Royal Road, Springfield, VA, 22161, USA.
DE2005-15013514WMS Price code: PC A03/MF A01

No abstract available.

Growth and Characterization of MBE Parametric Variations Upon Polarization Independent Strained Films. Final Report for the period of July 1, 2001-August 31, 2003
T. Daniels-Race.
Duke Univ., Durham, NC. Apr 2003, 10p. Sponsored by Department of Energy, Washington, DC. Product reproduced from digital image. Order this product from NTIS by: phone at 1-800-553-NTIS (U.S. customers); (703)605-6000 (other countries); fax at (703)605-6900; and email at orders@ntis.gov. NTIS is located at 5285 Port Royal Road, Springfield, VA, 22161, USA.
DE2005-837876WMS Price code: PC A02/MF A01

This project was designed to comprehensively investigate the effects of molecular beam epitaxy (MBE) growth variations upon tensile-strained films. Using two dimensional (2-D) structures, such as quantum wells of variable configurations, we worked to observe the electro-optical response of polarization independence. The latter had been studied for compressively strained systems. However, the proof of principle for the feasibility of tensile-strained single and double quantum wells, particularly in the GaAs as opposed to the InP material system, had been much less investigated by comparison. The significance of this project, from a Basic Energy Sciences perspective, has been in its contribution to the understanding of how MBE parameters and sample design effect the physics of strained materials which themselves have been tailored to react with polarization insensitivity. Fundamental issues of materials structure control, growth parameter modifications, and characterization methods were investigated. Both single and double quantum well systems were used with both symmetric and asymmetric well widths for the latter. In this work, we essentially investigated both the growth of and potential applications for quantum based structures that use tensile strain to induce polarization independence.

Foreign Technology

Journal of the Chinese Institute of Engineers. Volume 28, No. 2, March 2005. Transactions of the Chinese Institute of Engineers, Series A
S. S. Chen, and F. J. Shiou.
Chinese Inst. of Engineers, Taipei (Taiwan). cMar 2005, 202p. See also PB2005-103063. Order this product from NTIS by: phone at 1-800-553-NTIS (U.S. customers); (703)605-6000 (other countries); fax at (703)605-6900; and email at orders@ntis.gov. NTIS is located at 5285 Port Royal Road, Springfield, VA, 22161, USA.
PB2005-107471WMS Price code: PC A11/MF A03

Contents:
- Application of Fuzzy Optimum System Hierarchy Analysis Selection Method for Determining Repair Order of Existing Reinforced Concrete Bridges;
- An Empirical Approach;
- Prediction Method of Air Pressure Distribution on Building Vertical Drainage Stack;
- A Proposed Guideline for Verifying the Attainment of Soil Remediation for Taiwan;
- Slope Stability Analysis using Strength Reduction Technique;
- Determination of Aquifer Parameters using Radial Basis Function Network Approach;
- Transmission of Vibrations from High Speed Trains through Viaducts and Foundations to the Ground;
- A Construction Simulation System (COMSim) with Object-Oriented Modeling Elements;
- Numerical Predictions on the Dynamic Response of a Suspension Bridge with a Trapezoidal Cross-Section;
- On the Non-Iterative Procedure of Direct Displacement-Based

Seismic Design for Portal R.C. Bridges;
Using Inelastic Design Spectrum;
A Constitutive Model for the Uplift Behavior of Anchors in Cohesion less Soils;
A Study of Reinforced Concrete Bridge Columns Retrofitted by Steel Jackets;
Automated Image Mosaic king;
Life Prediction of Stainless Steels by Cyclic and Stable Hysteresis Curves;
Fatigue Behavior of Carbon/Epoxy Composites under Pretorsion and Low-Energy Impact Effects;
Enhancement of Thermal Performance in Sintered Miniature Heat Pipe;
The Effects of the Processing Variables on the Microstructure and Tensile Properties of Naturally Aged AA6022 Wrought Alloys;
Developing a Four-Layer System Rutting Model in Highway in Taiwan;
and Effects of Soil Properties on Surfactant Adsorption.

Materials Selection Guidelines for Geothermal Energy Utilization Systems
P. F. Ellis, and M. F. Conover.
Radian Corp., Austin, TX. Jan 1981, 598p. Sponsored by Department of Energy, Washington, DC. Div. of Geothermal Energy. Product reproduced from digital image. Order this product from NTIS by: phone at 1-800-553-NTIS (U.S. customers); (703)605-6000 (other countries); fax at (703)605-6900; and email at orders@ntis.gov. NTIS is located at 5285 Port Royal Road, Springfield, VA, 22161, USA.
DE2005-6664808WMS Price code: PC A99/MF A06

This manual includes geothermal fluid chemistry, corrosion test data, and materials operating experience. Systems using geothermal energy in El Salvador, Iceland, Italy, Japan, Mexico, New Zealand, and the United States are described. The manual provides materials selection guidelines for surface equipment of future geothermal energy systems. The key chemical species that are significant in determining corrosiveness of geothermal fluids are identified. The utilization modes of geothermal energy are defined as well as the various physical fluid parameters that affect corrosiveness. Both detailed and summarized results of materials performance tests and applicable operating experiences from forty sites throughout the world are presented. The application of various non-metal materials in geothermal environments are discussed. Included in appendices are: corrosion behavior of specific alloy classes in geothermal fluids, corrosion in seawater desalination plants, worldwide geothermal power production, DOE-sponsored utilization projects, plant availability, relative costs of alloys, and composition of alloys.

Oxidation Resistance of Ru-Capped EUV Multilayers
S. Bajt, Z. Dai, E. J. Nelson, N. Nguyen, S. Baker, M. A. Wall, and J. Alameda.
Lawrence Livermore National Lab., CA. 25 Feb 2005, 16p, UCRL-PROC-209970. Sponsored by Department of Energy, Washington, DC. Order this product from NTIS by: phone at 1-800-553-NTIS (U.S. customers); (703)605-6000 (other countries); fax at (703)605-6900; and email at orders@ntis.gov. NTIS is located at 5285 Port Royal Road, Springfield, VA, 22161, USA.
DE2005-15011620WMS Price code: PC A03

Differently prepared Ru-capping layers, deposited on Mo/Si EUV multilayers, have been characterized using a suite of metrologies to establish their baseline structural, optical, and surface properties in as-deposited state. Same capping layer structures were tested for their thermal stability and oxidation resistance. Post-mortem characterization identified changes due to accelerated tests. The best performing Ru-capping layer structure was studied in detail with transmission electron microscopy to identify the grain microstructure and texture. This information is essential for modeling and performance optimization of EUVL multilayers.

Roughness Scaling of Fracture Surfaces in Polycrystalline Materials
E. T. Seppaelae, B. W. Reed, M. Kumar, R. W. Minich, and R. E. Rudd.
Lawrence Livermore National Lab., CA. 4 May 2004, 12p, UCRL-CONF-203930. Sponsored by Department of Energy, Washington, DC. Product reproduced from digital image. Order this product from NTIS by: phone at 1-800-553-NTIS (U.S. customers); (703)605-6000 (other countries); fax at (703)605-6900; and email at orders@ntis.gov. NTIS is located at 5285 Port Royal Road, Springfield, VA, 22161, USA.
DE2005-15014135WMS Price code: PC A03/MF A01

The roughness scaling of fracture surfaces in two-dimensional grain boundary networks is studied numerically. Grain boundary networks are created using a Metropolis method in order to mimic the triple junction distributions from experiments. Fracture surfaces through these grain boundary networks are predicted using a combinatorial optimization method of maximum flow - minimum cut type.

——*Foreign Technology*——

Styrbara Signaturmeaterial Moejligheter och Forskningsbehov (Adabtable Signature Materials 2004)
H. Kariis, S. Bjoekert, G. Forssell, T. Hallberg, and A. Jaenis.
Swedish Defence Research Agency, Linkoeping. Sensor Technology. Nov 2004, 38p, FOI-R-1412-SE. Text in Swedish; summary in English. Product reproduced from digital image. Order this product from NTIS by: phone at 1-800-553-NTIS (U.S. customers); (703)605-6000 (other countries); fax at (703)605-6900; and email at orders@ntis.gov. NTIS is located at 5285 Port Royal Road, Springfield, VA, 22161, USA.
PB2005-106465WMS Price code: PC A04

The project ‘Adaptable signature materials’ was started in 2004 to meet the new demands on flexible signature management put upon in an ever-changing mission-oriented defense. The new sensor threats emerging from multi- and hyper-spectral sensors connected in a network centric warfare will be addressed. Within the project several classes of materials and systems of materials with potential for adaptability are studied. In this report, the background of the Swedish Armed Forces’ need for research in the field of flexible signature management is described. The research activities and publications within all the sub-projects are presented as well as national and international cooperation with other actors within the field. At the end a forecast for the future research needs in the area of adaptable signature management is given. The project Adaptable Signature Materials’ will end in 2005 and is expected to be followed by a project more oriented to the development of a signature demonstrator material. The goal of the coming project will be to 2007 demonstrate a material that possesses interesting properties in the visible, IR and radar regions and has adaptable reflectance in at least one of the regions.

Ceramics, Refractories, & Glass

Analysis of Pulse-jet Cleaning of Dust Cake from Ceramic Filter Element. (Final Report, 1999-2003.)
M. Hata, M. Furuuchi, C. Kanaoka, and T. Inagaki.
Kanazawa Univ. (Japan). Dept. of Civil Engineering. 2004, 14p. Sponsored by Department of Energy, Washington, DC. Order this product from NTIS by: phone at 1-800-553-NTIS (U.S. customers); (703)605-6000 (other countries); fax at (703)605-6900; and email at orders@ntis.gov. NTIS is located at 5285 Port Royal Road, Springfield, VA, 22161, USA.
DE2005-835879WMS Price code: PC A03/MF A01

Release of accumulated dust from the rigid candle filter surface has been extensively studied both theoretically and experimentally, especially for the case of pulse jet type cleaning. However, it is still unclear which is the most effective parameter to the release of accumulated dust. In this study, behaviors of released dust and pressure inside and outside the filter element were observed very precisely. Based on the observation, a simple model correlating between momentum acting on released dust, pressure and, shear and tensile stresses has been proposed. Then its validity was discussed by comparing calculated and experimental results.

Glass and Glass-Derivative Seals for Use in Energy-Efficient Fuel Cells and Lamps. (Topical Report, October 1, 2003-August 15, 2004.)
S. Misture, A. Varshneya, A. Hall, S. DeCarr, and S. Bancheri.
New York State Coll. of Ceramics, Alfred. 15 Aug 2004, 122p. Sponsored by Department of Energy, Washington, DC. Order this product from NTIS by: phone at 1-800-553-NTIS (U.S. customers); (703)605-6000 (other countries); fax at (703)605-6900; and email at orders@ntis.gov. NTIS is located at 5285 Port Royal Road, Springfield, VA, 22161, USA.
DE2005-835124WMS Price code: PC A07/MF A02

As the project approaches the end of the first year, the materials screening components of the work are ahead of schedule, while all other tasks are on schedule. For solid oxide fuel cells (SOFC), a series of 16 sealing glasses have been prepared and characterized. Traditional melting was used to prepare all of the glasses, and the sol-gel approach has been used to prepare some of the glasses as well as other compositions that might be viable because of the low processing temperatures afforded by the sol-gel method. The glass characterization included measurements of the viscosity and thermal expansion of the glasses, as well as the thermal expansion of the partly crystalline glass ceramics. In addition, the wetting and sintering behavior of all glasses has been measured, as well as the crystallization behavior. The time and temperature at which crystalline phases form from the glasses has been determined for all of the glasses. Each glass ceramic contains at least two crystalline phases, and most of the crystalline phases have been positively identified. Room temperature leak testing has been completed for all sealants, and experiments are in progress to determine the DC electrochemical degradation and degradation in wet hydrogen. The second component of the work, focused on seals for higher-temperature discharge lighting, has focused on determining the phase relations in the yttria - alumina - silica system at various silica levels. Again, traditional melting and sol-gel synthesis have been employed, and the solgel method was successful for preparing new phases that were discovered during the work. High temperature diffraction and annealing studies have clarified the phase relations for the samples studies, although additional work remains. Four new phases have been identified and synthesized in pure form, from which full structure solutions were obtained as well as the anisotropic thermal expansion for each phase. Functional testing of lamps are on on-going and will be analyzed during year 2 of the contract.

High Temperature Test Facility for Studying Ash Particle Characteristics of Candle Filter During Surface Regeneration
B. S. Kang, E. K. Johnson, and J. Rincon.
West Virginia Univ., Morgantown. Dept. of Mechanical and Aerospace Engineering. 2004, 16p. Sponsored by Department of Energy, Washington, DC. Order this product from NTIS by: phone at 1-800-553-NTIS (U.S. customers); (703)605-6000 (other countries); fax at (703)605-6900; and email at orders@ntis.gov. NTIS is located at 5285 Port Royal Road, Springfield, VA, 22161, USA.
DE2005-835884WMS Price code: PC A03/MF A01

Hot gas particulate filtration is a basic component in advanced power generation systems such as Integrated Gasification Combined Cycle (IGCC) and Pressurized Fluidized Bed Combustion (PFBC). These systems require effective particulate removal to protect the downstream gas turbine and also to meet environmental emission requirements. The ceramic barrier filter is one of the options for hot gas filtration. Hot gases flow through ceramic candle filters leaving ash deposited on the outer surface of the filter. A process known as surface regeneration removes the deposited ash periodically by using a high pressure back pulse cleaning jet. After this cleaning process has been done there may be some residual ash on the filter surface. This residual ash may grow and this may lead to mechanical failure of the filter. A High Temperature Test Facility (HTTF) was built to investigate the ash characteristics during surface regeneration at high temperatures. The system is capable of conducting surface regeneration tests of a single candle filter at temperatures up to 1500 F. Details of the HTTF apparatus as well as some preliminary test results are presented in this paper. In order to obtain sequential digital images of ash particle distribution during the surface regeneration process, a high resolution, high speed image acquisition system was integrated into the HTTF system. The regeneration pressure and the transient pressure difference between the inside of the candle filter and the chamber during regeneration were measured using a high speed PC data acquisition system. The control variables for the high temperature regeneration tests were (1) face velocity, (2) pressure of the back pulse, and (3) cyclic ash built-up time.

Predicting the Operating Behavior of Ceramic Filters from Thermo-Mechanical Ash Properties
G. Hemmer, and G. Kasper.
Karlsruhe Univ. (Germany, F.R.). Inst. fuer Mechanische Verfahrenstechnik und Mechanik. 2005, 16p. Sponsored by Department of Energy, Washington, DC. Product reproduced from digital image. Order this product from NTIS by: phone at 1-800-553-NTIS (U.S. customers); (703)605-6000 (other countries); fax at (703)605-6900; and email at orders@ntis.gov. NTIS is located at 5285 Port Royal Road, Springfield, VA, 22161, USA.
DE2005-835857WMS Price code: PC A03/MF A01

Stable operation, in other words the achievement of a succession of uniform filtration cycles of reasonable length is a key issue in high-temperature gas filtration with

ceramic media. Its importance has rather grown in recent years, as these media gain in acceptance due to their excellent particle retention capabilities. Ash properties have been known for some time to affect the maximum operating temperature of filters. However, softening and consequently 'stickiness' of the ash particles generally depend on composition in a complex way. Simple and accurate prediction of critical temperature ranges from ash analysis--and even more so from coal analysis--is still difficult without practical and costly trials. In general, our understanding of what exactly happens during break-down of filtration stability is still rather crude and general. Early work was based on the concept that ash particles begin to soften and sinter near the melting temperatures of low-melting, often alkaline components. This softening coincides with a fairly abrupt increase of stickiness, that can be detected with powder mechanical methods in a Jenicke shear cell as first shown by Pilz (1996) and recently confirmed by others (Kamiya et al. 2001 and 2002, Kanaoka et al. 2001). However, recording (sigma)-(tau)-diagrams is very time consuming and not the only off-line method of analyzing or predicting changes in thermo-mechanical ash behavior. Pilz found that the increase in ash stickiness near melting was accompanied by shrinkage attributed to sintering. Recent work at the University of Karlsruhe has expanded the use of such thermo-analytical methods for predicting filtration behavior (Hemmer 2001). Demonstrating their effectiveness is one objective of this paper. Finally, our intent is to show that ash softening at near melting temperatures is apparently not the only phenomenon causing problems with filtration, although its impact is certainly the 'final catastrophe'. There are other significant changes in regeneration at intermediate temperatures, which may lead to long-term deterioration.

Safe and Environmentally Acceptable Sol-gel Derived Pyrophoric Pyrotechnics
Lawrence Livermore National Lab., CA. 24 Jun 2005, 32p.
DE2005-15014310WMS Price code: PC A04/MF A01

For complete citation see Composite Materials

Coatings, Colorants, & Finishes

Metal-Matrix Composites and Thermal Spray Coatings for Earth Moving Machines. Final Report (July 2, 2001-June 11, 2003)
California Univ., Santa Barbara. Feb 2004, 132p.
DE2005-833402WMS Price code: PC A08

For complete citation see Composite Materials

Novel Nonporous Fouling-Resistant Enzymatic Composite Membranes for Waste Water Treatment
B. D. Freeman.
Texas Univ. at Austin. 12 Aug 2005, 5p. Product reproduced from digital image. Order this product from NTIS by: phone at 1-800-553-NTIS (U.S. customers); (703)605-6000 (other countries); fax at (703)605-6900; and email at orders@ntis.gov. NTIS is located at 5285 Port Royal Road, Springfield, VA, 22161, USA.
ADA436579WMS Price code: PC A01/MF A01

A new series of crosslinked hydrophilic polymer gels based on poly(ethylene oxide) was prepared. These membrane materials showed high water uptake and excellent resistance to bovine serum albumin (BSA) fouling. By controlling the crosslink density of the polymer gels, we were able to manipulate water uptake over a very broad range, from less than 100% to more than 500%, which provides a large window for tuning the permeation and rejection capabilities of these materials. Permeation properties of thin-films made of these gels is also reported. Approximately 20 m2 of chitosan composite membrane were prepared at our industrial partner, Membrane Technology and Research (MTR). Some samples from this membrane were modified to incorporate the following enzymes into the chitosan thin-film: (i) pronase, (ii) chymotrypsin, and (iii) lipase. The permeation properties of the enzyme-modified composite membranes were tested with an aqueous solution containing either a protein (BSA) or a fatty acid (trilaurin).

Steel-Free Hybrid Reinforcement System for Concrete Bridge Decks
A. Belarbi, and H. Wang.
Missouri Univ.-Rolla. Center for Infrastructure Engineering Studies. Dec 2004, 230p, UTC/R52. Sponsored by Department of Transportation, Washington, DC. Research and Special Programs Administration. Order this product from NTIS by: phone at 1-800-553-NTIS (U.S. customers); (703)605-6000 (other countries); fax at (703)605-6900; and email at orders@ntis.gov. NTIS is located at 5285 Port Royal Road, Springfield, VA, 22161, USA.
PB2005-108777WMS Price code: PC A12

A research project was initiated to develop a nonferrous hybrid reinforcement system for concrete bridge decks by using continuous fiber reinforced polymer (FRP) rebars and discrete randomly distributed polypropylene fibers. This hybrid system may eliminate problems related to corrosion of steel reinforcement while providing requisite strength, stiffness, and desired ductility, which are shortcomings of FRP reinforcement system in reinforced concrete. The test results showed that with the addition of fibers, structural performances of the system are improved. Although polypropylene fibers do not increase the ultimate bond strength, they provide enhanced ductile bond behavior. Also, with the addition of fibers, the flexural behaviors are improved with the increase of the ductility index m by approximately 40%, as compared to the plain concrete beams. In addition, with the addition of polypropylene fibers, the durability of the system was improved. Furthermore, some design recommendations are proposed based on analytical models and test results.

Composite Materials

Analysis, Fabrication, and Testing of a Composite Bladed Propeller for a Naval Academy Yard Patrol (YP) Craft
C. D. Wozniak.
Naval Academy, Annapolis, MD. 6 May 2005, 120p, USNA-TSPR-341 (2005). The original document contains color images. Product reproduced from digital image. Order this product from NTIS by: phone at 1-800-553-NTIS (U.S. customers); (703)605-6000 (other countries); fax at (703)605-6900; and email at orders@ntis.gov. NTIS is located at 5285 Port Royal Road, Springfield, VA, 22161, USA.
ADA436648WMS Price code: PC A07/MF A02

The U.S. Navy, and much of the maritime industry, uses nickel-aluminum-bronze (NAB) as the primary material for propeller construction. This is done for many reasons, including its anti-biofouling characteristics, high stiffness, and low

corrosion potential. However, NAB is a cathodic metal. While it experiences little corrosion itself, its presence leads to galvanic corrosion of the surrounding hull steel. The Navy has considered the feasibility of a composite bladed propeller design, but several variables need investigation. The goal of this Trident project was to design, build and test the Navy's first composite propeller. The detailed objectives of the research were to: evaluate a hub design; perform a structural design of a Yard Patrol (YP) craft composite bladed propeller; and finally, build and test a full-scale propeller using the composite materials. As the general concept used composite blades attached to a NAB hub, the first step was to develop a design for the hub-blade interaction. Afterwards, the loads were predicted using computational fluid dynamics. The pressure plot was then combined with the geometry in a finite element structural analysis program to determine fiber orientation and strength characteristics. A full-scale mold plug was created using stereolithography. Finally, the carbon/epoxy blades were laid up in this mold. The YP craft was selected as the test platform as it: 1) has two propellers (in the event of failure); and 2) is used for many hours, often in harsh conditions.

Buckling and Failure of Compression-Loaded Composite Cylindrical Shells With Geometric and Material Imperfections

M. W. Hilburger, and J. H. Starnes.
NASA Langley Research Center. Sep 2004, 30p, NASA/TM-2004-212677, L-19010. Color illustrations reproduced in Black and White. Publicly available Unlimited. CASI. Product reproduced from digital image. Order this product from NTIS by: phone at 1-800-553-NTIS (U.S. customers); (703)605-6000 (other countries); fax at (703)605-6900; and email at orders@ntis.gov. NTIS is located at 5285 Port Royal Road, Springfield, VA, 22161, USA.
N20040129673WMS Price code: PC A03/MF A01

The results of an experimental and numerical study of the effects of initial imperfections on the buckling response and failure of unstiffened thin-walled compression-loaded graphite-epoxy cylindrical shells are presented. The shells considered in the study have six different orthotropic or quasi-isotropic shell-wall laminates and two different shell-radius-to-thickness ratios. The numerical results include the effects of geometric shell-wall mid-surface imperfections, shell-wall thickness variations, local shell-wall ply-gaps associated with the fabrication process, shell-end geometric imperfections, nonuniform end loads, and the effects of elastic boundary conditions. Selected cylinder parameter uncertainties were also considered. Results that illustrate the effects of imperfections and uncertainties on the nonlinear response characteristics, buckling loads and failure the shells are presented. In addition, a common failure analysis is used to predict material failures in the shells.

Development and Validation of Steel Reinforced Polymer (SRP) for Strengthening of Transportation Instrastructures

Missouri Univ.-Rolla. Center for Infrastructure Engineering Studies. Jun 2005, 64p.
PB2005-108773WMS Price code: PC A05

For complete citation see Elastomers

Interface Damage Model for the Simulation of Delamination Under Variable-Mode Ratio in Composite Materials

A. Turon, P. P. Camanho, J. Costa, and C. G. Davila.
Girona Univ. Oct 2004, 32p, NASA/TM-2004-213277, L-19060. Publicly available Unlimited. CASI. Product reproduced from digital image. Order this product from NTIS by: phone at 1-800-553-NTIS (U.S. customers); (703)605-6000 (other countries); fax at (703)605-6900; and email at orders@ntis.gov. NTIS is located at 5285 Port Royal Road, Springfield, VA, 22161, USA.
N20040171493WMS Price code: PC A04/MF A01

A thermodynamically consistent damage model for the simulation of progressive delamination under variable mode ratio is presented. The model is formulated in the context of the Damage Mechanics (DM). The constitutive equations that result from the variation of the free energy with damage are used to model the initiation and propagation of delamination. A new delamination initiation criterion is developed to assure that the formulation can account for changes in the loading mode in a thermodynamically consistent way. Interfacial penetration of two adjacent layers after complete decohesion is prevented by the formulation of the free energy. The model is implemented into the commercial finite element code ABAQUS by means of a user-written decohesion element. Finally, the numerical predictions given by the model are compared with experimental results.

Metal-Matrix Composites and Thermal Spray Coatings for Earth Moving Machines. Final Report (July 2, 2001-June 11, 2003)

D. T. Weaver, M. T. Kiser, F. W. Zok, C. G. Levi, and J. Hawk.
California Univ., Santa Barbara. Feb 2004, 132p. Prepared in cooperation with Caterpillar, Inc., Peoria, IL. Sponsored by Department of Energy, Albany, OR. Order this product from NTIS by: phone at 1-800-553-NTIS (U.S. customers); (703)605-6000 (other countries); fax at (703)605-6900; and email at orders@ntis.gov. NTIS is located at 5285 Port Royal Road, Springfield, VA, 22161, USA.
DE2005-833402WMS Price code: PC A08

In an effort to realize minimum of a 2x increase in wear life of ground engaging components used on mining machines, two potentially cost effective processes were explored for the production of tailored, highly abrasion resistant materials: (1) hybrid pressure casting of steel composites, and (2) arc lamp fusing of thermal spray coatings. Steel composites comprised of cermet or oxide hard particles were successfully produced using pressure casting processes, although a cost effective process has not yet been identified for oxide particles. Both composites achieved project wear targets in high stress gouging wear, but the cermet composites did not meet the targets in impact wear, due to poor matrix toughness resulting from particle dissolution. Oxide composites had superior toughness and are expected to meet impact wear goals. Arc lamp processing of thermal spray coatings was successfully demonstrated to produce a metallurgical bond at the coating interface. Functionally graded materials were developed and successfully fused to allow for the accommodation of thermal process stresses in an intermediate layer. Ultimately, three functionally graded materials were identified as having high stress, three-body abrasion resistance sufficient to exceed project goals.

Safe and Environmentally Acceptable Sol-gel Derived Pyrophoric Pyrotechnics

R. L. Simpson, J. H. Satcher, and A. Gash.
Lawrence Livermore National Lab., CA. 24 Jun 2005, 32p, UCRL-TR-204902. Sponsored by Department of Energy, Washington, DC. Product reproduced from digital image. Order this product from NTIS by: phone at 1-800-553-NTIS (U.S. customers); (703)605-6000 (other countries); fax at (703)605-6900; and email at orders@ntis.gov. NTIS is located at 5285 Port Royal Road, Springfield, VA, 22161, USA.
DE2005-15014310WMS Price code: PC A04/MF A01

No abstract available.

Corrosion & Corrosion Inhibition

Effect of Nitrate on the Repassivation Potential of Alloy 22 In Chloride Containing Environments
Lawrence Livermore National Lab., CA. 17 Aug 2004, 20p.
DE2005-15014701WMS Price code: PC A03

For complete citation see Nonferrous Metals & Alloys

Numerical Simulation of Galvanic Corrosion Caused by Shaft Grounding Systems in Steel Ship Hulls
DEFENCE RESEARCH AND DEVELOPMENT ATLANTIC DARTMOUTH (CANADA). Jan 2005, 36p.
ADA436656WMS Price code: PC A04/MF A01

For complete citation see Nonferrous Metals & Alloys

Slow Strain Rate Testing of Alloy 22 in Simulated Concentrated Ground Waters
Lawrence Livermore National Lab., CA. 29 Oct 2003, 22p.
DE2005-15013711WMS Price code: PC A03/MF A01

For complete citation see Nonferrous Metals & Alloys

Steel-Free Hybrid Reinforcement System for Concrete Bridge Decks
Missouri Univ.-Rolla. Center for Infrastructure Engineering Studies. Dec 2004, 230p.
PB2005-108777WMS Price code: PC A12

For complete citation see Coatings, Colorants, & Finishes

Elastomers

Development and Validation of Steel Reinforced Polymer (SRP) for Strengthening of Transportation Instrastructures
P. Casadei, A. Nanni, and T. Ibell.
Missouri Univ.-Rolla. Center for Infrastructure Engineering Studies. Jun 2005, 64p, UTC/R94. Sponsored by Department of Transportation, Washington, DC. Research and Special Programs Administration. Order this product from NTIS by: phone at 1-800-553-NTIS (U.S. customers); (703)605-6000 (other countries); fax at (703)605-6900; and email at orders@ntis.gov. NTIS is located at 5285 Port Royal Road, Springfield, VA, 22161, USA.
PB2005-108773WMS Price code: PC A05

This report presents the characterization, laboratory and field validation of steel reinforced polymer (SRP) and steel reinforced grout (SRG) strengthening materials for strengthening of transportation infrastructures. These new composite materials consist of steel cords formed by interwoven steel wires embedded within a polymer resin or cementitious grout matrix. The properties of SRP are evaluated experimentally and compared to micromechanical equations to determine a suitability of these equations for the prediction of material constants. Laboratory tests were undertaken on shallow reinforced concrete beams strengthened with SRP and SRG materials and comparing experimental results to identical reinforced concrete beams strengthened with fiber reinforced polymer, with equal amount of strengthening. All beams were tested in a four point bending configuration, constantly monitoring deflections, strain and crack width opening. A type of anchor system to retard complete peeling of SRP/SRG laminates have been investigated and results of its performance are presented. Based upon the promising results of the two previous test campaigns, a series of tests on prestressed concrete double-T real-scale beams strengthened with SRP materials have been undertaken. The in-situ test campaign was made possible, due to the demolition of an existing concrete structure. Tests consisted in a control beam, a beam strengthened with one ply of SRP and a third and last beam strengthened with two plies of SRP and by anchoring at both ends the plies with SRP U-wraps. All beams were tested in a three point load configuration and were monitored at midspan for deflections as well as strains in the composite material.

Iron & Iron Alloys

Effect of Material Heat Treatment on Fatigue Crack Initiation in Austenitic Stainless Steels in LWR Environments
O. K. Chopra, B. Alexandreanu, and W. J. Shack.
Argonne National Lab., IL. Jul 2005, 80p, ANL-03/35. Sponsored by Nuclear Regulatory Commission, Washington, DC. Div. of Engineering Technology. Order this product from NTIS by: phone at 1-800-553-NTIS (U.S. customers); (703)605-6000 (other countries); fax at (703)605-6900; and email at orders@ntis.gov. NTIS is located at 5285 Port Royal Road, Springfield, VA, 22161, USA.
NUREG/CR-6878WMS Price code: PC A06

The ASME Boiler and Pressure Vessel Code provides rules for the design of Class 1 components of nuclear power plants. Figures I-9.1 through I-9.6 of Appendix I to Section III of the Code specify design curves for applicable structural materials. However, the effects of light water reactor (LWR) coolant environments are not explicitly addressed by the Code design curves. The existing fatigue strain-vs.-life data illustrate potentially significant effects of LWR coolant environments on the fatigue resistance of pressure vessel and piping steels. Under certain environmental and loading conditions, fatigue lives of austenitic stainless steels (SSs) can be a factor of 20 lower in water than in air. This report presents experimental data on the effect of heat treatment on fatigue crack initiation in austenitic Type 304 SS in LWR coolant environments. A detailed metallographic examination of fatigue test specimens was performed to characterize the crack morphology and fracture morphology. The key material, loading, and environmental parameters and their effect on the fatigue life of these steels are also described. Statistical models are presented for estimating the fatigue curves for austenitic SSs as a function of material, loading, and environmental parameters. Two methods for incorporating the effects of LWR coolant environments into the ASME Code fatigue evaluations are presented.

Heat Treatment Procedure Qualification. Final Technical Report
Pennsylvania State Univ., University Park. 2005, 100p. Sponsored by Department of Energy, Washington, DC. Order this product from NTIS by: phone at 1-800-553-NTIS (U.S. customers); (703)605-6000 (other countries); fax at (703)605-6900; and email at orders@ntis.gov. NTIS is located at 5285 Port Royal Road, Springfield, VA, 22161, USA.
DE2005-838836WMS Price code: PC A06

Heat treatment practices used by steel foundries have been carefully studied as part of comprehensive heat treatment procedure qualification development trials. These studies highlight the relationships between critical heat treatment process control parameters and heat treatment success. Foundry heat treatment trials to develop heat treatment procedure qualifications have shed light on the relationship between heat treatment theory and current practices. Furnace load time-temperature profiles in steel foundries exhibit significant differences depending on heat treatment equipment, furnace loading practice, and furnace maintenance. Time-temperature profiles of furnace control thermocouples can be very different from the time-temperature profiles observed at the center of casting loads in the furnace. Typical austenitization temperatures and holding times used by steel foundries far exceed what is required for transformation to austenite. Quenching and hardenability concepts were also investigated. Heat treatment procedure qualification (HTPQ) schema to demonstrate heat treatment success and to pre-qualify other alloys and section sizes requiring lesser hardenability have been developed. Tempering success is dependent on both tempering time and temperature. As such, furnace temperature uniformity and control of furnace loading during tempering is critical to obtain the desired mechanical properties. The ramp-up time in the furnace prior to the establishment of steady state heat treatment conditions contributes to the extent of heat treatment performed. This influence of ramp-up to temperature during tempering has been quantified.

Low Temperature Aging and Phase Stability of U6Nb
L. M. Hsiung, C. L. Briant, and K. R. Chasse.
Lawrence Livermore National Lab., CA. 21 Nov 2003, 14p, UCRL-CONF-201143. Sponsored by Department of Energy, Washington, DC. Product reproduced from digital image. Order this product from NTIS by: phone at 1-800-553-NTIS (U.S. customers); (703)605-6000 (other countries); fax at (703)605-6900; and email at orders@ntis.gov. NTIS is located at 5285 Port Royal Road, Springfield, VA, 22161, USA.
DE2005-15013685WMS Price code: PC A03/MF A01

No abstract available.

Materials Degradation & Fouling

General Corrosion and Localized Corrosion of Waste Package Outer Barrier
Department of Energy, Washington, DC. 2005, 246p. Product reproduced from digital image. Order this product from NTIS by: phone at 1-800-553-NTIS (U.S. customers); (703)605-6000 (other countries); fax at (703)605-6900; and email at orders@ntis.gov. NTIS is located at 5285 Port Royal Road, Springfield, VA, 22161, USA.
DE2005-762981WMS Price code: PC A12/MF A03

No abstract available.

Metal-Matrix Composites and Thermal Spray Coatings for Earth Moving Machines. Final Report (July 2, 2001-June 11, 2003)
California Univ., Santa Barbara. Feb 2004, 132p.
DE2005-833402WMS Price code: PC A08

For complete citation see Composite Materials

Miscellaneous Materials

Review of Optimisation Techniques for Layered Radar Materials Including the Genetic Algorithm
P. Saville.
DEFENCE RESEARCH AND DEVELOPMENT ATLANTIC DARTMOUTH (CANADA). Nov 2004, 38p, DRDC-ATLANTIC-TM-2004-260. The original document contains color images. Product reproduced from digital image. Order this product from NTIS by: phone at 1-800-553-NTIS (U.S. customers); (703)605-6000 (other countries); fax at (703)605-6900; and email at orders@ntis.gov. NTIS is located at 5285 Port Royal Road, Springfield, VA, 22161, USA.
ADA436821WMS Price code: PC A04/MF A01

The absorption of microwaves by a material depends on the properties of the material and its structure. Broadband absorbers can be fabricated by stacking resistive sheets separated by low dielectric spacers with a thickness of a quarter wavelength. This type of multilayered resonant absorber is called the Jaumann absorber. In this paper optimal design techniques for multilayer microwave absorbers are reviewed. These methods include analytical approximations, gradient optimisation routines, simulated annealing and the genetic algorithm. The genetic algorithm is a highly parallel stochastic technique that permits multi-objective optimisation and has a high probability of finding the global minimum.

Nonferrous Metals & Alloys

Boric Acid Corrosion of Light Water Reactor Pressure Vessel Materials
J. H. Park, O. K. Chopra, K. Natesan, and W. J. Shack.
Argonne National Lab., IL. Energy Technology Div. Jul 2005, 72p, ANL-04/08. See also NUREG-1823. Sponsored by Nuclear Regulatory Commission, Washington, DC. Div. of Engineering Technology. Order this product from NTIS by: phone at 1-800-553-NTIS (U.S. customers); (703)605-6000 (other countries); fax at (703)605-6900; and email at orders@ntis.gov. NTIS is located at 5285 Port Royal Road, Springfield, VA, 22161, USA.
NUREG/CR-6875WMS Price code: PC A05

This report presents experimental data on electrochemical potential and corrosion rates of the materials found in the reactor pressure vessel head and control rod drive mechanism (CRDM) nozzles in boric acid solutions of varying concentrations at temperatures of 95316DGC (203600DGF). Tests were conducted in (a) high-temperature, high-pressure aqueous solutions with a range of boric acid concentrations, (b) high-temperature (150316DGC) H-B-O solutions at ambient pressure, wetted and dry, and (c) low-temperature (95DGC) saturated, aqueous, boric acid solutions. These correspond to the following situations: (a) low leakage through the nozzle

and nozzle/head annulus plugged, (b) low leakage through the nozzle and nozzle/head annulus open, and (c) significant cooling due to high leakage and nozzle/head annulus open. The results indicate significant corrosion only for the low-alloy steel and no corrosion for Alloy 600 or 308 stainless steel cladding. Also, corrosion rates were significant in saturated boric acid solutions, and no material loss was observed in boric acid melts or deposits in the absence of moisture. The results are compared with the existing corrosion/wastage data in the literature.

Denuded Zones, Diffusional Creep, and Grain Boundary Sliding

J. Wadsworth, O. A. Ruano, and O. D. Sherby.
Lawrence Livermore National Lab., CA. 20 Aug 2001, 42p, UCRL-JC-144389. Sponsored by Department of Energy, Washington, DC. Product reproduced from digital image. Order this product from NTIS by: phone at 1-800-553-NTIS (U.S. customers); (703)605-6000 (other countries); fax at (703)605-6900; and email at orders@ntis.gov. NTIS is located at 5285 Port Royal Road, Springfield, VA, 22161, USA.
DE2005-15014270WMS Price code: PC A04/MF A01

The appearance of denuded zones following low stress creep in particle-containing crystalline materials is both a microstructural prediction and observation ofen cited as irrefutable evidence for the Nabarro-Herring mechanism of diffusional creep. The denuded zones are predicted to be at grain boundaries that are orthogonal to the direction of the applied stress. Furthermore, their dimensions should account for the accumulated plastic flow. In the present paper, the evidence for such denuded zones is critically examined. These zones have been observed during creep of magnesium, aluminum, and nickel-base alloys. The investigation casts serious doubts on the apparently compelling evidence for the link between denuded zones and diffusional creep. Specifically, denuded zones are clearly observed under conditions that are explicitly not diffusional creep. Additionally, the denuded zones are often found in directions that are not orthogonal to the applied stress. Other mechanisms that can account for the observations of denuded zones are discussed. It is proposed that grain boundary sliding accommodated by slip is the rate-controlling process in the stress range where denuded zones have been observed. It is likely that the denuded zones are created by dissolution ofprecipitates at grain boundaries that are simultaneously sliding and migrating during creep.

Effect of Hole Quality on the Fatigue Life of 2024-T3 Aluminum Alloy Sheet

R. A. Everett.
Army Research Lab. Aug 2004, 15p, NASA/TM-2004-212658, L-19011, ARL-TR-3106. Publicly available Unlimited. CASI. Product reproduced from digital image. Order this product from NTIS by: phone at 1-800-553-NTIS (U.S. customers); (703)605-6000 (other countries); fax at (703)605-6900; and email at orders@ntis.gov. NTIS is located at 5285 Port Royal Road, Springfield, VA, 22161, USA.
N20040110776WMS Price code: PC A03/MF A01

This paper presents the results of a study whose main objective was to determine which type of fabrication process would least affect the fatigue life of an open-hole structural detail. Since the open-hole detail is often the fundamental building block for determining the stress concentration of built-up structural parts, it is important to understand any factor that can affect the fatigue life of an open hole. A test program of constant-amplitude fatigue tests was conducted on five different sets of test specimens each made using a different hole fabrication process. Three of the sets used different mechanical drilling procedures while a fourth and fifth set were mechanically drilled and then chemically polished. Two sets of specimens were also tested under spectrum loading to aid in understanding the effects of residual compressive stresses on fatigue life. Three conclusions were made from this study. One, the residual compressive stresses caused by the hole-drilling process increased the fatigue life by two to three times over specimens that were chemically polished after the holes were drilled. Second, the chemical polishing process does not appear to adversely affect the fatigue life. Third, the chemical polishing process will produce a stress-state adjacent to the hole that has insignificant machining residual stresses.

Effect of Nitrate on the Repassivation Potential of Alloy 22 In Chloride Containing Environments

G. O. Illevbare, K. J. King, S. R. Gordon, H. A. Elayat, and G. E. Gdowski.
Lawrence Livermore National Lab., CA. 17 Aug 2004, 20p, UCRL-PROC-206102. Sponsored by Department of Energy, Washington, DC. Order this product from NTIS by: phone at 1-800-553-NTIS (U.S. customers); (703)605-6000 (other countries); fax at (703)605-6900; and email at orders@ntis.gov. NTIS is located at 5285 Port Royal Road, Springfield, VA, 22161, USA.
DE2005-15014701WMS Price code: PC A03

No abstract available.

Effect of the Environment and Alloy Composition on the Electrochemical Behavior of Ni-Cr-Mo Alloys

J. R. Hayes, A. W. Szmodis, K. L. Anderson, and C. A. Orme.
Lawrence Livermore National Lab., CA. 5 Jan 2004, 16p, UCRL-PROC-201681. Sponsored by Department of Energy, Washington, DC. Product reproduced from digital image. Order this product from NTIS by: phone at 1-800-553-NTIS (U.S. customers); (703)605-6000 (other countries); fax at (703)605-6900; and email at orders@ntis.gov. NTIS is located at 5285 Port Royal Road, Springfield, VA, 22161, USA.
DE2005-15014472WMS Price code: PC A03/MF A01

Alloy 22 (UNS N06022) is the candidate material for the corrosion resistant, outer barrier of the Yucca Mountain nuclear waste containers. One of the potential corrosion degradation modes of the container is uniform or passive corrosion. Therefore it is of importance to understand the stability of the oxide film, which will control the passive corrosion rate of Alloy 22. Many variables such as temperature, composition and pH of the electrolyte, applied potential, and microstructure and composition of the base metal would determine the thickness and composition of the oxide film. The purpose of this research work was to use electrochemical and surface analysis techniques to explore the influence of solution pH and applied potential on the characteristics of the oxide film formed on Alloy 22 and two experimental alloys containing differing amounts of chromium (Cr) and molybdenum (Mo). Results confirm that bulk metal composition is fundamental to the passive behavior and potential breakdown of the studied alloys. In these preliminary results, welded and non-welded Alloy 22 did not show differences in their anodic behavior.

Effects of Carbon, Oxygen, and Nitrogen on the Mechanical Properties of Titanium and Titanium Alloys
H. R. Ogden, and R. I. Jaffee.
Office of the Under Secretary of Defense for Research and Engineering, Washington, DC. Oct 1955, 106p. Prepared in cooperation with Battelle Memorial Inst., Columbus, OH. Sponsored by Department of Energy, Washington, DC. Product reproduced from digital image. Order this product from NTIS by: phone at 1-800-553-NTIS (U.S. customers); (703)605-6000 (other countries); fax at (703)605-6900; and email at orders@ntis.gov. NTIS is located at 5285 Port Royal Road, Springfield, VA, 22161, USA.
DE2005-4370612WMS Price code: PC A07/MF A02

This report reviews the effects of the alpha solute interstitials C, 0, and N on the mechanical properties of titanium alloys. These interstitial elements strengthen titanium, although this effect is lost at elevated temperatures. At room temperatures the interstitials have little effect on tensile ductility, but at subzero temperatures they promote embrittlement. They also have a deleterious effect on toughness, notch sensitivity, weld ductility, machinability, and bend ductility.

General Corrosion and Localized Corrosion of Waste Package Outer Barrier
Department of Energy, Washington, DC. 2005, 246p.
DE2005-762981WMS Price code: PC A12/MF A03

For complete citation see Materials Degradation & Fouling

Numerical Simulation of Galvanic Corrosion Caused by Shaft Grounding Systems in Steel Ship Hulls
Y. Wang.
DEFENCE RESEARCH AND DEVELOPMENT ATLANTIC DARTMOUTH (CANADA). Jan 2005, 36p, DRDC-TM-2004-284. The original document contains color images. Product reproduced from digital image. Order this product from NTIS by: phone at 1-800-553-NTIS (U.S. customers); (703)605-6000 (other countries); fax at (703)605-6900; and email at orders@ntis.gov. NTIS is located at 5285 Port Royal Road, Springfield, VA, 22161, USA.
ADA436656WMS Price code: PC A04/MF A01

The shaft grounding systems used on board HMC ships have substantially reduced the shaft-to-hull resistance and, thus, improved the performance of the shipboard impressed current cathodic protection (ICCP) system. Under some circumstances, however, the shaft grounding systems have been left on while the ICCP system was turned off. This led to the accelerated corrosion of the exposed steel ship hull on paint holidays because of the substantial difference of the electric potentials between the steel ship hull and the nickel-aluminum bronze propellers. The extent of the increased corrosion rate of the steel ship hull depends on a variety of conditions including the locations and areas of the paint holidays on the ship hull, the overall paint degradation, and seawater domain where the ship is located. A boundary element code, named CPBEM, developed at Defence R AND D Canada - Atlantic was used to numerically simulate the galvanic corrosion of the steel hull under the aforementioned various conditions. A box model was also used to demonstrate the effect of fluid domain on galvanic corrosion current and solution resistance. The modelling results have shown that the paint damage area significantly affects the galvanic corrosion rate, while the effect of the paint damage location on the galvanic corrosion rate is not significant when the ship is in an open sea. The little solution resistance encountered in the area away from the anodes and the cathode is attributed to the much larger cross sectional area for the galvanic current path in the large volume of seawater. The potential contours and galvanic corrosion current at various degrees of the paint degradation were also demonstrated.

Slow Strain Rate Testing of Alloy 22 in Simulated Concentrated Ground Waters
K. J. King, L. L. Wong, J. C. Estill, and R. B. Rebak.
Lawrence Livermore National Lab., CA. 29 Oct 2003, 22p, UCRL-PROC-200661. Sponsored by Department of Energy, Washington, DC. Product reproduced from digital image. Order this product from NTIS by: phone at 1-800-553-NTIS (U.S. customers); (703)605-6000 (other countries); fax at (703)605-6900; and email at orders@ntis.gov. NTIS is located at 5285 Port Royal Road, Springfield, VA, 22161, USA.
DE2005-15013711WMS Price code: PC A03/MF A01

The proposed engineering barriers for the high-level nuclear waste repository in Yucca Mountain include a double walled container and a detached drip shield. The candidate material for the external wall of the container is Alloy 22 (N06022). One of the anticipated degradation modes for the containers could be environmentally assisted cracking (EAC). The objective of the current research was to characterize the effect of applied potential and temperature on the susceptibility of Alloy 22 to EAC in simulated concentrated water (SCW) and other environments using the slow strain rate technique (SSRT). Results show that the temperature and applied potential have a strong influence on the susceptibility of Alloy 22 to suffer EAC in SCW solution. Limited results show that sodium fluoride solution is more detrimental than sodium chloride solution.

Solid Rocket Booster Hydraulic Pump Port Cap Joint Load Testing
W. R. Gamwell, and N. C. Murphy.
NASA Marshall Space Flight Center. Jun 2004, 46p, NASA/TM-2004-213282, M-1114. Publicly available Unlimited. CASI. Product reproduced from digital image. Order this product from NTIS by: phone at 1-800-553-NTIS (U.S. customers); (703)605-6000 (other countries); fax at (703)605-6900; and email at orders@ntis.gov. NTIS is located at 5285 Port Royal Road, Springfield, VA, 22161, USA.
N20040171461WMS Price code: PC A04/MF A01

The solid rocket booster uses hydraulic pumps fabricated from cast C355 aluminum alloy, with 17-4 PH stainless steel pump port caps. Corrosion-resistant steel, MS51830 CA204L self-locking screw thread inserts are installed into C355 pump housings, with A286 stainless steel fasteners installed into the insert to secure the pump port cap to the housing. In the past, pump port cap fasteners were installed to a torque of 33 Nm (300 in-lb). However, the structural analyses used a significantly higher nut factor than indicated during tests conducted by Boeing Space Systems. When the torque values were reassessed using Boeing's nut factor, the fastener preload had a factor of safety of less than 1, with potential for overloading the joint. This paper describes how behavior was determined for a preloaded joint with a steel bolt threaded into steel inserts in aluminum parts. Finite element models were compared with test results. For all initial bolt preloads, bolt loads increased as external applied loads increased. For higher initial bolt preloads, less load was transferred into the bolt, due to external applied loading. Lower torque limits were established for pump port cap

fasteners and additional limits were placed on insert axial deformation under operating conditions after seating the insert with an initial preload.

Plastics

NIOSH Health Hazard Evaluation Report: HETA No. 2003-0351-2972, Freudenberg-NOK, High Quality Plastics Division, Findlay, Ohio, June 2005
National Inst. for Occupational Safety and Health, Washington, DC. Jun 2005, 18p, HETA-2003-0351-2972. Product reproduced from digital image. Order this product from NTIS by: phone at 1-800-553-NTIS (U.S. customers); (703)605-6000 (other countries); fax at (703)605-6900; and email at orders@ntis.gov. NTIS is located at 5285 Port Royal Road, Springfield, VA, 22161, USA.
PB2005-109449WMS Price code: PC A03/MF A01

In August 2003 the National Institute for Occupational Safety and Health (NIOSH) received a confidential HHE request from employees at Freudenberg-NOK G.P., High Quality Plastics Division (HQP) Findlay, Ohio. They were concerned about potential exposure to airborne particles and fumes from the manufacturing of thermoplastic and polytetrafluroethylene (PTFE) ring seals. Some workers were experiencing non-specific respiratory symptoms and itchy skin.

Steel-Free Hybrid Reinforcement System for Concrete Bridge Decks
Missouri Univ.-Rolla. Center for Infrastructure Engineering Studies. Dec 2004, 230p.
PB2005-108777WMS Price code: PC A12

For complete citation see Coatings, Colorants, & Finishes

Wood & Paper Products

Condition Assessment of Timber Bridges. Part One. Evaluation of a Micro-Drilling Resistance Tool
B. K. Brashaw, R. J. Vatalaro, J. P. Wacker, and R. J. Ross. Minnesota Univ.-Duluth. Natural Resources Research Inst. Apr 2005, 16p, FPL-GTR-159. Sponsored by Forest Products Lab., Madison, WI. and Federal Highway Administration, Madison, WI. Wisconsin Div. Order this product from NTIS by: phone at 1-800-553-NTIS (U.S. customers); (703)605-6000 (other countries); fax at (703)605-6900; and email at orders@ntis.gov. NTIS is located at 5285 Port Royal Road, Springfield, VA, 22161, USA.
PB2005-109919WMS Price code: PC A03

The research presented in this report was conducted to evaluate the accuracy and reliability of a commercially available micro-drilling resistance device, the IML RESI F300-S (Instrument Mechanic Labor, Inc., Kennesaw, Georgia), in locating deteriorated areas in timber bridge members. The device records drilling resistance as a function of drilling depth, which allows the operator to assess the location of deterioration in the member cross section. Bridge components containing different levels of natural decay were used as test specimens in this study. The IML RESI F300-S was first used to assess decay in the timber bridge specimens. The specimens were then sawn along their length into slabs to expose their interior condition. The interior faces of these slabs were inspected visually and with a stress-wave probe to confirm if deterioration was present. On the basis of these tests, we conclude that this micro-drilling device accurately determines if deterioration is present at the point at which the test is performed.

Refractory for Black Liquor Gasifiers. (Report for July 1, 2004-September 30, 2004)
Missouri Univ.-Rolla. Oct 2004, 56p. Sponsored by Department of Energy, Washington, DC. Order this product from NTIS by: phone at 1-800-553-NTIS (U.S. customers); (703)605-6000 (other countries); fax at (703)605-6900; and email at orders@ntis.gov. NTIS is located at 5285 Port Royal Road, Springfield, VA, 22161, USA.
DE2005-835184WMS Price code: PC A05

The University of Missouri-Rolla will identify materials that will permit the safe, reliable and economical operation of combined cycle gasifiers by the pulp and paper industry. The primary emphasis of this project will be to resolve the material problems encountered during the operation of low-pressure high-temperature (LPHT) and low-pressure low-temperature (LPLT) gasifiers while simultaneously understanding the materials barriers to the successful demonstration of high-pressure high-temperature (HPHT) black liquor gasifiers. This study will define the chemical, thermal and physical conditions in current and proposed gasifier designs and then modify existing materials and develop new materials to successfully meet the formidable material challenges. Resolving the material challenges of black liquor gasification combined cycle technology will provide energy, environmental, and economic benefits that include higher thermal efficiencies, up to three times greater electrical output per unit of fuel, and lower emissions. In the near term, adoption of this technology will allow the pulp and paper industry greater capital effectiveness and flexibility, as gasifiers are added to increase mill capacity. In the long term, combined-cycle gasification will lessen the industry's environmental impact while increasing its potential for energy production, allowing the production of all the mill's heat and power needs along with surplus electricity being returned to the grid. An added benefit will be the potential elimination of the possibility of smelt-water explosions, which constitute an important safety concern wherever conventional Tomlinson recovery boilers are operated. Developing cost-effective materials with improved performance in gasifier environments may be the best answer to the material challenges presented by black liquor gasification. Refractory materials may be selected/developed that either react with the gasifier environment to form protective surfaces in-situ; are functionally-graded to give the best combination of thermal, mechanical, and physical properties and chemical stability; or are relatively inexpensive, reliable repair materials. Material development will be divided into 2 tasks: Task 1, Development and property determinations of improved and existing refractory systems for black liquor containment. Refractory systems of interest include magnesium aluminate and barium aluminate for binder materials, both dry and hydratable, and materials with high alumina contents, 85-95 wt%, aluminum oxide, 5.0-15.0 wt%, and BaO, SrO, CaO, ZrO(sub 2) and SiC. Task 2, Finite element analysis of heat flow and thermal stress/strain in the refractory lining and steel shell of existing and proposed vessel designs. Stress and strain due to thermal and chemical expansion has been observed to be detrimental to the lifespan of existing black liquor gasifiers. The thermal and chemical strain as well as corrosion rates must be accounted for in order to predict the lifetime of the gasifier containment materials.

Report to the Senate Appropriations Committee: Regulation of Wood Preserving Wastes. Executive Summary

Environmental Protection Agency, Washington, DC. Office of Solid Waste and Emergency Response. Jul 1991, 14p, EPA/530/SW-91/058A. See also PB91-220301. Product reproduced from digital image. Order this product from NTIS by: phone at 1-800-553-NTIS (U.S. customers); (703)605-6000 (other countries); fax at (703)605-6900; and email at orders@ntis.gov. NTIS is located at 5285 Port Royal Road, Springfield, VA, 22161, USA.

PB2005-110574WMS Price code: PC A03/MF A01

On November 15, 1990, the United States Environmental Protection Agency (EPA) issued a final rule designating three categories of wastes from wood preserving operations as hazardous waste under Subtitle C of the Resource Conservation and Recovery Act (RCRA). The Senate Committee on Appropriations had directed the Agency to submit by March 15, 1991, a Report regarding the potential advantages, costs, and risks associated with a multistatute approach to regulation of wastes from wood preserving operations. The approach would employ three statutory authorities to control wood preserving wastes in the following manner: (1) Clean Water Act (CWA) - regulation of wastewaters and stormwaters; (2) Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) - regulation of treated wood drippage and the establishment of drip pad management standards; (3) Resource Conservation and Recovery Act (RCRA) - regulation of process residuals. The report is in response to the Committee's directive to look at the advantages, costs, and risks of the multistatute approach. To do so, the elements of the multistatute approach are examined qualitatively in Section One. As part of this examination, a comparison of the multistatute elements to analogous RCRA elements is included at various points. In Section Two of the Report, the costs and risks of the multistatute approach are examined, including a comparison to those of the RCRA Subtitle C approach.

PRODUCT ANNOUNCEMENT

Communicating Health: Priorities and Strategies for Progress

New Report Presents Action Plan for Communications Objectives in Healthy People 2010

Healthy People 2010 is a 10-year plan for the Nation developed by the U.S. Department of Health and Human Services. The plan has two goals: increase the quality and years of healthy life, and eliminate health disparities. These goals have been elaborated in 467 objectives in 28 focus areas. *Communicating Health: Priorities and Strategies for Progress* presents the communications action plan for *Healthy People 2010*. The report is available from the National Technical Information Service.

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- Improvement of Health Literacy
- Research and Evaluation of Health Communication Programs
- Disclosure of Information to Assess the Quality of Health Web Sites
- Centers for Excellence in Health Communication
- Healthcare Providers' Communication Skills

The report will be especially helpful for researchers, teachers, practitioners, policymakers and organizations on the general strategies and specific steps that they can take in support of the objectives.

Communicating Health: Priorities and Strategies for Progress is available from NTIS, call 1-800-553-6847 or (703) 605-6000, for $12 plus $5 handling fee, no additional charge for shipping; quote order number PB2003-106852KSW. Most major credit cards accepted. Fax orders to (703) 605-6900. Order online at http://www.ntis.gov/products/commhealth.asp

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PRODUCT ANNOUNCEMENT

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- Recognize the veterans of these operations and collect their memoirs for the historic record

Volume 1 addresses the United States and British overflight efforts conducted through the end of 1956. These years bracket the least known and most poorly understood era of the Cold War. The accounts add significantly to the history of peacetime strategic reconnaissance. Their highly classified overflight missions involved incredible dangers and considerable hardships. In executing them successfully, they furnished critical intelligence during one of the darkest periods of the Cold War.

The appendixes in Volume 2 provide the biographies of contributors, aircraft characteristics, selected readings, and the historical background of overflights in Asia. It also includes over 150 pages of once classified overflight documents.

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	Standard Prices	Archival Prices		Exception Prices
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A02*	$ 14.00	$ 17.50	E02	$ 23.00
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A04	$ 29.50	$ 37.00	E04	$ 30.00
A05	$ 31.50	$ 39.50	E05	$ 33.50
A06	$ 34.00	$ 42.50	E06	$ 37.00
A07	$ 38.00	$ 47.50	E07	$ 41.50
A08	$ 41.50	$ 52.00	E08	$ 46.00
A09	$ 47.50	$ 59.50	E09	$ 51.00
A10	$ 51.00	$ 64.00	E10	$ 55.50
A11	$ 54.50	$ 68.50	E11	$ 60.00
A12	$ 59.00	$ 74.00	E12	$ 66.00
A13	$ 62.50	$ 78.50	E13	$ 70.50
A14	$ 64.50	$ 81.00	E14	$ 76.00
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A22	$ 89.00	$ 111.50		
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D03	$201.00	T03	$ 500.00
D04	$281.00	T04	$ 664.00
D05	$360.00	T05	$ 816.00
D06	$426.00	T06	$ 960.00
D07	$519.00	T07	$1,132.00
D08	$584.00	T08	$1,297.00
D09	$651.00	T09	$1,449.00
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D11	$810.00	T11	$1,752.00
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D14	$1,060.00	T14	$2,233.00
D15	$1,127.00	T15	$2,397.00
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A04	$ 59.00	$ 74.00	E04	$ 60.00
A05	$ 63.00	$ 79.00	E05	$ 67.00
A06	$ 68.00	$ 85.00	E06	$ 74.00
A07	$ 76.00	$ 95.00	E07	$ 83.00
A08	$ 83.00	$ 104.00	E08	$ 92.00
A09	$ 95.00	$ 119.00	E09	$ 102.00
A10	$ 102.00	$ 127.50	E10	$ 111.00
A11	$ 109.00	$ 136.50	E11	$ 120.00
A12	$ 118.00	$ 147.50	E12	$ 132.00
A13	$ 125.00	$ 156.50	E13	$ 141.00
A14	$ 129.00	$ 161.50	E14	$ 152.00
A15	$ 134.00	$ 167.50	E15	$ 164.00
A16	$ 138.00	$ 172.50	E16	$ 180.00
A17	$ 143.00	$ 179.00	E17	$ 196.00
A18	$ 151.00	$ 189.00	E18	$ 210.00
A19	$ 156.00	$ 195.00	E19	$ 233.00
A20	$ 160.00	$ 200.00	E20	$ 267.00
A21	$ 165.00	$ 206.50		
A22	$ 178.00	$ 222.50		
A23	$ 182.00	$ 227.50		"N" Codes
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D03	$403.00	T03	$ 1,000.00
D04	$561.00	T04	$ 1,328.00
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D06	$851.00	T06	$ 1,920.00
D07	$1,037.00	T07	$ 2,264.00
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