Diffraction Notes

LAMBDA RESEARCH 5521 FAIR LANE CINCINNATI, OH 45227 (513) 561-0883 NO. 18 SPRING, 1997

CUSTOMIZED LITERATURE SEARCH SERVICES FOR X-RAY DIFFRACTION APPLICATIONS AND MATERIALS TECHNOLOGY

NEW SERVICE OFFERED AT LAMBDA RESEARCH

As technology progresses, there is an increasing need to keep up with the latest changes and innovations. However, most people don't have the time or the resources to effectively collect and review all of the literature available, or to maintain a complete technical library. In an effort to address the needs of our clients, a new customized literature search service is being offered for those who require library services pertaining to x-ray diffraction and materials technology.

SEARCH STRATEGIES AND RESOURCES

Although the Internet and multiple on-line services are readily available, determining which resource is most worthwhile can be time-consuming and frustrating. Lambda Research technical support services eliminates the need to know where to begin searching for resources, and customizes a literature search specific to the topic of interest.

The key to a successful and productive search is constructing a proper search strategy. An initial discussion with a search specialist will serve to define the search to a specific area of interest in a number of ways. Searches can specify a time period, key word occurrences in titles or in whole texts, noted authors, and language. A search may involve a combination of materials such as stainless steel and nickel based alloys, and a specific finishing process such as shot peening or plasma spraying.

Resource availability should also be considered in a literature search. In addition to an on-site reference library, which houses a broad collection of books, periodicals and formal papers, Lambda Research has access to over 450 on-line databases, 30 of which specialize in engineering information. Virtually every engineering journal, conference proceeding, patent listing and technical publication is accessible.

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ANNOUNCEMENTS

1977 - 1997

CELEBRATING
20
YEARS OF EXCELLENCE

Lambda Research will be celebrating our 20th anniversary this year. Since entering the field of materials testing, there has been a steady growth in capabilities, equipment and services to meet the needs of our clients. Lambda Research now provides materials testing services to over 850 clients in the aerospace, automotive, petrochemical and ceramics industries on a regular basis.

In 1977, nearly all of projects completed involved x–ray diffraction residual stress measurement. While still the foundation of our support services, Lambda Research has increased our scope of testing services to include finite element analysis, mechanical residual stress measurement, quantitative and qualitative phase analysis, and pole figure determination.

In 1988, Lambda Research was one of the first materials testing laboratories to be accredited under ISO Guide 25, and in 1994 our Quality Assurance program became the first to be registered to ISO 9002. The quality assurance program encompasses all aspects of laboratory operation from technician training, instrument calibration, and the use of recognized standard testing procedures, all to insure accurate and timely results for our clients.

Lambda Research has made a strong commitment to internal research and development, so that we can offer clients the most current technology related to our x-ray diffraction materials testing services. It is our goal to continue to be the leading independent materials testing laboratory in our areas of specialization well into the next century.

Title: >>Stress Corrosion Cracking of Nickel Base Alloys in High Temperature Water.
Author(s)/Affiliation: Speidel, M O; Magdowski, R, Swiss Federal Institute of Technology
Conference: Sixth International Symposium on Environmental Degradation of Materials in Nuclear Power Systems--Water Reactors, San Diego, California, United States, 1-5 Aug. 1993
Publication: The Minerals, Metals & Materials Society, 420 Commonwealth Dr., Warrendale, Pennsylvania 15086, United States, 1993, 361-371
Country of Publication: USA
Journal Announcement: 9405
Document Type: Conference Paper
Language: ENGLISH
Descriptors: Conference Paper; Nickel base alloys-- Corrosion; Superalloys-- Corrosion; Ferrous alloys-- Corrosion; >>Stress corrosion cracking; Crack propagation; Stress intensity; Yield strength; Chemical composition; High temperature; Water-- Environment; Intergranular fracture
Alloy Index (Identifier): >>A286-- FE, SP/X750A-- NI, SP/X750B-- NI, SP/IN718-- NI, SP/IN600-- NI, SP/Nimonic 70-- NI, SP/Nimonic 80A-- NI, SP

Title: Irradiation-Assisted >>Stress-Corrosion Cracking in Austenitic Alloys.
Author(s)/Affiliation: Was, G S; Andresen, P L, University of Michigan
Publication: JOM 44, (4), 8-13 Apr. 1992 ISSN: 0148-6608
Country of Publication: USA
Journal Announcement: 9210
Document Type: Article
Language: ENGLISH
Descriptors: Journal Article; Austenitic stainless steels-- Corrosion; Nickel base alloys-- Corrosion; Superalloys-- Corrosion; >>Stress corrosion cracking-- Radiation effects; Safety; Nuclear reactor components-- Corrosion; Nuclear power generation
Alloy Index (Identifier): 304, 316, 20Cr-25Ni-Nb, >>A286-- SSA/600, 718-- NI, SP

Title: Corrosion Problems in Boiling Water Reactors and Their Remedies.
Author(s)/Affiliation: Rosbrog, B Studsvik
Publication: The Institute of Metals, 1 Carlton House Terrace, London SW1Y 5DB, UK, 1989 A Working Party Report on Corrosion in the Nuclear Industry 4-7
Journal Announcement: 9101
Document Type: ARTICLE
Language: ENGLISH
Descriptors: Boiling water reactors; Nuclear reactor components-- Corrosion; Pipe-- Corrosion; Austenitic stainless steels-- Corrosion; Superalloys-- Corrosion; Welded joints-- Corrosion; Pressure vessels-- Corrosion; >>Stress corrosion cracking; Intergranular corrosion; Corrosion fatigue
Alloy Index (Identifier): 304, 316-- SSA/Inconel X750-- NI, SP/>>A286-- FE, SP

Fig. 1 - Example of an expanded bibliographic report from a search for Alloy A286 and stress corrosion.

Resource databases are chosen which contain the greatest number of records satisfying the search requirements, and to cover the broadest possible range of resources available. Once the quantity of information available to the specific subject is determined, the search can be restricted, to provide a detailed listing of valuable pertinent data.

EXPERT REVIEW

Lambda Research offers expert review of the search for applicability to the subject, and to ensure the search strategies and information retrieved correctly address the requested inquiry. The teaming of a knowledgeable search specialist and a technical expert results in an expedient, thorough and cost effective search for the client.

Occasionally, a search request will go hand-in-hand with testing performed at Lambda Research. Information gathered from the search can be used to gain insight and direction to complete the project in a thorough and satisfactory manner.

Expert review minimizes problems related to technical terminology that may be used. For example, if specific information is requested on "glass bead peening," the use of too broad a term, such as "finishing," can extract too many unwanted references from "abrasive finishing" through "wiping."

On the other hand, a request for a specific alloy such as A286 as shown in Figure 1, can be too narrow. Many references in papers may use the terminology austenitic alloy or stainless steel to identify A286, which could be used to retrieve additional vital references.

Because key references can be eliminated erroneously through the use of incorrect terminology, there is an engineering quality assurance check for each search. An engineer familiar with the client's material and application is consulted prior to the search to review the terminology and search logic. This reduces wasted on-line time and print charges for unwanted references, and is more efficient for the client.

Title: >>Stress Corrosion Cracking Behavior of Alloys 718 and >>A286.
Author(s): Wilson, I L, Westinghouse Research and Development Center
Conference: Proceedings: 1986 Workshop on Advanced High-Strength Materials, Clearwater Beach, Florida, USA, 12-13 Mar. 1986
Publication: Electric Power Research Institute, 3412 Hillview Ave., Palo Alto, California 94304, USA, 1989, 23.1-23.33
Report No.: EPRI NP-6363
Journal Announcement: 9008
Document Type: REPORT
Language: ENGLISH
Abstract: The >>stress corrosion cracking (SCC) resistance of Inconel alloy 718 and alloy >>A286 was investigated in pressurized and boiling water reactor environments and in steam at 400 deg C and 3000 psi containing 11 psi a H sub 2. Inconel alloy 718 was tested in the standard No. 1 temper condition consisting of solution annealing at 982 deg C with single aging at 621 deg C and after heat treatment to simulate a brazing cycle. Alloy >>A286 was tested in the No. 1 temper condition consisting of solution annealing at 899 deg C with single aging at 732 deg C and after heat treatment to simulate a hot working process used in bolting manufacture. The BWR environment at 288 deg C with 200 ppb O sub 2 produced cracking in one alloy 718 bent beam specimen, one alloy >>A286 bent beam specimen, and one notched compact tension specimen after 10 000 h of exposure. Crack growth was intergranular with some transgranular cracking evident near the initiation site. No additional cracking was observed after 15 000 h of exposure. U-bends, bent beam specimens, and blunt notched 0.5 T CT specimens exposed to a high pressure 400 deg C steam and H sub 2 environment showed no SCC in alloys 718 or >>A286. Inconel alloy X750 cracked after 100 h of exposure. Testing in this environment provides an accelerated method for evaluating the performance of higher Ni alloys, such as X750, in PWR environments. Graphs, Photomicrographs.--AA
Descriptors: Nickel base alloys-- Corrosion; High alloy steels-- Corrosion; Superalloys-- Corrosion; >>Stress corrosion cracking-- Temperature effects; Boiling water reactors; Pressurized water reactors; Accelerated tests
Alloy Index (Identifier): Inconel 718-- NI, SP/>>A286-- SAH, SP

Title: >>Stress Corrosion Cracking of >>A286 Stainless Steel.
Author(s): Hall, J F ;Powell, D E Combustion Engineering
Conference: Proceedings: 1986 Workshop on Advanced High-Strength Materials, Clearwater Beach, Florida, USA, 12-13 Mar. 1986
Publication: Electric Power Research Institute, 3412 Hillview Ave., Palo Alto, California 94304, USA, 1989, 22.1-22.18
Report No.: EPRI NP-6363
Journal Announcement: 9008
Document Type: REPORT
Language: ENGLISH
Abstract: Alloy >>A286 is used as hot-headed screw-type threaded fasteners in sizes from 0.5-1.25 in. diameter. Except for one application at 61 000 psi, the fasteners are stressed to a nominal value of 33 000 psi and exposed to water ranging from 288-343 deg C. No >>stress corrosion cracking (SCC) failures have been reported for alloy >>A286 in the low stress condition after 13 years of service. The high stress application warranted concern since this stress is in the range where field failures of hot-headed fasteners have occurred. Three different specimen types (uniaxial tensile, precracked compact tension (CT), and modified threaded pins) fabricated from SA638, Grade 660, Type 1, 2.25 in. bar stock were used. Testing was performed in static water environment at 288 and 343 deg C for up to 9000 h. The water was deaerated with 400 ppm boron, 1 ppm Li, controlled amounts of N sub 2 H sub 2 and O sub 2 , and a pH of 7-8. Four interim inspections were conducted, along with the final inspection, after 9000 h of exposure. All precracked CT specimens loaded to K sub I = 45 and 55 ksi root in. underwent crack propagation with shorter crack initiation times at 343 deg C. The K sub ISCC was determined to be 31 and 41 ksi root in. at 343 and 288 deg C, respectively. There was essentially no crack growth at K sub I = 15 and 30 ksi root in. There were no cracks evident on the threaded pins after 9000 h of exposure. Alloy >>A286 is susceptible to SCC when highly stressed (levels > 100 ksi) or when cracklike defects (K sub I > 31 ksi root in.) are present in 288-343 deg C of borated water.--AA
Descriptors: High alloy steels-- Corrosion; Superalloys-- Corrosion; Fasteners-- Corrosion; >>Stress corrosion cracking; Stress intensity; Water-- Environment
Alloy Index (Identifier): A286-- SAH, SP

Fig. 2 - Example of a full report, including an abstract, from a search for Alloy A286 and stress corrosion.

RESULTS

A report is generated for each search subject. It may include bibliographic references, full abstracts (as shown in Figure 2), or a combination of key words and titles, depending on the needs of the client. The report also includes a summary of the search logic and the resources that were used, including a list of databases that were searched.

Lambda Research can also assist in obtaining copies of documents, or locating document resources where document copies can be directly purchased.

SENTRY SEARCHES

An automated search report is available for clients who need to be alerted to changes or updates on specific topics routinely. A customized sentry search report can keep a client up-to-date and current on new technology as soon as it is accessible.

LAMBDA RESEARCH
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LAMBDA RESEARCH is an x-ray diffraction laboratory providing unique x-ray diffraction services for materials research to the aerospace, automotive, power generation, ceramic, and petrochemical industries.

SERVICES

- Residual Stress Measurement
- Finite Element Analysis (FEA)
- Quantitative Phase Analysis
- Qualitative Phase Analysis
- Pole Figure and ODF Analysis
- Precise Lattice Parameter Determination
- Line Broadening
- Consultation

ACCREDITATION & CERTIFICATION

- Accredited by the American Association for Laboratory Accreditation to ISO/IEC Guide 25.
- Quality Assurance program registered to ISO 9002
- Certified throughout the automotive, aerospace and nuclear industries.
- All test methods employed are in accordance with ASTM or other recognized standards where applicable.

MEMBERSHIPS

• American Association for Laboratory Accreditation • American Ceramic Society • American Crystallographic Association
• American Society of Mechanical Engineers • ASM International • Materials Research Society • Society of Experimental Mechanics
• The Minerals, Metals & Materials Society • American Society for Testing and Materials • Society of Automotive Engineers

Lambda Presents at Energy Week

Doug Hornbach was invited to present a paper at Energy Week in Houston, Texas. Energy Week, which is sponsored by API and the ASME-Petroleum Division, deals with issues facing energy plant maintenance and engineering such as failure analysis. The topical paper presented to nuclear engineers addressed tensile residual stress fields produced in weldments. Mr. Hornbach has conducted research and development, and supervised a number of projects, dealing with stress corrosion cracking in austenitic alloy weldments. Several technical papers are available from Lambda Research, which were written by resident engineers in collaboration with nuclear industry experts. Copies can be obtained by calling Customer Service, ext. 102.

Partial Pole Figures

Data collection techniques and software have been developed to allow the calibration of partial pole figures, useful for determining the degree of orientation of thin films, from incomplete full pole figure data. The new technology is being used to quantify the texture developed in PVD deposited metallic films. Contact: Keith Kruger, ext. 106.