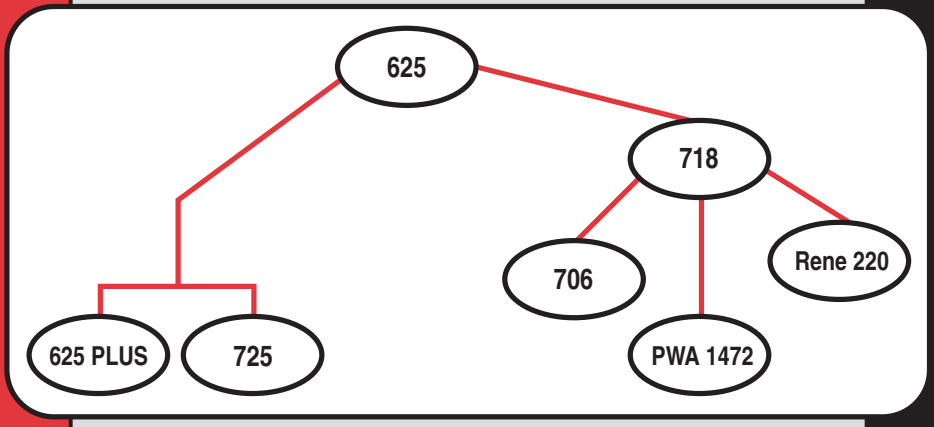
The Single Source on Progress and Problem-Solving in Superalloys



6th International Special Emphasis Symposium on

Superalloys 718, 625, 706, and Derivatives

October 2-5, 2005
Hyatt Regency Pittsburgh International Airport Hotel
Pittsburgh, Pennsylvania

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GENERAL INFORMATION

Devoted exclusively to superalloys 718, 625, and 706, this symposium will provide state-of-the-art knowledge to complement the five previous meetings, which resulted in five published volumes acknowledged as the single source reference on progress and problems in superalloys from 1989 to 2001.

ORGANIZING COMMITTEE

Chairperson
E.A. Loria, *Consultant*

COMMITTEE MEMBERS

S.J. Balsone, *GE Gas Turbine Operations*

D. Furrer, *Ladish*

J.R. Groh, *GE Aircraft Engines*

L.A. Jackman, *Allvac*

R.L. Kennedy, *Allvac*

G.E. Maurer, *Carpenter Tech*

A. Mitchell, *University of British Columbia*

B. Mueller, *Howmet*

S.J. Patel, *Special Metals*

D.F. Paulonis, *Pratt & Whitney*

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J.J. Schirra, *Pratt & Whitney*

G.D. Smith, *Special Metals*

CORRESPONDING MEMBERS

T. Carneiro, *CBMM, Reference Metals*

J.Y. Guedou, *SNECMA*

J.F. Uginet, *Fortech*

X. Xie, *Beijing University of Science & Technology*

ADVANCE REGISTRATION DEADLINE

Superalloys attendees, including authors, presenters, and session chairs, are required to register. To receive the discounted advance registration fee, registration and payment must be received by Monday, September 12, 2005.

3 CONVENIENT WAYS TO REGISTER

Mail the form in this booklet to TMS Meeting Services,
184 Thorn Hill Road, Warrendale, PA 15086, USA
Fax to (724) 776-3770
Visit http://www.tms.org/Meetings/Specialty/Superalloys2005/SuperalloysHome.html

REGISTRATION FEES

	Advance	On-site
Member	$495	$595
Nonmember	$595	$695
Student	$150	$200

Full conference registration includes the welcoming reception, coffee breaks, conference luncheons, access to the technical sessions, and a copy of the proceedings.

Student registration includes the welcoming reception, coffee breaks, and access to the technical sessions.

Badges must be worn to gain access to the technical sessions and social functions.

REFUND POLICY

Written requests must be sent to TMS Meeting Services, 184 Thorn Hill Road, Warrendale, PA 15086, USA. No cancellations will be accepted after September 12, 2005. A $75 processing fee is charged for all cancellations.

SOCIAL EVENTS

Sunday, October 2 ..... Welcoming Reception
Monday, October 3 ..... Luncheon Buffet
Tuesday, October 4 ..... Luncheon Buffet
Wednesday, October 5 ..... Luncheon Buffet

ACCOMMODATIONS

The headquarters hotel and site for this symposium is the Hyatt Regency Pittsburgh International Airport Hotel. All technical and social activities will take place at this first-class hotel, which is directly connected to the Pittsburgh International Airport by an enclosed climate-controlled moving walkway. A 20-minute drive from downtown Pittsburgh, the Hyatt Regency is the only hotel located on airport property. The hotel offers spacious guest rooms and many amenities, including exercise equipment, unique shops, a restaurant, coffee bar, lounge, and room service.

RESERVATIONS

Attendees should mail or fax the enclosed housing form as early as possible to the Hyatt Regency. After August 26, the conference rate and rooms may not be available.

MAILING ADDRESS

Hyatt Regency Pittsburgh International Airport Hotel
Attention Ingrid Shaw
1111 Airport Boulevard
P.O. Box 12420
Pittsburgh, PA 15231

FAX

(724) 899-6080

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From the North:

Follow 79 South to exit 60B (airport exit), Steubenville Pike. Follow this highway for approximately three miles, then take Route 60 North (exit to the right) towards the airport, bearing left at the Route 60 North split. Take airport exit and bear to the left following the gold "Commercial Curbs" signs. Hotel is on the left.

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Follow 79 North to exit 59B (airport, Route 60 North, Route 22/30). Take Route 60 North/airport. Take the airport exit. Follow the gold "Commercial Curbs" signs. Hotel is on the left.

From the East:

Take Route 22 West or the Pennsylvania Turnpike West to 376 West. Follow 376 West into Pittsburgh. Once in the city, follow the airport signs, which are 279 South. Follow these signs, over the Fort Pitt Bridge, through the Fort Pitt Tunnel, out of town for about 12 miles. 279 South turns into Route 22/30. Follow this highway until seeing the signs for the airport/Route 60 North. Take airport exit and follow the gold "Commercial Curbs" signs. Hotel is on the left.

From the West:

Take Interstate 80 East to 76 East. Take exit 10 onto Route 60 South. Take the airport exit. Follow the gold "Commercial Curbs" signs. Hotel is on the left.

Complimentary parking in the long-term parking lot is available.

CONFERENCE PROCEEDINGS PUBLICATION

A proceedings volume that contains the papers from the oral presentations made during the symposium is planned to be published and available at the conference. Full conference registrants receive a copy of the proceedings as part of the registration fee.

Additional copies of the conference proceedings will be available for purchase at the meeting. Additional copies may also be ordered on the advance registration form for $130 each plus shipping and handling. Those ordering in advance should contact TMS for the shipping and handling charge and to arrange for delivery of additional books after the conference.

INFORMATION

For more information on the technical aspects of Superalloys 718, 625, 706, and Derivatives, contact:

Edward A. Loria, Committee Chairperson
Telephone (412) 221-5905

Jon Groh, Committee Member
Telephone (513) 243-9437
E-mail jon.groh@ae.ge.com

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REFER TO GOLD FILE NO. 57153207

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Advance reservations may be made by booking online at www.hertz.com or calling the Hertz reservations line at (800) 654-2240 in the U.S. or (800) 263-0600 in Canada. International customers should contact the nearest Hertz reservation center. Advance reservations are recommended. Travelers must identify themselves as attendees of the TMS superalloys symposium and reference CV#02QJ0015 in order to receive the special rates.

Rates are available from Hertz locations in Pittsburgh.

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- Weekly rentals are from five to seven days. Weekend rentals have a minimum two-day keep, and Thursday pick-up requires a minimum three-day keep.

DESTINATION HIGHLIGHTS

PITTSBURGH, PENNSYLVANIA

October in Pittsburgh brings pleasant fall temperatures ranging from 50 to 60 degrees. Visitors can enjoy the great outdoors, with its vivid red, orange and yellow leaves painting a colorful canvas of the hills against a blue-sky backdrop. Broadway shows, unique museums, and a rainbow of ethnic restaurants provide entertaining days and nights.

Pittsburgh isn't just a product of steel mills any longer. A world-class technology hub with recognized innovation in all areas of the industry, the Pittsburgh region is home to some of the most dynamic ventures, both startup and Fortune 500. Here, companies are developing the next generation of software and Internet applications, researching tomorrow's tissue engineering technologies, and perfecting the latest advanced manufacturing techniques. There is the technical and scientific side of Pittsburgh as seen in the research departments of its renowned universities, such as Carnegie-Mellon, Duquesne, and the University of Pittsburgh, and in its hospitals, where patients from all over the world travel for life-saving transplant operations.

Whether outdoors for a stroll around a scenic park or inside for an entertaining show, visitors find Pittsburgh offers a variety of energizing and relaxing activities. For more information about the city of Pittsburgh, visit **www.visitpittsburgh.com**.

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6th International Special Emphasis Symposium on

Superalloys 718, 625, 706, and Derivatives

TECHNICAL PROGRAM

Sunday Evening, October 2, 2005

6:30 - 7:45 PM Welcoming Reception

Invited Overviews

Introduction by: Robert E. Schafrik, General Manager, EMPL, GE Aircraft Engines, Cincinnati, OH 45215 USA

8:00 PM

Allvac®718Plus™, Superalloy for the Next Forty Years: *Richard L. Kennedy*[1]; [1]ATI Allvac

Allvac®718Plus™ alloy is a new nickel base Superalloy with a highly desirable combination of excellent mechanical properties, increased temperature capability, good fabricability and moderate cost. This highly desirable combination of characteristics positions the alloy to very effectively fill the longstanding gap between the two most widely used wrought superalloys, 718 and Waspaloy. This paper will review the development of alloy 718Plus, which has progressed over the last eight years, including the effects of chemistry, heat treatment, processing and structure on mechanical properties. The current production status and capability of the alloy will also be discussed along with ongoing applications development. Comparisons will be made to 718, Waspaloy and other superalloys illustrating that alloy 718Plus is the best available candidate to sustain the advances in engine development made possible over the forty-plus year life of alloy 718.

8:30 PM
Extending the Size of Alloy 718 Rotating Components: *Robin C. Schwant*[1]; J. Jay Jackson[1]; Ling Yang[1]; Martin Morra[2]; [1]GE Energy; [2]GE Global Research Center

GE introduced the use of Alloy 718 in its heavy-duty gas turbine rotors in the late 1990's. The size of these parts is an order of magnitude larger than those used in aircraft engines. The challenges associated with production of very large 718 ingots and forgings are discussed. The issues include segregation, grain growth, microstructure and production equipment size limitations. Property distributions and comparisons to another turbine wheel material, Alloy 706, are included.

Monday AM, October 3, 2005
Melting and Solidification

Session Chairs: Shailesh J. Patel, Special Metals Corporation; Laurence A. Jackman, ATI Allvac

8:30 AM
Alloy 718 Large Ingots Studies: *Carlo Malara*[1]; John F. Radavich[2]; [1]Foroni SpA; [2]Micro-Met Laboratories, Inc.

8:50 AM
Metals Affordability Initiative: Application of Allvac Alloy 718Plus™ for Aircraft Engine Static Structural Components: *Eric Allen Ott*[1]; Howard W. Sizek[2]; [1]General Electric Company; [2]Air Force Research Laboratory

9:10 AM
Advancing Alloy 718 Vacuum Arc Remelting Technology Through Model-Based Controls: *Rodney L. Williamson*[1]; Joseph J. Beaman[2]; Frank J. Zanner[3]; John J. deBarbadillo[4]; [1]Sandia National Laboratories; [2]University of Texas; [3]Zan Tek Enterprises; [4]Special Metals Corporation

9:30 AM
Alloy 718 Forging Development for Land-Based Gas Turbines: *J. Jay Jackson*[1]; Jean-Francois Uginet[2]; [1]GE Energy; [2]Aubert & Duval Holding

9:50 AM
Clean Metal Nucleated Casting of Superalloys: *William T. Carter*[1]; Joseph J. Jackson[1]; Robin M. Forbes Jones[2]; Ramesh S. Minisandram[2]; [1]General Electric Company; [2]ATI Allvac

10:10 AM
Modification of Alloy 706 for High Temperature Steam Turbine Rotor Application: *Shinya Imano*[1]; Takashi Shibata[2]; Tsukasa Azuma[2]; Tatsuya Takahashi[2]; Hiroyuki Doi[1]; [1]Hitachi; [2]Japan Steel Works

10:30 AM Break

10:50 AM
Optimizing the Forging of Critical Aircraft Parts by the Use of Finite Element Coupled Microstructure Modelling: *Martin Stockinger*[1]; Johann Tockner[1]; [1]Bohler Schmiedetechnik GmbH & Co KG

11:10 AM
Probabilistic Life of IN718 for Aircraft Engine Disks: *Stephane Deyber*[1]; Franck Alexandre[2]; André Pineau[2]; Julien Vaissaud[2]; [1]Snecma Moteurs; [2]Ecole des Mines de Paris

11:30 AM
Processing of Rolling Technologies for IN718: *Michael Walter*[1]; Arnold Tatschl[1]; [1]Böhler-Edelstahl

11:50 AM
Mechanical Properties of Counter-Gravity Cast IN718: *Sanjay Shendye*[1]; Blair King[1]; Paul McQuay[2]; [1]Metal Casting Technology, Inc.; [2]Hitchiner Manufacturing Company, Inc.

12:10 PM
The Role of Niobium in Wrought Precipitation-Hardened Nickel-Base Alloys: *Gaylord D. Smith*[1]; Shailesh J. Patel[1]; [1]Special Metals Corporation

Monday PM, October 3, 2005
Allvac 718Plus Development

Session Chairs: Jon R. Groh, GE; Daniel F. Paulonis, Pratt & Whitney

1:30 PM
Structure and Property Comparison of Alloy 718Plus™ and Waspaloy Forgings: *Ian Dempster*[1]; Wei-Di Cao[2]; Richard Kennedy[2]; Betsy Bond[2]; Jose Aurrecoechea[3]; [1]Wyman-Gordon Forgings; [2]ATI Allvac; [3]Solar Turbines Incorporated

1:50 PM
Solidification and Solid State Phase Transformation of Allvac® 718Plus™ Alloy: *Wei-Di Cao*[1]; [1]ATI Allvac

2:10 PM
Structure Stability Study on a New Developed Modified 718 Alloy—Allvac® 718Plus™: *Xishan Xie*[1]; [1]University of Science and Technology Beijing

2:30 PM
Press Forging of Alloy 718Plus™: *Joe Lemsky*[1]; Kevin Kloske[2]; Tom Bayha[3]; Howard Sizek[4]; [1]Ladish Company, Inc.; [2]Pratt & Whitney; [3]ATI Allvac; [4]Air Force Research Laboratory

2:50 PM
IsoCon Processing of Alloy 718Plus™: *Joe Lemsky*[1]; Kevin Kloske[2]; Tom Bayha[3]; [1]Ladish Company, Inc.; [2]Pratt & Whitney; [3]ATI Allvac

3:10 PM Break

3:30 PM
A T-T-T Diagram of a New Developed Modified 718 Alloy—Allvac® 718Plus™: *Xishan Xie*[1]; [1]University of Science and Technology Beijing

3:50 PM
Evaluation of Allvac® 718Plus™ in the Cold Worked and Heat Treated Condition: *Betsy J. Bond*[1]; [1]ATI Allvac

4:10 PM
Application of Direct Aging to Allvac® 718Plus™ Alloy for Improved Performance: *Wei-Di Cao*[1]; Richard L. Kennedy[1]; [1]ATI Allvac

4:30 PM
Investment Casting of Allvac® 718Plus™ Alloy: *Kevin E. Kloske*[1]; Min Lu[2]; Thomas D. Bayha[3]; [1]Pratt & Whitney; [2]PCC Structurals, Inc.; [3]ATI Allvac

4:50 PM
Effect of Thermal-Mechanical Treatment on the Fatigue Crack Propagation Behavior of Newly Developed Allvac® 718Plus™ Alloy: *Xingbo Liu*[1]; Jing Xu[1]; Nate Deem[1]; Keh-Minn Chang[1]; Ever J. Barbero[1]; Wei-Di Cao[2]; Richard L. Kennedy[2]; Tadeu Carneiro[3]; [1]West Virginia University; [2]ATI Allvac; [3]Companhia Brasileira de Metalurgia e Mineração

5:10 PM
Properties and Microstructure of Allvac® 718Plus™ Rolled Sheet: *Thomas D. Bayha*[1]; David Bergstrom[2]; [1]ATI Allvac; [2]ATI Allegheny Ludlum

Tuesday AM, October 4, 2005
Processing Effects and Physical Metallurgy

Session Chairs: Alec Mitchell, University of British Columbia; John J. Schirra, Pratt & Whitney

8:30 AM
Characteristics of VIM/VAR Processed Alloy 718 Ingot and Their Effects on the Billet Cogging Process: *Nho-Kwang Park*[1]; J. -T. Yeom[1]; X. -X. Cui[1]; [1]Korea Institute of Machinery & Materials

8:50 AM
Freckle-Defects in VAR-Ingots of Ni-Base Superalloys: Simulations and Predictions: David Robert Poirier[1]; Pil K. Sung[1]; *Robert G. Erdmann*[1]; [1]University of Arizona

9:10 AM
Analysis of Microstructural Properties of IN718 After High Speed Forging: *Lars Renhof*[1]; Susanne Guder[1]; Ewald Werner[1]; Martin Stockinger[2]; [1]Technical University Munich; [2]Boehler Schmiedetechnik

9:30 AM
Combined Effects of Large Reductions and Heating Temperatures-Times on Grain Size Control of Alloy-718 Rolled Rings: *Jorge A. Manriquez*[1]; Jorge Cardenas[2]; Hugo Guajardo[2]; Chris Harwood[2]; [1]Tecnologico de Monterrey; [2]Frisa-Wyman Gordon

9:50 AM
The Use and Performance of Wrought 625 Alloy in Primary Surface Recuperators for Gas Turbine Engines: *James M. Rakowski*[1]; Charles Stinner[1]; [1]Allegheny Ludlum

10:10 AM
The Effect of Nb, Ti, Al on Precipitation and Strengthening Behavior on 718 Type Superalloys: *Xishan Xie*[1]; [1]University of Science and Technology Beijing

10:30 AM Break

10:50 AM
Primary Carbide Precipitation in IN718: *Alec Mitchell*[1]; [1]University of British Columbia

11:10 AM
The Effect of Sheet Processing on the Elevated Temperature Strength and Creep Behavior of INCONEL Alloy 718: *Carl J. Boehlert*[1]; Nate Eisinger[2]; [1]Michigan State University; [2]Special Metals Corporation

11:30 AM
Effect of Thermo-Mechanical Processing on the Microstructure and Grain Size of Annealed Alloy 718: *Sarwan Mannan*[1]; Donald Dobbs[1]; [1]Special Metals Corporation

11:50 AM
Predicting Microstructural Transitions via Computer Modeling and The Importance of Strain and Temperature in IN718 Forging Design: Andrew Haynes[1]; *Tim Howson*[2]; [1]Pratt & Whitney; [2]Wyman-Gordon Forgings

12:10 PM
Metallurgical Evaluation of Spray Deposited and Ring Rolled IN718: *Guoqing Zhang*[1]; [1]BIAM

Tuesday PM, October 4, 2005
Physical Metallurgy

Session Chairs: Robin C. Schwant, General Electric Company; Gaylord Smith, Special Metals Corporation

1:30 PM
A Structural Comparison of Alloy 718Plus™ to Alloy 718: *John F. Radavich*[1]; Tadeu Carneiro[2]; [1]Micro-Met Laboratories, Inc.; [2]Reference Metals Company Inc

1:50 PM
Carbides and Their Influence on Notched Low Cycle Fatigue Behavior of Fine-Grained IN718 Gas Turbine Disk Material: *Prabir R. Bhowal*[1]; Agnieszka Wusatowska-Sarnek[1]; [1]Pratt & Whitney

2:10 PM
Characterization of the Effect of Discrete Laves Particles on Low Cycle Fatigue Lives in Premium Grade Forged and Heat-Treated Inconel 718: *Robert A. Grelotti*[1]; Paul D. Genereux[1]; John J. Schirra[1]; [1]Pratt & Whitney

2:30 PM
Effect of Delta-Phase on the Hot Ductility of Wrought Alloy 718: *Göran P. Sjöberg*[1]; Tomas Antonsson[2]; Hans Fredriksson[2]; Saied Azadian[3]; Richard Warren[4]; [1]Volvo Aero Corporation; [2]Royal Institute of Technology; [3]Luleå University of Technology; [4]Malmö Högskola

2:50 PM
High Temperature Hold Time Effects on Fine Grain Processed 718 Fatigue Properties: *Dan Greving*[1]; Harry Kington[1]; Derek Rice[1]; Brian Hann[1]; [1]Honeywell Engines, Systems & Services

3:10 PM Break

3:30 PM
Influence of Thermal Exposure on the Microstructure of Delta Processed Billet and Bar for Alloy 718: *Jeffrey Russell*[1]; [1]ATI Allvac

3:50 PM
Modelling Microstructural Transformations of Nickel Base Superalloy IN718 during Hot Deformation: *Robert Paul Guest*[1]; Sammy Tin[2]; [1]Firth Rixson Ltd; [2]Cambridge University

4:10 PM
Dynamic and Metadynamic Recrystallisation of IN718: *Robert Paul Guest*[1]; Sammy Tin[2]; [1]Firth Rixson Ltd; [2]Cambridge University

4:30 PM
Influence of P on Creep Performance of DA IN718: *Joe Heaney*[1]; Jeff Russell[2]; Pawel Mrowczynski[3]; [1]GE/MPED; [2]ATI Allvac; [3]Wyman Gordon Forgings

4:50 PM
Influence of Phosphorus on the Deformation Mechanism and Mechanical Properties of IN718 Alloy: *Wenru Sun*[1]; L. F. Huang[1]; S. L. Yang[1]; S. R. Guo[1]; Z. Q. Hu[1]; [1]Chinese Academy of Sciences

5:10 PM
Alloy 625 and 725 Trends in Properties and Applications: *Lewis Edward Shoemaker*[1]; [1]Special Metals Corporation

Tuesday Evening, October 4, 2005
Design, Processing, Properties

Session Chairs: John F. Radavich, Micro-Met Laboratories Inc; Edward A. Loria, Consultant

7:30 PM
Modeling Microstructure Evolution in 718 Ingot to Billet Conversion: *William Carden*[1]; [1]Vista Engineering, Inc.

7:45 PM
Design Optimization of Alloying Elements and Their Concentrations for Specified Strength, Temperature, Time-to-Rupture, Cost and Weight: *George S. Dulikravich*[1]; Igor N. Egorov[2]; [1]Florida International University; [2]IOSO Technology Center

8:00 PM
Spray Forming and Post Processing of Superalloy Rings: *Michael Walter*[1]; Johann Tockner[2]; Martin Stockinger[2]; Nils Ellendt[3]; Volker Uhlenwinkel[3]; [1]Bohler Edelstahl GmbH; [2]Bohler Schmiedetechnik GmbH & Co KG; [3]University Bremen

8:15 PM
A Unified Computer Model of the Spray Forming Process of Inconel 718 Billets and Rings: *Iñaki Garmendia*[1]; Aitor Landaberea[1]; Udo Fristching[2]; Omar Belkessam[2]; Patrick S. Grant[3]; Jiawei Mi[3]; [1]INASMET; [2]University Bremen; [3]University of Oxford

8:30 PM
Sprayforming Optimization of Superalloy Aeroengine Components: *Oscar Caballero*[1]; [1]ITP

8:45 PM
Thermophysical Properties of IN738LC, MM247LC and CMSX-4 in the Liquid and High Temperature Solid Phase: *Rainer K. Wunderlich*[1]; H. J. Fecht[1]; L. Battezzati[2]; R. Brooks[3]; P. N. Quested[3]; I. Egry[4]; J. Etay[5]; J. P. Garandet[6]; B. Vinet[6]; K. C. Mills[7]; A. Passerone[8]; E. Ricci[8]; S. Seetharaman[9]; R. Aune[9]; [1]University of Ulm; [2]Universita di Torino; [3]National Physical Laboratory; [4]DLR-Köln; [5]Centre National de la Recherche Scientifique EMP; [6]Commissariat à l'Energie Atomique/CEREM; [7]Imperial College; [8]IENI-CNR; [9]Royal Institute of Technology

9:00 PM
Microstructural Investigations of Electron Beam Welded Alloy 718: *Mahadevan Sundararaman*[1]; Padmakar Potdar[1]; [1]Bhabha Atomic Research Centre

9:15 PM
A Comparison of the Precipitation Kinetics of γ' Particles in Virgin and Re-Solutioned Alloy 625: *Mahadevan Sundararaman*[1]; Hrishikesh Chidanand Pai[1]; [1]Bhabha Atomic Research Centre

9:30 PM
Notched Low Cycle Fatigue of Alloy 718: *A. Sridhar*[1]; Vikas Kumar[2]; A. K. Gogia[1]; [1]Project Office (Materials); [2]Defence Metallurgical Research Laboratory

9:45 PM
Properties of Bulk and Sheet Micro-, Submicro-, and Nanocrystalline Alloy 718: *Shamil Khamzaevich Mukhtarov*[1]; Vener Anvarovich Valitov[1]; Nadya Ruzavilevna Dudova[1]; [1]Institute for Metals Superplasticity Problems RAS

Wednesday AM, October 5, 2005
Processing Effects and Properties

Session Chairs: Joe Lemsky, Ladish Company, Inc.; Kevin E. Kloske, Pratt & Whitney

8:30 AM
Characterization of Residual Stresses in Turbine Discs by Neutron and High-Energy X-Ray Diffraction: Ulrike Cihak[1]; Helmut Clemens[1]; Peter Staron[2]; *Martin Stockinger*[3]; Johann Tockner[3]; Jens Homeyer[4]; [1]University Leoben; [2]GKSS Research Center; [3]Bohler Schmiedetechnik GmbH&Company KG; [4]HASYLAB at DESY

8:50 AM
Residual Stresses in IN718 Turbine Disks: *Christian Krempaszky*[1]; Ewald Werner[1]; Martin Stockinger[2]; [1]TU-Munich; [2]Böhler Schmiedetechnik GmbH & Company KG

9:10 AM
Effect of Grain Size/Tensile Strength on the Low Cycle Fatigue at Elevated Temperature of Alloy 718 Cogged by Open Die Forging Press: *Y. S. Song*[1]; M. R. Lee[1]; J. T. Kim[1]; [1]Doosan Heavy Industry Company

9:30 AM
Effect of Portevin-Le Châtelier Instabilities on the Sensitivity of Alloy 718 to Oxidation Assisted Intergranular Cracking at High Temperatures: *Eric Andrieu*[1]; Jean Marc Cloue[2]; Bernard Viguier[1]; Veronique Garat[2]; [1]CIRIMAT-ENSIACET; [2]Framatome-ANP

9:50 AM
High Temperature Intergranular Oxidation of Alloy 718: *Eric Andrieu*[1]; Julien Deleume[2]; Veronique Garat[2]; Jean Marc Cloue[2]; [1]CIRIMAT-ENSIACET; [2]Framatome-ANP

10:10 AM
Modelling the Material Properties and Behaviour of Ni and Ni-Fe Based Superalloys: *Nigel John Saunders*[1]; Zhanli Guo[2]; Alfred Peter Miodownik[1]; Jean-Philippe Schille[2]; [1]Thermotech Ltd; [2]Sente Software Ltd.

10:30 AM Break

10:50 AM
Effects of Cyclic Solution Treatment on the Microstructures and Mechanical Properties of Alloy 718: *Jaekeun Hong*[1]; Jihong Park[1]; Nhokwang Park[1]; Seongjun Kim[2]; Chungyun Kang[2]; [1]Korea Institute of Machinary and Materials; [2]Pusan National University

11:10 AM
The Role of Oxygen Grain-Boundary Diffusion during Intercrystalline Oxidation and Intergranular Fatigue Crack Propagation in Alloy 718: *Ulrich Krupp*[1]; Philip E.-G. Wagenhuber[1]; Vicente Braz da Trindade Filho[1]; William M. Kane[2]; Charles J. McMahon Jr.[2]; [1]University of Siegen; [2]University of Pennsylvania

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Thermal Fatigue Resistance of 718 Derivatives for Aluminum Die Casting Dies: *Michael Antony*[1]; John W. Smythe[1]; [1]ATI Allvac

11:50 AM
A New Alloy Designed for Superheater Tubing in Coal-Fired Ultra Supercritical Boilers: *Brian A. Baker*[1]; [1]Special Metals Corporation

12:10 PM
Metallurgical Effects on Machinability of Wrought Inconel 718: *Maria Johansson*[1]; Viktor Recina[2]; Birger Karlsson[1]; [1]Chalmers University of Technology; [2]Volvo Aero Corporation

Wednesday PM, October 5, 2005
Weldability and Applications

Session Chairs: Xishan Xie, University of Science and Technology Beijing; Edward A. Loria, Consultant

1:30 PM
Transient Liquid Phase Joining of Single Crystal Superalloy Blades to Polycrystalline Superalloy Disk Material: *Gopal Das*[1]; [1]Pratt & Whitney

1:50 PM
Design and Manufacture of a Very Large Hot-Gas Expander Impeller in Alloy 718 for Highly Corrosive Off-Gas: Volker Schulte[1]; *Sharad Chandra*[1]; Klaus Mohr[1]; Dieter Bokelmann[2]; Karl-Heinz Schoenfeld[2]; Joerg Poppenhaeger[2]; [1]MAN Turbo AG; [2]Saarschmiede Freiformschmiede GmbH

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Heat Affected Zone Microfissuring in Electron Beam Welded Allvac 718 Plus™ Alloys: Krutika R. Vishwakarma[1]; Norman L. Richards[1]; *Mahesh C. Chaturvedi*[1]; [1]University of Manitoba

2:30 PM
Mixed INCONEL® Alloy 718 Inertia Welds for Rotating Applications — Microstructures and Mechanical Properties: *Olaf Roder*[1]; Dietmar Helm[1]; Stephanie Neft[1]; Joachim Albrecht[2]; Gerd Luetjering[2]; [1]MTU Aero Engines GmbH; [2]Technical University Hamburg-Harburg

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Mechanical Properties of 718 Inertia Weld and Its Comparison with EBW: *P. V. Neminathan*[1]; T. Mohandas[2]; [1]Kaveri Engine Programme; [2]Defence Metallurgical Research Laboratory

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Single Point Turning Process Optimization of Fine Grain Processed 718: *Brian Hann*[1]; Dan Greving[1]; Harry Kington[1]; Derek Rice[1]; [1]Honeywell Engines, Systems & Services

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Development of Forgeable Ni-Base Alloys for USC Steam Turbine Applications by Microstructure Simulation and Formability Tests: *X. Li*[1]; R. Kopp[1]; M. Wolske[2]; [1]RWTH Aachen University; [2]Hydro Aluminium Deutschland GmbH

4:10 PM
A Method of Optimizing Chemical Composition to Obtain Both Higher Strength and Higher Plasticity for Alloy IN718C: *Ping Yan*[1]; [1]Central Iron & Steel Research Institute

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A Precipitation-Hardened, Corrosion-Resistant Nickel-Chromium-Molybdenum-Niobium Alloy for Service in Marine and Oilfield Applications: *Lewis Edward Shoemaker*[1]; [1]Special Metals Corporation

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Creep-Testing Foils and Sheets of Alloy 625 for Microturbine Recuperators: *Neal D. Evans*[1]; Philip J. Maziasz[1]; John P. Shingledecker[1]; [1]Oak Ridge National Laboratory

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