

Program

SUPERALLOYS

**September 12 - 16, 2010
Awaji Island, Japan**

Program Chairs:

Professor Sammy Tin,
Illinois Institute of Technology, USA

Professor Qiang (Charles) Feng
University of Science and Technology Beijing (USTB), China

Professor Roger Reed
The University of Birmingham, UK

Professor Tresa M. Pollock
University of California at Santa Barbara, USA

Dr. Hideyuki Murakami
National Institute for Materials Science, Japan

Professor Koji Kakehi
Tokyo Metropolitan University, Japan



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Sunday, September 12, 2010

16:00 – 18:00	Registration (Reception Hall B Foyer, Conference Center)
18:00 – 20:00	Welcome Reception and Dinner (Reception Hall B Foyer)
20:00 – 20:15	Welcome and Announcements (Reception Hall B)
20:15 – 21:15	Plenary Keynote Talk: AERO-ENGINE BUSINESS AND MATERIALS TECHNOLOGIES IN JAPAN, NOW AND CHALLENGES, Yukiya Nakagawa, IHI

NOTES

- Technical Sessions will be held in Reception Hall B in the Conference Center.
- Vouchers will be distributed at registration for lunches (Mon, Tues, and Wed.) and for dinners on Monday and Tuesday.
- Breakfasts will be in the Westin Hotel.
- Audiotaping, videotaping and photography of presentations are prohibited.
- Speakers – Please leave at least 5 minutes for questions and discussion.
- Please do not smoke at any conference functions.
- Turn your cellular telephones to vibrate or off during technical sessions.
- Be sure to make any corrections to your name/contact information on the Master Participant List or confirm that the listing is correct. A corrected copy will be sent to all participants after the conference.

Monday, September 13, 2010

07:00 – 08:00 Breakfast

Session 1: Alloy Deployment

- 08:30 – 09:10 Alloys by design: application to single crystal superalloys
Roger C Reed, University of Birmingham, UK (Invited)
- 09:10 – 09:50 Single-crystal superalloy design approach for industrial gas turbine application
Akane Suzuki, GE Global Research, USA (Invited)
- 09:50 – 10:20 Effect of ruthenium on microstructure and properties of high Re bearing single crystal superalloys
Yushi Luo, Beijing Institute of Aeronautical Materials, China
- 10:20 – 10:40 Coffee break
- 10:40 – 11:20 Development of a W and Re reduced single crystal alloy (LEK 94) with reduced density and price
Uwe Glatzel, Metals and Alloys, University of Bayreuth, Germany (Invited)
- 11:20 – 11:50 Effects of Ru and Cr on microstructure and stress-rupture property of Ni-based single crystal superalloys
J.Y. Chen, State Key Laboratory for Advanced Metals and Materials, University of Science and Technology Beijing, China
- 11:50 – 12:20 Effects of chromium and ruthenium on the microstructures and creep rupture life for a single crystal nickel-base superalloy
Tao Jin, Institute of Metal Research, Chinese Academy of Sciences, China
- 12:20 – 14:00 Lunch
- 14:00 – 14:40 Microstructure and properties of new gamma prime strengthened Co-base alloys
Tresa M. Pollock, University of California Santa Barbara, USA (Invited)
- 14:40 – 15:10 Development of dual two-phase intermetallic alloys composed of geometrically close packed Ni₃Al and Ni₃V structures
Takayuki Takasugi, Osaka Prefecture University, Japan (Invited)
- 15:10 – 15:40 Polycrystalline γ - γ' - δ Ternary Eutectic Ni-Base Superalloys
Sammy Tin, IIT, USA
- 15:50 – 16:10 Coffee Break

Session 2: Mechanical Behavior

- 16:10 – 16:40 Creep mechanisms of Ni-Co-base disc superalloys
Y. Yuan, National Institute for Materials Science, Japan
- 16:50 – 17:20 Fatigue crack propagation in the post-service gas turbine superalloy by miniature ct specimen
Motoki Sakaguchi, Nagaoka University of Technology, Japan

Monday, September 13, 2010 (continued)

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| 17:20 – 17:50 | Influence of refinement in dendritic structure on the fatigue crack growth behavior in single-crystal nickel-base superalloys
Clinique L. Brundidge, University of Michigan, USA |
| 19:00 – 20:30 | Dinner |
| 20:30 – 22:00 | Poster Session I and Social Hour |

Tuesday, September 14, 2010

07:00 – 08:00	Breakfast
08:00 – 08:15	Announcements
08:30 – 09:10	Determining fault energies in the γ' phase of Ni-based superalloys Catherine Rae, Materials Science and Materials, Cambridge University, UK (Invited)
09:10 – 09:40	The effects of composition and heat treatment on fatigue crack propagation performance of various sub-solvus and super-solvus heat treated turbine disc alloys S. Everitt, Materials Research Group, University of Southampton , UK
09:40 – 10:10	On the effect of creep on local lattice orientation in single crystal Ni-based superalloy microstructures E. J. Payton, Institute for Materials, Ruhr-Universität Bochum, Germany
10:10 – 10:30	Coffee break
10:30 – 11:10	High temperature biaxial fatigue property of polycrystalline and directionally solidified Ni base superalloys Takashi Ogata, CRIEPI, Japan (Invited)
11:10 – 11:40	The influence of the gamma/gamma prime microstructure evolutions on the very high temperature/low stress non-isothermal creep behaviour of 4th generation single crystal nickel-based superalloy Xavier Milhet, PPRIME UPR CNRS 3346, France
11:40 – 12:10	New Results on Creep Testing of Ni-Based Superalloys with Miniaturized Specimens P. Nörtershäuser, Institut für Werkstoffe, Ruhr-Universität Bochum, Germany
12:10 – 14:00	Lunch
14:00 – 14:30	Three-Dimensional characterization of dislocation networks in lightweight single crystal Ni-based superalloy microstructures L. Agudo, Institut für Werkstoffe, Ruhr University Bochum, Germany
14:30 – 15:00	Constitutive modelling of the creep behavior of single crystal superalloys under non-isothermal conditions inducing phase transformations Julien Ghighi, Turbomeca - SAFRAN group / Institut P' - CNRS – ENSMA – Université de Poitiers, UPR CNRS 3346, France
15:10 – 15:40	Destabilization of the rafted structure during creep in Ni-based superalloys simulated by phase-field method Yuhki Tsukada, Graduate School of Engineering, Nagoya University
15:40 – 16:00	Coffee break

Tuesday, September 14, 2010 (continued)

Session 3: Physical Metallurgy

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| 16:00 – 16:40 | Rafting caused by prestraining and subsequent annealing in a Ni superalloy
Tsutomu Mori, Materials Science Centre, University of Manchester, UK/ Japan (Invited) |
| 16:40 – 17:10 | Serrated grain boundary formation and its implications in a wrought Ni-based superalloy with low gamma-prime volume fraction
Hyun Uk Hong, Korea Institute of Materials Science, Korea |
| 17:10 – 17:40 | The effect of γ' dissolution and TCP phase formation on lattice misfit
Steffen Neumeier, University of Cambridge, Department of Materials Science & Metallurgy, UK |
| 19:00 – 20:30 | Dinner |
| 20:30 – 22:00 | Poster Session and Social Hour |

Wednesday, September 15, 2010

07:00 – 08:00 Breakfast

Session 4: Honorary session on solidification for Professor Hu from IMR

08:20 – 08:30 Opening remarks from Prof. Qiang Feng, University of Science and Technology, Beijing, China

08:30 – 09:00 Directionally solidified IGT blade by liquid metal cooling process
J. Zhang, Institute of Metal Research, Chinese Academy of Sciences, China (Invited)

09:00 – 09:30 Effect of refractory and trace elements on the solidification characteristics and segregation of single crystal superalloys under high thermal gradient directional solidification
Lin Liu, Northwestern Polytechnical University, China (Invited)

09:30 – 10:00 Determining heat transfer coefficients during precision casting of superalloys
Rainer Völkl, Metals and Alloys, University of Bayreuth, Germany

10:00 – 10:20 Coffee Break

10:20 – 10:50 Investigation on the quality control factor of castings with high Cr content cast Ni-base superalloy K4648
Liang Zheng, National Key Laboratory of Science and Technology on Advanced High Temperature Structural Materials, Beijing Institute of Aeronautical Materials, China (Invited)

10:50 – 11:20 Melt superheating treatment: influence on solidification microstructure and mechanical property of Ni-based monocrystal superalloy
Lin Liu, State Key Laboratory of Solidification Processing, Northwestern Polytechnical University, China

11:20 – 11:50 Formation of stray grains during directional solidification of nickel-based superalloys
Yizhou Zhou, Institute of Metal Research, Chinese Academy of Sciences, China

11:50 – 12:30 Research Activities of Solidification on Development of Superalloys
Prof. Hu, Institute of Metal Research, Chinese Academy of Sciences, China (invited)

12:30 – 12:35 Closing Remarks

12:35 – 14:00 Lunch

Session 5: Interfaces and Coatings

14:00 – 14:40 Characterization of a hip-bonding between a PM Disk superalloy and a single crystal blade superalloy
Pierre Caron, ONERA, France (Invited)

14:40 – 15:20 Oxidation and inter-diffusion behaviors of rutil coated single crystal superalloy
Hongbo Guo, Beijing University of Aeronautics and Astronautics, China

Wednesday, September 15, 2010 (continued)

15:20 – 15:50	Comparison of EQ and MCRALY bond coats for thermal barrier applications Christopher Mercer, National Institute for Materials Science, Japan
15:50 – 16:20	3D study of microstructural evolution in coated nickel-based superalloys S.D. Newman, Loughborough University, UK
16:20 – 16:40	Coffee Break
16:40 – 17:20	Microstructural changes of bond-coated Ni-based single crystal superalloys, effect of pre-surface treatment, surface crystal orientation and coating process Hideyuki Murakami, National Institute for Materials Science, Japan (Invited)
17:20 – 17:50	Modeling of microstructural evolution in multi-layered overlay coatings M.S.A. Karunaratne, Loughborough University, UK
17:50 – 18:20	Effect of heat treatment on fracture behavior and delamination toughness in air plasma-sprayed Y_2O_3 - ZrO_2 thermal barrier coating system Makoto Hasegawa, Division of Materials Science and Engineering, Graduate School of Engineering, Yokohama National University, Japan
19:30 – 22:00	Banquet and talk by Ram Darolia (Westin Hotel)

Thursday, September 16, 2010

07:00 – 08:00	Breakfast
08:30	Bus departure for Optional Industry Tour

Poster List

- CONTRIBUTIONS OF GRAIN BOUNDARY SLIDING AND INTRAGRANULAR PLASTICITY TO THE CREEP BEHAVIOUR OF A DISK SUPERALLOY**
Didier LOCQ, Office National d'Études et de Recherches Aérospatiales (ONERA), FRANCE
- INFLUENCE OF THE DENDRITIC/INTERDENDRITIC CHEMICAL COMPOSITION ON THE MECHANICAL PROPERTIES OF A 4TH GENERATION SUPERALLOY STUDIED BY NANOHARDNESS CARTOGRAPHY**
Xavier Milhet, PPRIME UPR CNRS, France
- DEFLECTED 'TEAR DROP' CRACKING IN NICKEL BASED SUPERALLOYS**
Christian Schoettle, School of Engineering Sciences, University of Southampton, UK
- THE DEGRADATION BEHAVIOR OF THERMAL BARRIER COATINGS ON A 4TH GENERATION SINGLE CRYSTAL SUPERALLOY TMS-138**
Akira Tateno, IHI Corporation, Japan
- MICROSTRUCTURAL CHANGES OF ALUMINIZED AND PT-ALUMINIZED NI-BASED SINGLE CRYSTAL SUPERALLOYS**
Kazuki KASAI, Shibaura Institute of Technology, Japan

6. **EVOLUTION OF RAFT STRUCTURE DURING CREEP DEFORMATION OF NI-BASED SINGLE CRYSTAL SUPERALLOY**
Nobuyasu Tsuno, IHI Corporation, Japan
7. **PREDICTION OF REACTION DIFFUSION PHENOMENA BETWEEN IR-COATING AND NI-ALLOY SUBSTRATE USING PHASE-FIELD MODEL**
Machiko ODE, Hideyuki MURAKAMI, National Institute for Materials Science, Japan
8. **EFFECTS OF HEAT TREATMENT ON MICROSTRUCTURES AND CREEP PERFORMANCES OF IN718**
Chen-Ming Kuo, I-Shou University, Taiwan
9. **EFFECTS OF REJUVENATION HEAT TREATMENT ON HIGH TEMPERATURE CREEP AND OXIDATION PROPERTIES OF RENE142 DS SUPERALLOY**
Chun-Yu Lin, I-Shou University, Taiwan, Chen-Ming Kuo, Department of Mechanical and Automation Engineering, I-Shou University,
10. **THE STRUCTURE AND HOT DEFORMATION BEHAVIOR OF ESR-CDS RENÉ88DT**
FENG Di, High Temperature Materials Division, Central Iron and Steel Research Institute, China
11. **THE EFFECTS OF ALLOYING ELEMENTS ON PLANAR FAULTS ENERGIES AND DISLOCATION MOVEMENT IN γ AND γ' PHASES OF NI-BASED SINGLE-CRYSTAL SUPERALLOYS**
Ping Yan, Central Iron and Steel Research Institute, China
12. **STUDY ON MICROSTRUCTURE AND PROPERTIES OF DIFFERENT POWDER METALLURGY SUPERALLOYS**
ZHANG Yiwen, High Temperature Materials Research Institute, CISRI, China
13. **DESIGN AND PROPERTIES OF NEW CAST AND WROUGHT SUPERALLOYS FOR TURBINE DISK APPLICATIONS**
Alexandre DEVAUX, Aubert & Duval, FRANCE; Yutaka Kamatani, Eramet International
14. **VERY HIGH TEMPERATURE CREEP BEHAVIOR OF MC2 SINGLE CRYSTAL NI-BASED SUPERALLOY UNDER COMPLEX THERMAL CYCLING CONDITIONS**
Jonathan Cormier, Institut Pprime, CNRS - ENSMA - Université de Poitiers, France
15. **THE ROLE OF CR ON THE SOLIDIFICATION PATH AND AS-CAST MICROSTRUCTURE OF γ (Ni) γ' (Ni₃Al)- γ' (Ni₃Nb) NI-BASE SUPERALLOYS**
Mengtao Xie, Illinois Institute of Technology (IIT), USA
16. **THE EFFECT OF CRYSTALLOGRAPHIC ORIENTATION ON COMPRESSIVE CREEP OF A NI-BASED SUPERALLOY CMSX4**
Osamu Shirahige, Department of Mechanical Engineering, Tokyo Metropolitan University, Japan
17. **EFFECTS OF DETRIMENTAL DIFFUSION ZONE AND HEAT TREATMENT ON CREEP STRENGTH OF ALUMINIZED NICKEL-BASED SINGLE CRYSTAL SUPERALLOYS**
Shunsuke Shimabayashi, Tokyo Metropolitan University, Japan
18. **PRECIPITATION AND CLUSTERING IN THE EARLY STAGES OF AGEING IN INCONEL 718**
Talukder Alam, Australian Key Centre for Microscopy and Microanalysis, The University of Sydney, Australia
19. **INVESTIGATION OF MICROSTRUCTURAL CHANGES OF POWDER PARTICLES DURING HVOF PROCESSING OF COATED SUPERALLOYS**
SJ Yan, Loughborough University, UK

20. **EFFECT OF THE HIP PARAMETERS ON THE MICRO-STRUCTURAL EVOLUTION OF A SX NI-BASED SUPERALLOY**
Inmaculada Lopez-Galilea, Ruhr University Bochum, Germany
21. **A NEW OXIDE MORPHOLOGY MAP: INITIAL OXIDATION BEHAVIOUR OF NI-BASE SINGLE CRYSTAL SUPERALLOYS**
Aya Suzuk Shin, High Temperature Materials Center, National Institute for Materials Science, Japan
22. **NEW RESULTS ON CREEP TESTING OF NI-BASED SUPERALLOYS WITH MINIATURIZED SPECIMENS**
P. Nörtershäuser, Institut für Werkstoffe, Ruhr-Universität Bochum, Germany
23. **THE PRECIPITATION OF TOPOLOGICALLY CLOSE-PACKED PHASES IN NI-RE-W ALLOYS**
F. Li, University of Cambridge/Rolls-Royce University Technology Centre, UK
24. **GRAIN GROWTH KINETICS OF NI-CO BASE DISK SUPERALLOY TMW-4M3 AT TEMPERATURES BELOW G' SOLVUS**
Toshio Osada, National Institute for Materials Science, Japan
25. **SEPARATING THE EFFECTS OF $\hat{\epsilon}$ - $\hat{\epsilon}^2$ LATTICE MISFIT AND MICROSTRUCTURAL INSTABILITY ON CREEP LIFE REDUCTION IN RUTHENIUM-BEARING SUPERALLOYS**
Cathie M.F. Rae, University of Cambridge, U.K.
26. **INFLUENCE OF MISORIENTATION ON TMF PROPERTIES OF AN SC SUPERALLOY CMSX-4**
X. Zhang, National Institute for Materials Science, Japan
27. **MICROSTRUCTURE AND CREEP STRENGTH OF DIFFERENT γ/γ' - STRENGTHENED CO-BASE SUPERALLOY VARIANTS**
Alexander Bauer, Department of Materials Science & Engineering, Institute I, University Erlangen-Nürnberg, Germany
28. **LOCAL MECHANICAL PROPERTIES AND THERMAL STABILITY OF BOND COATS STUDIED BY NANOINDENTATIONS AND ISOTHERMAL OXIDATION**
Ralf Webler, Department of Materials Science & Engineering, Institute I, University Erlangen-Nürnberg, Germany
29. **MECHANICAL CHARACTERIZATION OF THIN, FREESTANDING AL BOND COATS BY IN-SITU TENSILE TESTING**
Markus Krottenthaler, Department of Materials Science & Engineering, Institute I, University Erlangen-Nürnberg, Germany
30. **THIRTY-YEAR RESEARCH ON P/M NICKEL-BASED SUPERALLOYS FOR TURBINE DISKS IN THE USTB**
Benfu HU, University of Science and Technology Beijing, China