

Subray R. Hegde

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Immigration Status

India: Citizen by Birth

Canada: Permanent Resident (Citizenship under process)

USA: O-1 Visa Holder (Alien with extraordinary ability in science)

Education:

Ph.D. (Aerospace Engineering) – 2006-2009

Carleton University, Ottawa

Thesis: “*Sub-Solidus and Super-Solidus Heat Treatments of a Single Crystal Superalloy*”

M.A.Sc. (Materials Engineering) – 2004-06

University of British Columbia, Vancouver

Thesis: “*High Temperature Oxidation Behaviour of the Single Crystal Superalloy CMSX-10*”

M.Sc.(Engg.) (Metallurgy) – 2000-2003

Indian Institute of Science, Bangalore

Thesis: “*Deposition of 8 wt% Ytria Stabilized Zirconia Coatings by Flame Pyrolysis of Solution Precursors*”

B.E. (Metallurgical Engineering) – 1995-1999

National Institute of Technology Karnataka, Surathkal, India

Final Year Project: “*Extraction of Manganese salts from Low Grade Manganese Ore*”

Engineering Diploma (Metallurgy) – 1992-95

VISLSJ Govt. Polytechnic, Bhadravathi, India

Final Year Project: “*Design and Construction of a Cylindro-Conical Ball Mill*”

Professional Experience:

Teaching:

Assistant Professor - September 2013 onwards

Department of Metallurgical and Materials Engg., NIT-Surathkal

- Teaching undergraduate courses on fatigue, fracture, creep and joining of metals
- Supervising undergraduate laboratory course on metallography
- Supervising a research project on thermomechanical processing of FCC materials for superior creep resistance

Teaching Assistant - January/2006-December/2009

Department of Mechanical and Aerospace Engg., Carleton University - Ottawa, Canada

- Served as a Teaching Assistant - Engineering Materials Laboratory for 3 terms. Demonstrated experiments, supervised and monitored undergraduate mechanical and aerospace engineering students on experimentation and handling of furnaces and lab equipment. Trained, corrected and graded the students on technical report writing. Trained new teaching assistants for engineering materials laboratory
- Served as a Teaching Assistant - Problem Analysis in Engg. Materials for 5 terms. Tutored undergraduate students on theoretical principles of engineering materials and solved numerical problems in a class room atmosphere. Conducted and graded quizzes. Trained additional teaching assistants on tutoring and problem analysis in materials engineering.

Industrial Experience:

Senior Metallurgist/Materials Scientist – February/2012-July/2013

Johns Manville Corporation, Berkshire Hathaway Group, Littleton-CO, USA

- Served as corporate metallurgist, and technical expert on structural materials; stainless steels, Fe/Ni/Co based superalloys and precious alloys
- Reviewed and directed all metallurgical/materials related technical activities and consultation for the group
- Directed and provided technical expertise on failure & root cause analysis, corrosion, welding, heat treatment, materials selection, materials processing, materials testing, and materials characterization
- Managed metallurgy lab & personnel, and closely worked with supply chain, in-house alloy shop, and out-sourced vendors on alloy pool inventory, refining, casting, powder metallurgy, machining and fabrication

Senior Materials Engineer – June/2010 – February/2012

Life Prediction Technologies Inc, Ottawa, Canada

- Served as Aerospace Materials Specialist on various consulting projects involving stainless steels, superalloys, metallic overlay coatings, ceramic thermal barrier coatings
- Materials Testing Coordinator – Microstructural Analysis, Creep, Fatigue, Oxidation
- Materials Characterization Specialist – x-ray diffraction, x-ray back reflection, optical microscopy, scanning/transmission electron microscopy, energy dispersive spectroscopy, electron microprobe analysis, thermo-gravimetric analysis, differential thermal analysis
- Diagnostic/Prognostic Investigator – high temperature deformation and failure analysis of gas turbine materials

Management Trainee – July/1999-July/2000

TI Diamond Chain Ltd, Murugappa Group, India

- Served as shop-floor metallurgist in an automotive/industrial chain manufacturing plant
- Successfully commissioned a newly constructed sealed quench heat treatment furnace
- Established heat treatment processes for automotive components
- Performed mechanical testing and metallurgical analysis for heat treated products
- Developed prototypes and new products in a cross functional environment
- Successfully commissioned a newly designed industrial conveyor belt chain in a client's cement plant

Research Experience:

Visiting Guest Worker – 2006-2010

Institute of Aerospace Research, National Research Council Canada, Ottawa

- Coordinated and progressed collaborative superalloy research between Carleton University and Structures and Materials Performance Laboratory – NRC, Ottawa
- Characterized as-cast and heat treated superalloy specimens by standard metallography, optical microscopy, quantitative phase fraction analysis
- Investigated conventional ‘step-wise’ homogenization-solution heat treatments for a heavily alloyed experimental single crystal superalloy with a special emphasis on incipient melting, identified the occurrence of up-hill diffusion during extended isothermal holding that causes incipient melting
- Constructed an incipient melting map for the single crystal alloy and designed a new homogenization-solution methodology involving a continuously heating step between solvus and solidus temperatures
- Performed unconventional heat treatments involving exposures to super-solidus temperatures, identified the phenomenon of epitaxial growth within the single crystal structure during the re-solidification cycle
- Based on the re-solidification behavior, designed an innovative ‘mushy-zone’ heat treatment methodology for highly segregated single crystal superalloys

Research Assistant – 2006-2009

Department of Mechanical and Aerospace Engineering, Carleton University, Ottawa

- Operated a pilot scale Bridgman furnace to produce experimental single crystal superalloy bars by melting polycrystalline master alloys followed by directional solidification by mould withdrawal method
- Characterized single crystal specimens by optical microscopy, phase fraction analysis, microporosity analysis and electron microprobe analysis
- Based on the ‘mushy-zone’ heat treatment concept, designed a super-solidus processing methodology to produce refined single crystal microstructure for superalloys by incorporating a super-solidus exposure step into the standard Bridgman method
- Studied heat treatment responses of both super-solidus processed and regular Bridgman processed single crystal superalloys and confirmed the benefits of modified method
- Proposed and tested a new joining methodology for single crystal superalloys by super-solidus processing route in a Bridgman furnace

Research Assistant – 2004-2005

Department of Materials Engineering, University of British Columbia, Vancouver

- Studied high temperature isothermal oxidation behavior of a third generation single crystal superalloy, CMSX-10
- Characterized superalloy specimens by thermogravimetric analysis, optical microscopy, scanning electron microscopy, transmission electron microscopy, energy dispersive spectroscopy, X-Ray diffraction and X-Ray back reflection

Project Assistant – 2002-2003

Department of Materials Engineering, Indian Institute of Science, Bangalore, India

- Designed and fabricated an experimental flame pyrolysis set-up for depositing partially stabilized zirconia coatings on superalloy substrates and MCrAlY bond coats.
- Characterized deposited coatings by optical microscopy, scanning electron microscopy, energy dispersive spectroscopy, X-Ray diffraction and Image Analysis

Funded Projects

- Proposed and established a collaborative research project between Life Prediction Technologies Inc., University of Ottawa, and Carleton University titled, “*Development of deformation mechanism maps for gas turbine disc materials*” funded by Federal Development Ontario, administered by SME4SME, University of Ottawa, 2010-2012
- Proposed and completed a funded research project titled “*Development of deformation mechanism maps for Grade-91 alloy*” between LPTi and Materials Technologies Laboratory, Hamilton, funded by Natural Resources Canada. 2011-2012
- Successfully handled an Industrial Research Assistance Program on “*High temperature oxidation kinetics and prognostics of thermal barrier coatings*”, funded by NRC 2010-2012

Published Technical Papers

1. Mahyar Asadi, Dominic Guillot, Arnaud Weck, Subray R. Hegde, Ashok K. Koul, Trevor Swatzky and Henry Saari, "Constructing a validated deformation mechanism map using low temperature creep strain accommodation processes for Nickel-base alloy 718", Proceedings of Pressure Vessels and Piping Conference, ASME (2012) 65-73
2. S.R. Hegde, R.M. Kearsey, J.C. Beddoes, *Designing homogenization-solution heat treatments for single crystal superalloys*, Materials Science and Engineering A, 527 (2010) 5528-5538
3. S.R. Hegde, R.M. Kearsey, H. Saari, J.C. Beddoes, *Microstructure refinement of as-cast single crystal superalloys by re-solidification*, Advanced Materials Research 89-91(2010) 250-255
4. S.R. Hegde, R.M. Kearsey, J.C. Beddoes, *Design of solutionizing heat treatments for an experimental single crystal superalloy*, Superalloys 2008, TMS (2008) 301-310
5. S.R. Hegde, R.M. Kearsey, J.C. Beddoes, *Resolidification behaviour of single-crystal superalloys*, Scripta Materialia, 57 (2007) 837-840
6. A. Akhtar, S. Hegde, R.C. Reed, *The oxidation of single-crystal nickel-based superalloys*, JOM-TMS (Journal of Metals), 5, 81 (2006) 37-42
7. R. Kavitha, S. Hegde and V. Jayaram, *Oxide films by combustion pyrolysis of solution precursors*, Materials Science and Engineering A 359 (1-2) (2003) 18-23

Technical Reports

1. S. Hegde, R.M. Kearsey, J.C. Beddoes, P. Au, *Investigation of incipient melting and resolidification behaviour of heavily segregated single crystal superalloys*, LTR-SMPL-2006-0167
2. S. R. Hegde, A. K. Koul, *Thermally grown oxide (TGO) kinetics based life prediction model*, Life Prediction Technologies Inc. (proprietary of LPTi-Canada)

Patenting and Intellectual Properties

1. S.R. Hegde, N. Chalasani, *Submerged combustion burner and melter, and method of use*, International patent applied for Johns Manville Corporation
2. S. R. Hegde, “Submerged Combustion Burners” – International patent applied for Johns Manville Corporation

Professional Association:

- Reviewer, Technical Journals and Conferences of ASME, ASM, TMS and Elsevier Science
- Member, ASM Ottawa Valley Chapter