B. Radhakrishnan

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Education

Ph.D.	Materials Science and Engineering, University of Alabama at Birmingham	1989
M.S.	Metallurgy, Indian Institute of Technology, Madras, India	1977
B.Tech.	Metallurgy, Indian Institute of Technology, Madras, India	1975

Skills

Experience with a wide range of topics related to materials science and engineering, with particular reference to weldability of Nickel base superalloys, microstructure–processing relationships in materials, computer simulation of microstructure and texture evolution during thermomechanical processing, and continuum analysis of materials processing using finite element techniques.

Honors and Awards

- Significant Event Award, Metals and Ceramics Division, ORNL, 1994-95.
- Co-recipient of Warren F. Savage Memorial Award offered by the American Welding Society, April 1996.
- Best Poster Award in Physical Sciences, Electron Microscopy Society of America Meeting, San Jose, August 1991.
- Outstanding Graduate Student Award, Department of Materials Engineering, University of Alabama at Birmingham, 1988-89.
- Phi Kappa Phi Honor Society, University of Alabama at Birmingham, 1989.
- Research Assistantship, University of Alabama at Birmingham, 1986-1989.
- Tau Beta Pi Honor Society, University of Alabama at Birmingham, 1987
- Alpha Sigma Mu Honor Society, University of Alabama at Birmingham, 1988
- Alpha Sigma Mu Honor Society, University of Alabama at Birmingham, 1988
- Best Poster Award, American Welding Society Conference, New Orleans, 1988.
- Best Paper Award for a paper on Electroslag Welding of 316 Stainless Steel presented at the National Welding Seminar, Cochin, India, 1988.
- National Merit Scholarship, India, 1968-1975.
- Government of India Merit Scholarship for Residential Schools, 1965-1969.

Membership in Professional Societies

- American Welding Society
- The Metals Minerals and Materials Society
- Materials Research Society
- TMS subcommittee on Modeling and Simulation

Research Experience

June 1994 – present (Research Staff Member, Oak Ridge National Laboratory, Oak Ridge, TN)

- Developed an improved Monte Carlo based algorithm for simulating grain growth in materials, developed methodology for correlating Monte Carlo and real space-time coordinates in grain growth, and applied above techniques to simulate grain growth in temperature gradients such as in the weld heat affected zone.

- Developed a Monte Carlo based algorithm for simulating recrystallization, developed methodology for correlating Monte Carlo and real space-time coordinates in recrystallization, applied the technique to simulate recrystallization kinetics during continuous annealing (CA) of high strength steels and interstitial-free (IF) steels of interest to automotive industries.

- Developed a mesoscale, probabilistic growth criterion for simulating grain selection during solidification and incorporated the criterion in Cellular Automaton-and Monte Carlo-based simulations of grain structure evolution in weld fusion zones and castings.

- Developed a unique simulation technique for static recrystallization by coupling a Monte Carlo-based recrystallization simulation with a finite element-crystal plasticity based microstructural deformation simulation. Utilized the coupled Finite Element-Monte Carlo technique to develop a fundamental understanding of the influence of deformation microstructure on the spatial distribution and orientations of recrystallized nuclei and their anisotropic growth in the deformation substructure. Applied the above technique to predict the recrystallization texture during thermomechanical processing of Al

Jan. 1990 – June 1993 (Postdoctoral Research Associate, Department of Materials Science and Engineering, University of Alabama at Birmingham)

- Developed a computational technique for calculating the kinetics of formation, spreading and re-solidification of grain boundary liquid during weld thermal cycle.

- Developed Monte Carlo-based grain growth code to simulate grain growth in the presence of stable and soluble second phase particles. Utilized the code to predict the local volume fraction of second phase particles on grain boundaries during thermal cycling in the weld heat affected zone.

Jan 1986 – Dec 1989 (Research Assistant, Department of Materials Engineering, University of Alabama at Birmingham)

- Designed and carried out Gleeble thermomechanical tests to determine the distribution of grain boundary liquid during thermal cycling of Ni-base superalloy 718

- Characterized grain boundary liquid distribution using light microscopy, Scanning Electron Microscopy (SEM) and Analytical Electron Microscopy (AEM).

- Developed a quasi-ternary phase diagram for alloy 718, and used it to predict the mechanism of niobium carbide liquation in alloy 718.

March 1979 – Dec. 1985 (Scientist, Materials Division, National Aeronautical Laboratory, Bangalore, India)

- Designed and fabricated a laboratory-scale electro-slag re-melting (ESR) system. Optimized re-melting practice for low alloy steel compositions of interest to the aeronautical industry.

- Designed and fabricated a laboratory-scale, consumable guide electro-slag welding (CGESW) system. Optimized welding process for low alloy steels and stainless steels using plate electrodes.

Shift Engineer, Deccan Wires Limited, Bangalore, India, January 1977-March 1979.

- Supervised manufacture of high carbon steel and low alloy steel wires for springs through patenting, wire drawing, annealing, oil-quenching and tempering. Performed on-line quality and production control to optimize product quality.

Professional Services:

Principal Reviewer, Welding Journal
Reviewer, Metallurgical and Materials Transactions, A
Past member, Graduate Faculty, Department of Materials Science and Engineering, University of Alabama at Birmingham, 1992-93.
Technical Monitor for a project on Forming of Al alloys, involving several industries, and universities.
Technical Monitor for ORNL's Advanced Turbine System (ATS) program involving several leading turbine-alloy manufacturers in the US.

Past and Current Research Projects:

- "Migration of Constitutionally Liquated Films," Basic Energy Sciences (BES) program, Department of Energy (DOE), Co-PI with R. G. Thompson of the University of Alabama at Birmingham.
- "Making Competitive Alloy 718 Structural Castings," Southern Metal Casting Research, University of Alabama at Birmingham, Co-PI with R. G. Thompson of the University of Alabama at Birmingham.
- "Modeling Microstructural Evolution," Cray Research, Inc, Co-PI with R. G. Thompson of the University of Alabama at Birmingham.
- "Modeling of Microstructural Evolution during Continuous Annealing of High Strength Steels, Cooperative Research and Development Agreement (CRADA) with

General Motors, Co-PI with Thomas Zacharia of ORNL, Defense Program (DP), DOE.

- "Modeling of Residual Stresses in Welds," Office of Naval Research, Co-PI with Thomas Zacharia of ORNL.
- Modeling of Transient Stresses in the HAZ of Intersecting Welds in Al-Li Alloy 2195, Lockheed Martin Manned Space Systems, Michoud, LA
- "Modeling of Microstructural Evolution during Solidification," Advanced Industrial Materials (AIM) Program (Internal Funding), ORNL, PI.
- Co-Principal Investigator, "Non-equilibrium Processing Science", Basic Energy Sciences (BES), DOE.
- Lead ORNL contact for a DOE-sponsored project on Metal Forming through the Center for Synthesis and Processing (CSP).
- Team member of a Computational Materials Science Network (CMSN) project sponsored by DOE with Prof. Tony Rollett of Carnegie Mellon University and Prof. David Srolovitz of the University of Michigan as PI s.
- "Mesoscale Modeling of Hot Tearing," project funded by ORNL's Advanced Turbine System (ATS) program.
- Principal Investigator, Cooperative Research and Development Agreement (CRADA) with South East Center for Aluminum Technology (SECAT), Department of Energy Office of Industrial Technology.

Publications: (21 peer reviewed, 20 conference proceedings)

Presentations (Selected)

1. B. Radhakrishnan, "Multi Length-scale Modeling of Thermomechanical Processing," 2000 Physical Metallurgy Gordon Conference, Holderness School, NH, July 23-28, 2000.

2. B. Radhakrishnan, G. Sarma , and T. Zacharia, "Modeling of Deformation and Recrystallization in FCC Polycrystals," workshop on Multiple-Length-Scale Simulation of Materials Microstructure and evolution, Argonne Theory Institute, Argonne National Laboratory, August 23-25, 1999 (Invited).

3. B. Radhakrishnan, G. Sarma and T. Zacharia, "Mesoscale Simulation of Cube Texture Evolution during Hot Rolling of Aluminum Alloys," Twelfth International Conference on Textures of Materials (ICOTOM 12). August 9-13, 1999, Montreal, Quebec, Canada.

4. B. Radhakrishnan, G. Sarma and T. Zacharia, "Mesoscale Simulation of Microstructure and Texture Evolution during Thermomechanical Processing of FCC polycrystals," 4th International Conference on Recrystallization and Related Phenomena, (RexX '99), July 9-13, 1999, Tsukuba City, Japan

5. B. Radhakrishnan, G. Sarma and T. Zacharia, "Mesoscale Modeling of Microstructural Evolution during Thermomechanical Processing, BES External Peer Review, Oak Ridge National Laboratory, March 14-17, 1999.

6. B. Radhakrishnan, G. Sarma and T. Zacharia, "Modeling of Nucleation during Recrystallization," Third International Conference on Grain Growth (ICGG-3), June 14-19, 1998, Pittsburgh, PA (Invited).

7. B. Radhakrishnan, G. Sarma and T. Zacharia, "Coupled Finite Element-Monte Carlo Simulation of Microstructure and Texture Evolution during Hot Deformation," Hot Deformation of Aluminum Alloys II, Rosemont, IL, October 11-15, 1998 (Invited).

8. B. Radhakrishnan, G. Sarma, T. Zacharia, "Simulation of Microstructure and Texture Evolution during Deformation and Static Recrystallization," Alcoa Technical Center, Pittsburgh, PA, June 12, 1998 (Invited).

9. B. Radhakrishnan and T. Zacharia, "Modeling of Recrystallization during Continuous Annealing of High Strength Steel Sheets," Materials TACT meeting on GMR CRADA on Lightweight Materials, General Motors Technology Center, Warren, MI, February 10, 1994.

10. B. Radhakrishnan and T. Zacharia, "Modeling of Recrystallization during Continuous Annealing," Annual Review Meeting, GMR CRADA on Lightweight Materials, General Motors Technology Center, Warren, MI, January 26, 1995.

11. B. Radhakrishnan and T. Zacharia, "On the Prediction of HAZ Grain Size using Monte Carlo Simulation," International Conference on Modeling and Control of Joining Processes, December 8-10, Orlando, Florida, 1993.

12. B. Radhakrishnan and R. G. Thompson, "Modeling of Subsolidus Liquation in the Weld Heat Affected Zone," Proceedings of the 3rd International Conference on Trends in Welding Research, Gatlinburg, TN, June 1-5, 1992.

13. B. Radhakrishnan and R. G. Thompson, "Modeling of Microstructural Evolution in the Weld Heat Affected Zone," Sandia National Laboratories, Livermore, CA, July 22, 1991.

14. B. Radhakrishnan, "Subsolidus Liquation and Cracking in the Weld Heat Affected Zone," Oregon Graduate Institute of Science and Technology, February 8, 1991.

15. B. Radhakrishnan and R.G. Thompson, "Liquid Film Migration in the Weld Heat Affected Zone of Alloy 718," TMS Fall Meeting, Indianapolis, Indiana, October 2-5, 1989.

16. B. Radhakrishnan and R.G. Thompson, "The Kinetics of Intergranular Liquation in the weld HAZ of Alloy 718," Proceedings of the 2nd International Conference on Trends in Welding Research, May 14-18, 1989, Gatlinburgh, TN

17. B. Radhakrishnan and R.G. Thompson, "Diffusional Effects in Heat Affected Zone Liquation," TMS Fall Meeting, Chicago, Illinois, September 1988.

18. B. Radhakrishnan and R.G. Thompson, "Correlation of Hot Cracking Susceptibility with Liquid Phase Distributions in Cast Alloy 718, "American Welding Society Convention, New Orleans, Louisiana, April, 1988.