

## **K. S. Ravi Chandran**

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### **I. SUMMARY**

<b>Current Position:</b>	Tenured Professor
<b>Citizenship:</b>	U.S. Citizen
<b>Current Research Topics:</b>	Computational Alloy Design and Processing of Materials Novel PM Processing of Titanium Alloys Li-ion Battery Materials Science, Neutron Diffraction
<b>Research supported by:</b>	NSF, AFOSR, ARL, DARPA, Several private Industries (Cumulatively about \$8M, about \$320K/year; ~20 years)
<b>Graduate Students Supervised:</b>	Graduated 25 MS & PhD students as sole adviser.
<b>Publications:</b>	~160
<b>Citations:</b>	~ 4800, H-index of 38.
<b>Presentations:</b>	About 120 (invited and others)
<b>Research Laboratory:</b>	Director of Alloy Processing lab with SPS Unit, vacuum sintering and powder processing facilities, Director of mechanical behavior Laboratory, Director of Electrochemical Laboratory

### **II. RESEARCH BACKGROUND/EXPERTISE**

- Alloy Design, Physical Metallurgy, Mechanical Behavior of Materials
- Materials Processing by Powder Metallurgy
- Electrochemistry of Li-ion battery electrodes, analytical modeling of Li-ion cells, in-situ neutron diffraction, neutron imaging
- Mathematical modeling of solid-state diffusion and heat transfer problems in materials science
- Synthesis of nano-ceramics, cermets and ceramic coatings, biomedical implant materials

### **III. ACADEMICS**

- Ph. D., Materials Science and Engineering, (1989), Indian Institute of Science, Bangalore, IN
- M. Eng. (Distinction), Physical Metallurgy (1985), Indian Institute of Science, Bangalore, IN
- B. Eng. (Honors), Metallurgical Engineering (1983), PSG Institute of Technology, IN

#### IV. PROFESSIONAL HISTORY

- **Director**, State Center of Excellence on Titanium and Boride Materials (2005--2010)
- **Air Force Summer Faculty Fellow**: Materials Behavior Branch, Air Force Research laboratory Wright Patterson AFB, OH (Summer 1998)
- **Associate Professor**: Department of Metallurgical Engineering, University of Utah, Salt Lake City, UT (1998-2002); **Assistant Professor**: same as above (1995-98)
- **Research Scientist**: Wright Patterson AFB/Universal Energy Systems (UES), Inc., Dayton, OH (1993-95)
- **U. S. National Research Council Fellow**: Air Force Research Laboratory, Wright-Patterson AFB, Dayton, OH (1989-93)

#### V. AWARDS

- **Elected Fellow of ASM**, American Society of Materials International, 2010
- **Outstanding Teaching Award**, Department of Materials Science & Engineering, 2019
- **Outstanding Researcher Award**, Department of Metallurgical Engineering, 2016
- **University of Utah Showcase for Extraordinary Faculty Achievements**, 2016
- **Outstanding Teaching Award** (2007), Department of Metallurgical Engineering
- **Champion H. Mathewson Award** (2006) of The Minerals, Metals and Materials Society (TMS-AIME) for notable contribution to Metallurgical Science
- **Stoel Rives Utah Innovation Award Finalist** (2004) for TiB Orthopedic Devices
- **Outstanding Chair Citation**, United Engineering Foundation, NY, 1998
- **Outstanding Teaching Award** (1997), Dept. of Metallurgical Engineering, University of Utah
- **U.S. Air Force Citation for Exemplary Research**, Wright Patterson Air Force base, OH, 1994
- **NRC Fellowship Award**, U. S. National Research Council, U.S. National Academy of Sciences, Washington, 1989-92
- **A. K. Bose Gold Medal**, Indian Institute of Metals (Nationally Best M. Eng. Thesis), 1985
- **K. P. Abraham Medal**, Indian Institute of Science (Top GPA in M. Eng.), 1985
- **A. A. Krishnan Medal**, Indian Institute of Science (Best M. Eng. Thesis), 1985
- **Best B. Eng. Thesis award**, Directorate of Technical Education, Madras, 1983

#### VI. PROFESSIONAL ACTIVITIES & SERVICE

##### • Research Collaborations

Ortho Development Corporation, UT (Biomedical Devices), 2003-  
GE Aviation, OH (Fatigue of Superalloys), 2006-  
Oak Ridge National Laboratory, TN (Neutron Diffraction & Imaging) 2013-  
Las Alamos National Laboratory, NM (Neutron Diffraction) 2012-  
University of Illinois, Urbana Champagne (Computational Design of Structural Materials)

##### • Patents

US Patent, 7264682 B2: Titanium Boride Coatings on Titanium Surfaces  
US Patent, 7501081 B2: Nanostructured Titanium Boride Monolithic Material

US Patent, 7459105 B2: Nanostructured Titanium Boride Monolithic Material

- **Conference Organizer:**

- **Symposium on Advanced Manufacturing of Powder Metallurgy Titanium**

- Principal organizer (with Z. Fang, A. Imam and J. Stewart), MS&T2014 Meeting in Pittsburgh October 2014

- **Symposium on Competing Failure Modes and Variability in Fatigue**

- Principal organizer (with J. M. Larsen, G. T. Cashman and T. Sakai), Int. Conf. in MS&T2008, Pittsburgh, October 2008. Edited the proceedings published as Int. J. Fatigue, Vol. 32, Issue 3, 2012

- **Small Fatigue Cracks: Mechanics, Mechanisms and Applications:** Principal

- organizer (with Prof. R. O. Ritchie, and Prof. Y. Murakami), Engineering Foundation International Conference, Kona, Hawaii, December, 1998

- Edited the proceedings published as a book by Elsevier

- **Panels:**

- NRC-AFOSR Review Panels for Proposals (2000, 2002)

- NSF-DMR Review Panels for Proposals (2000, 2004, 2008, 2010)

- **Reviewer:**

- Acta Materialia, Scripta Materialia, Metallurgical and Materials Transactions, International J. of Fatigue, International J. of Fracture, J. of American Ceramic Society, J. of Testing and Evaluation, Materials Science & Engineering, ASME J. of Engineering Materials and Technology, J. Materials Science, Surface Coatings & Technology

- Proposals from NSF, DOE, ARO, AFOSR, ONR and SBIR Programs

- **Professional Service Responsibilities:**

- **External**

- Chair, ASM Gold Medal Selection Committee (2020--)

- Member, ASM Gold Medal Selection Committee (2017-2020)

- Member, AISI Awards Committee (2012-)

- Chair, TMS Awards & Selections Committee (2015-2018)

- Key Reader, Board of Review, Metallurgical Transactions A (2003-)

- TMS/ASM Mechanical Behavior Committee (2002-)

- TMS/ASM Composite Materials Committee (2004-)

- TMS/ASM Titanium Committee (2007-)

- Consultant, EG&G and Toole Army Chemical Weapons Depot (2006)

- Executive Member, TMS Structural Materials Division (1996-2000)

- TMS Student Affairs Committee Member (1996-2000)

- **Internal**

- Chair, College Council (2018-)

- MSE Faculty Search Committee (2016, 2018, 2019)

- Elected to University Senate, 2016-2019

- Assistant Chair, 2002-2005

- RPT Committee Chair, 2010-2013

- Department Coordinator, Ivor Thomas Building Committee, 2006-2007

- Department Newsletter Editor (2005-2012)

- Coordinator, Materials Characterization Facility, (1998-)

Member, University Promotion and Tenure Advisory Committee (2007-2010)  
Member, University of Utah Tech Transfer Advisory Committee (2004-2010)  
Member of University Research Committee (2004)  
Undergraduate Student Advisor (2012-2014)  
Graduate Admissions committee (1995-2016)  
College Curriculum Committee (1995-2003)  
Graduate Committees of several MS and PhD students  
College Teaching Awards Committee (1995-2003)

## VII. TEACHING

- **Courses Taught:**

Met. E. 1620	Introduction to Physical Metallurgy	(before 2002)
Met. E. 3530	Experimental Techniques & Laboratory	(all years)
Met. E. 5450	Mechanical Behavior of Materials	(all years)
Met. E. 5760	Capstone Design Problem in Physical Metallurgy	(every alternate year)
Met. E. 6300	Alloy and Material Design	(Graduate Level)
Met E. 6100	Fatigue and Fracture Mechanics	(Graduate Level)

## VIII.1. RESEARCH LABS/EQUIPMENT OF MY GROUP

### A. Powder Materials Processing Laboratory:

Spark Plasma Sintering Unit: Thermal Technology 10000 A spark plasma sintering system  
2 Sintering Furnaces; 2 Melting furnaces  
Jar Mill, Ball Mill, containers for powder milling in inert environment

### B. Physical metallurgy Laboratory:

Optical and stereomicroscopes, mounting and polishing equipment, precision sectioning machines, high temperature inert gas furnace, induction heating unit, high temperature creep testing furnace

### C. Fatigue & Fracture Mechanics Laboratory:

MTS servohydraulic fatigue and Instron creep test systems, induction and resistance heating systems and furnaces, Lab-made ballistic armor test system

### D. Li Battery Research Laboratory:

MBraun glove boxes, potentiostats, source meters, Gamry electrochemical testers, Instec substrate heater

## VIII.2. FUNDING OF RESEARCH PROJECTS (ACTIVE & COMPLETED)

35. In Operando Neutron Diffraction Investigation of Li Battery Electrodes, **Office of Science, DoE**, \$440,000 (2018-2021)
34. Lead PI of Project: Computational Design, Rapid Processing and Characterization of Multiple Classes of Materials to Accelerate Material Innovation, (2014-18) **DMREF Program, NSF**,

- \$1,572,000 with University of Utah as lead (\$1,172,000) and D. Trinkle, University of Illinois, as subaward, received \$400,000
33. Mechanical Breakage of Mineral Particles-II, **METSO Corporation**, \$130,000 (2019-21)
  32. A new method for low cost production of titanium alloys for reducing energy consumption of mechanical system, **DOE ARPA-E Advanced Manufacturing Initiative**, (Co-PI with Z. Fang) \$1,800,000 (2012-16).
  31. Breakage energy of mineral particles at high compressive compactions, **METSO Corporation**, \$79,869 (2016-17)
  30. Research on Consolidation of Hard Particles at High Energies, **METSO Corporation**, \$97,608 (2014-16)
  29. In-situ neutron diffraction study of electrochemically induced phase transitions in anode materials, **DOE-BES Neutron Scattering Program**, \$414,000, (2012-17).
  28. Understanding electrochemically induced phase transitions, **Division of Materials Research, NSF**, \$95,000, (2012-13).
  27. REU Supplement for Understanding electrochemically induced phase transitions, **Division of Materials Research, NSF**, \$6,000, (2012-13).
  26. Measurement of Particle Consolidation at High Energies, **METSO Corporation**, \$65,000 (2013-14)
  25. Determination of Breaking Energy of Material Particles, **METSO Corporation**, \$40,000 (2012-13)
  24. Li-Mg Alloys as anodes for energy storage, **University of Utah Seed Grant** \$27,000, (2011-13).
  23. Determination of Breakage Energies of Particles, **METSO Corporation**, \$120,000 (2010-11)
  22. Exploiting anomalous diffusion near phase transition for deep surface coatings, **Division of Materials Research, NSF**, \$168,340, (2007-09).
  21. Designing materials property information system, **University Seed Grant**, \$27,000, (2007-08).
  20. State funding for Center of Excellence on Titanium Boride Materials and Biomedical Devices, **Utah State Office of Economic Development**, \$372,000, (2003-08).
  19. Industry funding for Center of Excellence on Titanium Boride Materials and Biomedical Devices, **Ortho Development Corporation**, \$382,000, (2003-08)
  18. Industry funding for “Center of Excellence on Titanium Boride Materials and Biomedical Devices, **Ortho Development Corporation**, \$40,000, (2003-08)
  17. Controlling the Duality of Fatigue for large improvements in fatigue life of engineering materials, Small Grant for Exploratory Research, **Division of Materials Research, NSF**, \$90,000, (2006-07).
  16. Orientation Imaging Microscopy of small fatigue cracks, **Vextec Inc.**, DARPA subcontract, \$60,000, (2004-05).
  15. Characterization of Magnesium Alloys, **US Magnesium**, \$46,432, (2002-05)
  14. Microstructure and Mechanical Behavior of in-situ Ceramic-Titanium Composites Reinforced with TiB Whiskers, **Army Research Office**, \$325,000, (1999-03)

13. Microstructural Aspects of Small Fatigue Cracks, **Division of Materials Research, NSF**, \$270,000, (1997-00)
12. Fatigue of Beta Titanium Alloys, funded by **Air Force Office of Scientific Research**, \$300,000 for three years, from March 1996
11. Finite Element Modeling of Mechanical Behavior of Functionally Graded Ceramic-Titanium Metal Armor-SBIR Phase II research, **Army Research Laboratory**, Aberdeen Proving Ground, MD (through Cercom, Inc., Vista, CA), \$140,000 for two years, from June 1996
10. Functionally Graded Ceramic-Titanium Metal Armor-SBIR Phase I research, **Army Research Laboratory**, Aberdeen Proving Ground, MD, (through Cercom, Inc., Vista, CA), \$12,000 for six months, from April 1995
9. Thermophysical Properties of Coatings for Thermal Barrier Applications, **Air Force Research Laboratory**, WPAFB, OH, \$ 50,000 for one year from June 95
8. Mechanical Behavior of TiAl Lamellar Polycrystals, **Air Force Office of Scientific Research**, \$ 40,000 for one year, from May 2000
7. Development of Magnesium Alloys, funded by **Magnesium Corporation**, UT, \$50,000 1999-2002
6. Grant for Small Fatigue Cracks, Engineering Foundation Conference, **NSF**, \$ 5,000 for conference support, 1998-1999
5. Grant for Small Fatigue Cracks, Engineering Foundation Conference, **United Engineering Foundation**, New York, \$ 5,000 for conference support, 1998-1999
4. Grant for Small Fatigue Cracks, Engineering Foundation Conference, **AFOSR**, \$6,000 for conference support, 1998-1999
3. Grant for Exploratory Research on Novel Nanoscale Materials, **College of Mines and Earth Sciences**, \$11,000, 1996
2. Grant for Exploratory Research on Synthesis of Cr-Nb Intermetallics, **College of Mines and Earth Sciences**, \$9,000, 1997
1. Grant for Exploratory Research on Research on Lightweight Mg Alloys **College of Mines and Earth Sciences**, \$10,000, 1998

### VIII.3. FUNDED RESEARCH INSTRUMENTATION WITH OTHER PIs

- “Acquisition of a Variable Pressure Scanning Electron Microscope with EDAX and OIM for Materials Research.” Funded by Materials Research Instrumentation Program, **NSF**, \$300,000 (Co-PI with Dr. J E. Shield and Dr. A.V. Virkar), 1999
- “Acquisition of a Regional-use Surface Analysis System,” R. Roemer, L. Reith, I. Harvey, S. Anderson (PIs). \$750,000. Contributed a major section for thin film chemical analysis. **NSF** (2005-2006)

## **IX. LIST OF PUBLICATIONS & PRESENTATIONS**

~ 160 Publications including reviews above (Citations>5400, H-index 38)

~ 120 Presentations

### **IX.1. EDITED BOOKS/JOURNALS**

1. Guest Editor, **International Journal of Fatigue, Special Issue on Competing Failure Modes and variability in fatigue**, Vol. 32, No.3, 2010.
2. Guest Editor, **JOM**, May 2003 Topical Issue: **Titanium-Boron Alloys and Composites**
3. **Small Fatigue Cracks: Mechanics, Mechanisms and Applications**, Proceedings of the International Engineering Foundation Conference, edited by K. S. Ravichandran, R. O. Ritchie and Y. Murakami, Elsevier Science Ltd., London, UK, 1999

### **IX.2. HANDBOOK CHAPTERS / JOURNAL REVIEWS**

159. Z. Fang, James D. Paramore, Pei Sun, KS Ravi Chandran, Ying Zhang, Yang Xia, Fei Cao, Mark Koopman, and Michael Free. "Powder metallurgy of titanium—past, present, and future." **International Materials Reviews** (2017): 1-53.
158. P. Kumar, K. S. Ravi Chandran, "Strength-Ductility Property Maps of Powder Metallurgy (PM) Ti-6Al-4V Alloy: A Critical Review of Processing-Structure-Property Relationships," **Metall. Mater. Trans**, 48A, (2017) p. 2301
157. F. Cao, KS Ravi Chandran. "Fatigue Performance of Powder Metallurgy (PM) Ti-6Al-4V Alloy: A Critical Analysis of Current Fatigue Data and Metallurgical Approaches for Improving Fatigue Strength." **JOM**, Vol. 68, 2016, pp. 735-746
156. K. S. Ravi Chandran, K. B. Panda and S. S. Sahay, "Overview: TiB<sub>w</sub>-reinforced Ti Composites: Processing, Properties, Application Prospects and Research Needs," **JOM**, Vol. 56, No. 5, 2003, pp. 42-48
155. B. Sarma and K. S. Ravi Chandran, "Recent Advances in Surface Hardening of Titanium," Review, **JOM**, Vol. 63, February 2011, pp. 85-92
154. S. K. Jha and K. S. Ravichandran, "Review of High Cycle Fatigue Resistance in Beta Titanium Alloys," **JOM**, March 2000, pp. 30-35
153. K. S. Ravichandran and A. K. Vasudevan, "Fracture Resistance of Structural Alloys," in **ASM Fatigue and Fracture Handbook**, American Society for Materials International, Vol. 19, 1996, p. 381
152. K. S. Ravichandran, "Effect of Crack Shape on Crack Growth," in **ASM Fatigue and Fracture Handbook**, American Society for Materials International, Vol. 19, 1996, p. 159

### **IX.3. ALL PUBLICATIONS**

151. Chandran, KS Ravi, and Sarah E. Galyon Dorman. "The nature of specimen-size-effect on fatigue crack growth and net-section fracture mechanics approach to extract the size-independent behavior." *International Journal of Fatigue* 145 (2021): 106088.
150. Vadlamani, B., M. Jagannathan, J. Palmer, and KS Ravi Chandran. "Large effect of structural variations in the columnar silicon electrode on energy storage capacity and electrode structural integrity in Li-ion cells." *Journal of Materials Research*: 1-13.
149. Ranjan, Ashwani, Rajnesh Tyagi, Vikas Jindal, and K. S. R. Chandran. "Investigation on Wear Characteristics of TiBFe Composites Containing 10 at.% Boron and 10-30 at.% Iron." *Journal of Materials Engineering and Performance* (2020): 1-10.
148. Degnah, A., J. Du, and KS Ravi Chandran. "CALPHAD Approach and processing of a multicomponent titanium matrix composite for high strength and fracture toughness." *Materials Science and Engineering: A* 781 (2020): 139210.
147. Chandran, KS Ravi. "Fracture mechanics analysis of generalized compact tension specimen geometry using the mechanics of net-section." *Engineering Fracture Mechanics* 222 (2019): 106703.
145. Du, J., V. Jindal, A. P. Sanders, and KS Ravi Chandran. "CALPHAD-guided alloy design and processing for improved strength and toughness in Titanium Boride (TiB) ceramic alloy containing a ductile phase." *Acta Materialia* 171 (2019): 18-30.
144. Lark, Alexander, Jun Du, and KS Ravi Chandran. "Material design and processing of a new class of titanium boride cermets with tough metallic phases and mechanical properties." *Journal of Materials Research* 33, no. 24 (2018): 4296-4306.
143. Rou, Somnaang, and KS Ravi Chandran. "First principles calculation of single-crystal elastic constants of titanium tetraboride (Ti<sub>3</sub>B<sub>4</sub>) and experimental validation." *Journal of the American Ceramic Society* (2018) DOI: 10.1111/jace.15562
142. Jindal, Vikas, Aditya Sarda, Ahmed Degnah, and KS Ravi Chandran. "Effect of iron & boron content on the Spark Plasma Sintering of Ti-B-Fe alloys." *Advanced Powder Technology* 30, no. 2 (2019): 423-427.
141. Chandran, KS Ravi. "Fracture mechanics analysis of generalized compact tension specimen geometry using the mechanics of net-section." *Engineering Fracture Mechanics* 222 (2019): 106703.
140. Chandran, KS Ravi. "A new exponential function to represent the effect of grain size on the strength of pure iron over multiple length scales." *Journal of Materials Research* 34, no. 13 (2019): 2315-2324.
139. Chandran, KS Ravi. "Net-section based approach for fatigue crack growth characterization using compact tension specimen: Physical correlation of mean stress or stress ratio effects." *International Journal of Fatigue* 124 (2019): 473-482.
138. Kumar, P., and KS Ravi Chandran. "Enhancement of fatigue resistance using the accelerated diffusion/sintering phenomenon near beta transus temperature in Ti-6Al-4V powder metallurgy alloy." *Scripta Materialia* 165 (2019): 1-5.
137. Chandran, KS Ravi. "Mechanics of fatigue crack growth under large-scale plasticity: A direct physical approach for single-valued correlation of fatigue crack growth data." *International Journal of Fatigue* 117 (2018): 299-313.
136. Chandran, KS Ravi. "Fatigue crack growth in bending: Successful correlation of mean stress



- (stress ratio) effects using the change in net-section strain energy." **Fatigue & Fracture of Engineering Materials & Structures** 41, no. 12 (2018): 2566-2576.
135. Vadlamani, B. S., M. Jagannathan, and KS Ravi Chandran. "Silicon with columnar microporous architecture for ultrahigh total energy-storage capacity and with highly reversible lithiation performance." *ACS Applied Energy Materials* 1, no. 3 (2018): 993-1001.
  134. Y. Zhang, KS Ravi Chandran, and H. Z. Bilheux. "Imaging of the Li spatial distribution within V<sub>2</sub>O<sub>5</sub> cathode in a coin cell by neutron computed tomography." **Journal of Power Sources** 376 (2018): 125-130.
  133. Chandran, KS Ravi. "A novel characterization of fatigue crack growth behavior in metals: The physical relationship between the uncracked section size and the remaining fatigue life." **Materials Science and Engineering: A** 174 (2018) 117-123
  132. Chandran, KS Ravi. "Insight on physical meaning of finite-width-correction factors in stress intensity factor (K) solutions of fracture mechanics." **Engineering Fracture Mechanics** 186 (2017): 399-409.
  131. J. Du and K. S. Ravi Chandran, "Formation of bulk titanium boride (TiB) nano-ceramic with Fe–Mo addition by electric-field-activated-sintering, **J. Am. Ceram. Soc.** Vol. 100 (2017) 5450-5459
  130. Y. Zhang, K. S. Ravi Chandran, H. Z. Bilheux, M. Jagannathan, J. C. Bilheux, "The Nature of Electrochemical Delithiation of Li-Mg Alloy Electrodes: Neutron Computed Tomography and Modeling of Li Diffusion and Delithiation Phenomenon," **Journal of the Electrochem. Soc.**, 164 (2), 2017, A28-A38.
  129. K. S. Ravi Chandran, "A physically based constitutive equation to characterize S-N fatigue," **Proc. Seventh Int. Conf. Very High Cycle Fatigue**, Dresden, July 3-4, 2017, Edited by M. Zimmerman and H. J. Christ, Siegener Werkstoffkundliche Berichte, 2017, p. 113
  128. K. S. Ravi Chandran, "A physically based constitutive equation for fatigue crack growth," **Proc. Seventh Int. Conf. Very High Cycle Fatigue**, Dresden, July 3-4, 2017, Edited by M. Zimmerman and H. J. Christ, Siegener Werkstoffkundliche Berichte, 2017, p. 148
  127. Chandran, KS Ravi. "A new approach to the mechanics of fatigue crack growth in metals: Correlation of mean stress (stress ratio) effects using the change in net-section strain energy." **Acta Materialia** 135 (2017): 201-214.
  126. Chandran, KS Ravi. "New approach for the correlation of fatigue crack growth in metals on the basis of the change in net-section strain energy." **Acta Materialia** 129 (2017): 439-449.
  125. Chandran, KS Ravi. "A universal functional for the physical description of fatigue crack growth in high-cycle and low-cycle fatigue conditions and in various specimen geometries." **International Journal of Fatigue** 102 (2017): 261-269.
  124. F. Cao, and K. S. Ravi Chandran. "The role of crack origin size and early stage crack growth on high cycle fatigue of powder metallurgy Ti-6Al-4V alloy." **International Journal of Fatigue** 102 (2017): 48-58.
  123. F. Cao, K. S. Ravi Chandran and P. Kumar, "New Approach to Achieve High Strength Powder Metallurgy Ti-6Al-4V Alloy through Accelerated Sintering at  $\beta$ -Transus Temperature and Hydrogenation-dehydrogenation Treatment," **Scripta Mater.**, Vol. 130,

2016, pp. 22-26

122. K. S. Ravi Chandran, "A physical model and constitutive equations for complete characterization of SN fatigue behavior of metals," **Acta Mater.**, Vol. 121, 2016, p. 85-103
121. J. Du, A. P. Sanders, V. Jindal and K. S. Ravi Chandran, "Rapid In situ formation and densification of nanostructured titanium boride by electric field activated sintering," **Scripta Mater.**, Vol. 123, 2016, pp. 95-99
120. B. Sarma and K. S. Ravi Chandran, "Superior surface hardening by cyclic-phase-change-diffusion (CPCD): Supersaturation of hard boride in titanium subsurface layer," **Scripta Mater.**, Vol. 124, 2016, pp. 121-125
119. K. S. Ravi Chandran, A. P. Sanders, J. Du, L. S. Walker, "Rapid synthesis of nanostructured titanium boride (TiB) by electric field activated reaction sintering," Processing, Properties, and Design of Advanced Ceramics and Composites, Vol. 259, **Ceramic Transactions**, John Wiley & Sons, 2016, p. 187.
118. F. Cao and K. S. Ravi Chandran, "A new Approach to Improve Fatigue Strength of Ti-6Al-4V," **Metall. Mater. Trans. A**, Vol. 47, 2016, 2335-2345
117. P. Kumar, K. S. Ravi Chandran, F. Cao, M. Koopman, and Z. Fang, "The Nature of Tensile Ductility as Controlled by Extreme-Sized Pores in Powder Metallurgy Ti-6Al-4V Alloy" **Metall. Mater. Trans. A**, Vol. 47, 2016, 2150-2161
116. K. S. Ravi Chandran, F. Cao, and J. C. Newman. "Fatigue crack growth in miniature specimens: The equivalence of  $\Delta K$ -correlation and that based on the change in net-section strain energy density." **Scripta Materialia** 122 (2016): 18-21.
115. K. S. Ravi Chandran, "Mechanical Fatigue of Polymers: A New Approach to predict the S-N behavior," **Polymer**, 91, 2016, 222-238
114. P. Sun, Pei, Z. Fang, M. Koopman, Y. Xia, J. Paramore, K.S. Ravi Chandran, Y. Ren, and J. Lu. "Phase Transformations and Formation of Ultra-Fine Microstructure During Hydrogen Sintering and Phase Transformation (HSPT) Processing of Ti-6Al-4V." **Metall. Mater. Trans. A**, Vol. 46, 2015, 5546-5560
113. K. S. Ravi Chandran, A. P. Sanders and J. Du, "Rapid Synthesis of Nanostructured Titanium Boride (TiB) by Electric Field Activated Reaction Sintering," In Processing, Properties, and Design of Advanced Ceramics and Composites, **Ceramic Trans.**, Edited by G. Singh et al., Vol. 259, 2015, p. 187
112. J. D. Paramore, Z. Zak Fang, Pei Sun, M. Koopman, K.S. Ravi Chandran, M. Dunstan, "A powder metallurgy method for manufacturing Ti-6Al-4V with wrought-like microstructures and mechanical properties via hydrogen sintering and phase transformation (HSPT)," **Scripta Mater.**, Vol. 107, 2015, p. 103
111. P. Kumar, K.S. Ravi. Chandran, F. Cao, P. Sun, M Koopman, Z. Z. Fang, Effects of Powder Processing and Sintering on Tensile Ductility of PM Ti-6Al-4V alloy made by Hydrogen Sintering of Titanium Hydride Powders, **Proc. of the 13th world conference on Titanium**, Edited by V. Venkatesh, et al., Wiley-TMS, pp. 1355-1359, 2016.
110. P. Kumar, K. S. Ravi Chandran, A Quantitative Relationship to Predict the Effect of Extreme-Sized Pores on Tensile Ductility of Powder Metallurgy Ti-6Al-4V alloy, **Proc. of the 13th world conference on Titanium**, Edited by V. Venkatesh et al., Wiley-TMS, pp. 1441-1446, 2016.

109. F. Cao, P. Kumar, M. Koopman, C. L. Lin, Zak Z. Fang, K. S. Ravi Chandran, "Understanding Competing Fatigue Mechanisms in a Powder Metallurgy Ti-6Al-4V Alloy: Role of Crack Initiation and Duality of Fatigue Response," **Mater. Sci. Eng. A**, Vol. A630, 2015, p. 139
108. F Cao, KS Chandran, P Kumar, P Sun, M Koopman, Z.Z. Fang, Improved Fatigue Performance of PM Ti-6Al-4V Alloy Processed By Hydrogen Sintering and Phase Transformation of TiH<sub>2</sub> Powders, **Proc. of the 13th World Conference on Titanium**, edited by V. Venkatesh et al., 2016, John Wiley & Sons, pp. 1465-1469.
107. K. S. Ravi Chandran, "Joule Heating of Graphene and Nanowires: Analytical Model for Current-induced Transient Temperature Evolution and Substrate Effects," **Int. J. Heat and Mass Transfer**, Vol. 88, 2015, p.14
106. P. Sun, Z. Fang, M. Koopman, J. Paramore, K. S. Ravi Chandran, Y. Ren, and J. Lu. "An experimental study of the (Ti-6Al-4V)-xH phase diagram using in situ synchrotron XRD and TGA/DSC techniques," **Acta Mater.**, 84 (2015): 29-41
105. M. Jagannathan, K. S. Ravi Chandran, "Analytical modeling and simulation of electrochemical charge/discharge behavior of Si thin film negative electrodes in Li-ion cells," **Journal of Power Sources**, Vol. 247, 2014, pp. 667-675
104. B. Vadlamani, K. An, M. Jagannathan, K.S.R. Chandran, "An In-Situ Electrochemical Cell for Neutron Diffraction Studies of Phase Transitions in Small Volume Electrodes of Li-Ion Batteries," **Journal of The Electrochem. Soc.**, 161 (10), 2014, A1731-A1741
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#### **IX.4. INVITED PRESENTATIONS**

1. K. S. Ravi Chandran, "CALPHAD based Alloy Design of Multiclass materials," Department of Materials Engineering, Indian Institute of Science, 9 December 2018
2. K. S. Ravi Chandran, "New Advances and Physical Models of Fatigue," Department of Materials Science and Engineering, Indian Institute of Technology, 2 Jan 2019
3. K. S. Ravi Chandran, Fatigue Performance of AM Titanium: A Critical Analysis of PM Ti-6Al-4V Fatigue Behavior & Relevance to Additive Manufacturing, Symposium on Additive Manufacturing of Metals, MS&T 2017, Pittsburgh, 14 August 2017.

4. K. S. Ravi Chandran, "A Physically Based Law for S-N Fatigue Behavior of Metals," Invited Presentation, Fatigue in Materials: Fundamentals, Multiscale Modeling and Prevention, 2017 TMS Annual Meeting & Exhibition, San Diego, March 2017.
5. K. S. Ravi Chandran, The Complexity of Fatigue Behavior as Determined by Competing Failure Mechanisms in Metallic Materials, **Fatigue and Microstructure: A Symposium on Recent Advances, MS&T 2011**, Columbus, Oct. 18, 2011
6. K. S. Ravi Chandran, "Competing Failure Modes in Fatigue," Engineering Materials Laboratory, **GE Aviation**, Cincinnati, July 2011
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8. K. S. Ravi Chandran, "New advances in titanium research and development in USA," **Defense Metallurgical Research Laboratory**, Hyderabad, India. August 2008.
9. K. S. Ravi Chandran, "Strange aircraft accidents and unusual fatigue failures," **Int. Conf. Recent Advances in Materials Processing**, December 2006, PSG Institute of Technology, Coimbatore, India
10. K. S. Ravi Chandran, "Advances in Biomedical Implants," **Int. Conf. Recent Advances in Materials Processing**, December 2006, PSG Institute of Technology, Coimbatore, India
11. **Special Lecture**, K. S. Ravi Chandran, Computational Determination of Anisotropic Elastic Constants of Titanium Borides, Dept. of MSE, **Case Western Reserve University**, Cleveland, OH, September 2004
12. K. S. Ravi Chandran, "Computationally determined Anisotropic Elastic Constants of TiB," Presented in **Ab-Initio Computer Simulations of Mechanical Behavior, WIEN2K Workshop**, Penn State University, June 2004
13. K. S. Ravi Chandran, "New advances in titanium research, development and applications for transportation and defense industry, **Tata Research Design Development Center**, Pune, India, April 2004
14. K. S. Ravi Chandran, "New advances in titanium research, development and applications for transportation and defense industry, **Indian Institute of Technology**, Mumbai, India, April 2004
15. K. S. Ravi Chandran, "In situ titanium metal matrix composites and graded structures as affordable material solutions," **Low Cost Titanium Workshop: Applications for Ship and Ground Vehicle Structures**, December 2003
16. **Gordon Laboratory Lecture**, K. S. Ravi Chandran, Titanium Based Functionally Graded Materials: Synthesis and Fracture Mechanisms, **Cambridge University**, UK, May 2002
17. K. S. Ravi Chandran, "Fatigue of Beta Titanium Alloys: Role of Microstructure on Crack Initiation, Growth and Fatigue Life," Keynote Presentation in **Fatigue 2002: Eight International Fatigue Congress**, Stockholm, Sweden, June 2002
18. K. S. Ravi Chandran, "Mechanical Behavior of Ti-TiB Functionally Graded Materials," Department of Materials Science and Engineering, **University of Tennessee**, Knoxville, August 2001
19. K. S. Ravi Chandran, "Micromechanics of Small Fatigue Cracks," Department of Mechanical and Aerospace Engineering, **University of Arizona**, Tucson, March 2001

20. K. S. Ravi Chandran, "Micromechanics of Fatigue of Small Cracks in Structural Metals," **GE Research and Development Center**, Schenectady, NY, June 2000
21. K. S. Ravichandran, "Functionally Graded Materials in the Ti-B System," Department of Metallurgy, **Indian Institute of Science**, India, July 1999
22. K. S. Ravichandran, "Mechanical Behavior Issues in Functionally Graded Materials in the Ti-B System," **Defense Metallurgical Research Laboratory**, India, July 1999
23. K. S. Ravichandran, K. An, R. E. Dutton and S. L. Semiatin, "Microstructure and Thermal conductivity of Layered Thermal Barrier Coatings Processed by Plasma Spray and Physical Vapor Deposition Techniques," **Workshop on Thermal Barrier Coatings 85th Meeting of AGARD Structures and Materials Panel**, Aalborg, Denmark, October 15-16, 1997
24. K. S. Ravichandran, "Progress in Understanding the Thermal Conductivity of Thermal Barrier Coatings," **Operhall Research Center, Howmet Corporation**, White Hall, MI, May 1996
25. K. S. Ravichandran, "Thermal Conductivity of Thermal Barrier Coatings," **Materials Directorate, Wright Patterson Air Force Base**, OH, October 1995
26. K. S. Ravichandran, "Mechanism Related Issues in Cr-Hf intermetallic Composites," **DOE Workshop on High Temperature Laves Phases, Oak Ridge National Laboratory**, May 1996, Knoxville, TN
27. K. S. Ravichandran, "Issues on Mechanical Behavior of Some Intermetallic & Composite materials," **Department of Materials Science & Engineering, Lehigh University, PA**, 9 March 1995
28. K. S. Ravichandran, "Mechanical Behavior of Advanced Intermetallic Materials," **Department of Metallurgy & Institute of Materials Science, University of Connecticut**, Storrs, 16 September 1994
29. K. S. Ravichandran, "Three-Dimensional Aspects of Surface Cracks in Fatigue," **Department of Metallurgy, Indian Institute of Science, Bangalore, India**, 22 December 1994

## **IX.5. OTHER PRESENTATIONS**

30. H. Alnasser, T. Sanders and K. S. Ravi Chandran, "Tensile Properties and Processing induced Variability in Laser Additive Manufactured Ti-6Al-4V Cellular Structure" Symposium: Additive Manufacturing of Metals: Microstructure and Material Properties, MS&T 2018, Columbus, OH.
31. P. Kumar and K. S. Ravi Chandran, "Accelerated Sintering of Powder Metallurgy (PM) Ti-6Al-4V Alloy at the Beta Transus and its High Fatigue Performance" Symposium: Composition-Processing-Microstructure-Property Relationships of Titanium, MS&T 2018, Columbus, OH.
32. K. S. Ravi Chandran, "After Six Decades of Hall-Petch Relationship: A New Exponential Function for Better Correlation of Grain Size Effect on Strength of Iron/Steel Over Multiple Length Scales" Symposium: On Deformation and Transitions at Grain Boundaries VI, MS&T 2018, Columbus, OH.
33. A. Lark, V. Jindal, A. Degnah, K.S. Ravi Chandran, Designing Novel Cermet Materials in the Ti-B-Fe-Mo System, Symposium on Design, Processing, and Development of Structural Materials - Complex and Multicomponent Alloys, MS&T 2017, October 2017, Pittsburgh, USA

34. A. Degnah, V. Jindal and K. S. Ravi Chandran Computational Phase Equilibria and Design of Metal Matrix Composites in Ti-B-Fe System Symposium on Phase Transformations and Microstructural Evolution in Ti and Its Alloys MS&T 2017 10/12/2017 Pittsburgh, USA.
35. Somnaang Rou and K.S. Ravi Chandran, "First Principles (DFT) Calculation of Elastic Constants of Ti<sub>3</sub>B<sub>4</sub>," ICME Success Stories and Applications; Fourth World Congress on Integrated Computational Materials Engineering May 2017, Ypsilanti, MI, USA
36. Jun Du, K. S. Ravi Chandran. "Mechanism and Kinetics of In Situ Formation of Titanium Boride (TiB) in the Electrical-field-assisted Sintering Process", Innovative Processing and Synthesis of Ceramics, Glasses and Composites. MS&T 2017, Pittsburgh, USA, August, 2017.
37. Jun Du, K. S. Ravi Chandran, A. P. Sanders. "Flexural Strength of Nanostructured Titanium Boride (TiB) Ceramic as Affected by the Leftover Ductile Metallic Phase", Innovative Processing and Synthesis of Ceramics, Glasses and Composites. MS&T 2017, Pittsburgh, USA, August, 2017.
38. K. S. Ravi Chandran, "A physically based constitutive equation to characterize S-N fatigue behavior," Presented in Seventh Int. Conf. Very High Cycle Fatigue, Dresden, July 3-4, 2017.
39. K. S. Ravi Chandran, "A physically based constitutive equation for fatigue crack growth," Presented in Seventh Int. Conf. Very High Cycle Fatigue, Dresden, July 3-4, 2017.
40. P. Kumar, K.S. Ravi Chandran, F. Cao, "Accelerated Sintering of Powder Metallurgy Ti-6Al-4V alloy by repeated Phase Transformation Induced by Thermal Cycling", MS&T16, 23-27 Oct. 2016, Salt Lake City, UT, USA
41. A. Degnah, V. Jindal, A. Sanders, and K. S. Ravi Chandran, "Computational Design and Processing of Titanium Metal Matrix Composites in Ti-B-X System," Symposium on ICME Accelerated Materials Discovery, Materials Science & Technology 2016 October 26, 2016
42. S. Rou and K. S. Ravi Chandran, "First Principles (DFT) Calculation of Elastic Constants of Ti<sub>3</sub>B<sub>4</sub>," presented at the Materials Science & Technology 2016 Conference & Exhibition, Salt Lake City, UT, 2016, Oct. 23-27, 2016
43. A. P. Sanders, P. Kumar, A. Degnah, K. S. Ravi Chandran, "Technique-dependent R-curve behavior in bulk nanostructured TiB" Materials Science & Technology Conference 2016, Salt Lake City, UT, Oct. 23-27, 2016
44. F. Cao, K.S. Ravi Chandran, P. Kumar, "Achieving very high strength in powder metallurgy Ti-6Al-4V alloy through accelerated sintering at  $\beta$ -transus and hydrogenation-dehydrogenation treatment," MS&T 2016, October 23-26, Salt Lake City, Utah.
45. J. Du, A.P. Sanders, V. Jindal, K.S. Ravi Chandran, "Rapid in situ formation and densification of titanium boride (TiB) nano-ceramic in electric field activated sintering," Processing and Performance of Materials Using Microwaves, Electric and Magnetic Fields, Ultrasound, Lasers, and Mechanical Work – Rustum Roy Symposium, MS&T 2016 Conference, Oct 23, 2016

46. Y. Zhang, K. S. Ravi Chandran, Hassina Z Bilheux, Madhu Jagannathan. "Investigation of Li Spatial Distribution inside Bulk Li-Mg Alloy Electrode after Delithiation Using Neutron Imaging, Symposium on Energy Storage VI: Materials, Systems and Applications Symposium, MS&T 2016 Conference, Oct 23, 2016
47. B. Vadlamani, Ke An, M. Jagannathan, K.S. Ravi Chandran, An In-Situ Electrochemical Cell for Neutron Diffraction Studies of Phase Transitions in Small Volume Electrodes of Li-Ion Batteries, Symposium EE4—Electrode Materials and Electrolytes for Lithium and Sodium Ion Batteries 2016 Materials Research Society Spring Meeting, Phoenix, March 27-31, 2016.
48. K. S. Ravi Chandran, "Processing of Nanostructured Titanium Boride by SPS," Advanced Synthesis and Processing of Ceramics, MST2015, Columbus OH, 10/2015
49. P. Kumar, K.S. Ravi Chandran :A quantitative relationship to predict the effect of extreme-sized pores on tensile ductility of powder metallurgy Ti-6Al-4V alloy, Titanium-2015, Science and Technology, 13th world Conference on Titanium, August 16-20, 2015, TMS. San Diego, CA, USA
50. P. Kumar, K.S. Ravi Chandran, F. Cao, P. Sun, M. Koopman, and Z. Zak Fang: Effects of powder processing and sintering on tensile ductility of PM Ti-6Al-4V alloy made by hydrogen sintering of titanium hydride powders, Titanium-2015, Science and Technology, 13th world Conference on Titanium, August 16-20, 2015, TMS. San Diego, CA, USA
51. K. S. Ravi Chandran, "Rapid SPS Synthesis of Nanostructured Titanium Boride." MS&T 2015 in Ceramics Processing Symposium, October 2015
52. Fei Cao, K.S. Ravi Chandran, Pankaj Kumar, Pei Sun, Mark Koopman, Z. Zak Fang, Improved Fatigue Performance of PM Ti-6Al-4V Alloy Processed by Hydrogen Sintering and Phase Transformation of TiH<sub>2</sub> Powders, **The 13th World Conference on Titanium**, August 16-20, 2015, San Diego, CA
53. K. S. Ravi Chandran, S-N Fatigue Curve in Fatigue of Materials: Competing Failure Modes and Dual S-N Curves," **Int. Symp. Fatigue of Materials III, Advances and Emergences in Understanding**, MST 2014, October 2014, Pittsburgh, PA.
54. Pankaj Kumar, Fei Cao, K.S. Ravi Chandran, Porosity-ductility correlation in Powder Metallurgy Ti-6Al-4V alloy made by Dehydrogenation of CIPed Compacts of Titanium Hydride, **Symposium on Advanced Manufacturing of Titanium**, Materials science & Technology, October 12-16, 2014, Pittsburgh, PA
55. Fei Cao, Pankaj Kumar, K.S. Ravi Chandran, Fatigue Behavior of PM Ti-6Al-4V Alloy Obtained by Dehydrogenation of CIPed Titanium Hydride Powder Compacts, **Symposium on Advanced Manufacturing of Titanium**, Materials science & Technology, October 12-16, 2014, Pittsburgh, PA
56. K. S. Ravi Chandran, "First Principles Calculations of Elastic Constants of Titanium Borides" **2nd World Congress on Integrated Computational Materials Engineering (ICME)**, Salt Lake City, July 7-11, 2013.

57. M. Jagannathan and K. S. Ravi Chandran, "Analytical Modeling and Simulation of Electrochemical Charge/Discharge Behavior of Li-ion Cells with Si Thin Film Negative Electrodes" **2nd World Congress on Integrated Computational Materials Engineering (ICME)**, Salt Lake City, July 7-11, 2013.
58. K. S. Ravi Chandran, "Joule Heating of Graphene: Analytical Modeling of Transient Heating by Currents", **Nanoscale Heat Transport, 2013 Materials Research Society Spring Meeting** in San Francisco, CA, April 2013
59. M. Jagannathan, K. S. Ravi Chandran, and Joshua E. Ramos, "Energy Storage Capacity and Cyclability of Si Anodes with Nanoscale Columnar Structure for Li-ion Batteries", **Symposium F: Materials for Vehicular and Grid Energy Storage, 2013 Materials Research Society Spring Meeting**, San Francisco, April 1-5, 2013.
60. M. Jagannathan and K. S. Ravi Chandran, "Computational Modeling of Electrochemical Charge/Discharge Behavior of a-Si Thin Film Anodes in Li-ion Cells", **Symposium G: Electrochemical Interfaces for Energy Storage and Conversion- Fundamental Insights from Experiments and Computations**, 2013 Materials Research Society Spring Meeting, San Francisco, April 1-5, 2013.
61. M. Jagannathan and K. S. Ravi Chandran, "Electrochemical Charge/Discharge Characteristics of Li(Mg) Alloy Anodes for High Capacity Lithium Batteries", **Symposium O: Next-Generation Energy Storage Materials and Systems, 2012 Materials Research Society Spring Meeting**, San Francisco, April 9-13, 2012.
62. M. Jagannathan and K. S. Ravi Chandran, "Phase transformation during electrochemical discharge of Li(Mg) Anodes for High Capacity Lithium Batteries", **Materials for Energy Storage, 2011 Materials Science & Technology Conference**, Columbus, OH, October 16-20, 2011
63. K. S. Ravi Chandran, "Accelerated Kinetics of Surface Coating Growth by Diffusion near the Phase Transition Temperature: Mechanism of Growth of Boride Layers on Titanium, **Phase Stability, Diffusion, Kinetics and their Applications (PSDK-VI)**, MS&T 2011, Columbus, Oct. 19, 2011
64. K. S. Ravi Chandran, "Recent Advances in Surface Hardening of Titanium with an Emphasis on Boriding and Its Potential Applications," **Titanium Processing and Applications, MS&T 2011**, Columbus, Oct. 20, 2011
65. B. Sarma, K. S. Ravi Chandran, presentation in **Phase Stability, Diffusion, Kinetics and their Applications** MS&T 2009, Pittsburgh, PA.
66. B. Sarma, K. S. Ravi Chandran, presentation in **Surface Engineering**, MS&T 2009, Pittsburgh, PA.
67. K. S. Ravi Chandran, Presentation in **Advances in Ceramic Synthesis**, MS&T 2009, Pittsburgh, PA.
68. B. Sarma, K. S. Ravi Chandran, presentation **Phase Stability, Diffusion, Kinetics and their Applications** MS&T 2008, Pittsburgh, PA.
69. K. S. Ravi Chandran, presentation in **Cermics Symposium**, MS&T 2008, Pittsburgh, PA.
70. K. S. Ravi Chandran, presentation in **Symposium on Competing modes in Fatigue**, MS&T 2008, Pittsburgh, PA.

71. M. Oja and K. S. Ravi Chandran, Orientation Imaging Microscopy in Fatigue, presentation MS&T 2008, Pittsburgh, PA
72. A. P. Sanders, N. Tikekar, C. Lee and K. S. Ravi Chandran, "Challenges in achieving surface texture in titanium surface hardened with titanium boride layers," **Medical Device Materials IV: Materials and Processes for Medical Devices**, Sept. 2007, Palm Desert, CA
73. C. Lee, N. Tikekar, K. S. Ravi Chandran and A. Sanders "Wear resistance of titanium boride coated titanium alloy against alumina," in **Medical Device Materials IV; Materials and Processes for Medical Devices Conference** Sept 2007, Palm Desert, CA
74. K. S. Ravi Chandran, and G. T. Cashman, "Competing failure modes in fatigue and the consequent S-N curve shapes," **Fourth Int. Conf. Very High Cycle Fatigue**, University of Michigan, Ann Arbor, August 2007
75. K. S. Ravi Chandran, "Duality of fatigue failures," GE Aviation, Cincinnati, OH, March 2006
76. N. M. Tikekar and K. S. Ravi Chandran, "A novel double layered coating on titanium: Kinetics of boron diffusion and coating development," presented at **Multicomponent Multiphase Diffusion Symposium honoring J. E. Morral**, 2005 TMS Annual Meeting, San Francisco, 2005.
77. K. S. Ravi Chandran and S. K. Jha, "Overview of high-cycle fatigue of beta titanium alloys: Role of microstructure on crack initiation, growth and fatigue life," presented at **Beta Titanium Alloys of the 2000's**, 2005 TMS Annual Meeting, San Francisco, 2005.
78. S. K. Jha and K. S. Ravi Chandran, "Designing a beta titanium alloy for optimum fatigue performance," presented at **Beta Titanium Alloys of the 2000's**, 2005 TMS Annual Meeting, San Francisco, 2005.
79. K. Panda and K. S. Ravi Chandran, "Ab-initio computational calculations of elastic constants of titanium boride using density functional theory," presented at **Computational Aspects of Mechanical Properties of Materials**, 2005 TMS Annual Meeting, San Francisco, 2005.
80. K. S. Ravi Chandran, "Titanium Boride Technology for Orthopedic Implants," Ortho Development Corporation, June 2003
81. K. S. Ravi Chandran, "Fracture Mechanics of Functionally Graded Materials," Symposium Honoring Prof. J. F. Knott, 2002 TMS Meeting, Columbus, OH
82. K. S. Ravi Chandran, "Hierarchical design of WC-CO cermets." Symposium honoring Prof. G Thomas, 2002 TMS Meeting, Columbus, OH
83. K. S. Ravi Chandran, "Ti-TiB MMCs" Advanced Metal Matrix Composites, 2002 TMS Meeting, Columbus, OH
84. S. K. Jha and K. S. Ravi Chandran, "An Unusual Fatigue Phenomenon: Duality of the S-N Curve in the beta-titanium Alloy: Ti-10V-2Fe-3Al," presented at **Fatigue 2002: Eight International Fatigue Congress**, Stockholm, Sweden, 2nd to 7th June 2002.
85. S. K. Jha and K. S. Ravi Chandran, "Effect of the beta-phase Solute Content on the Crack Nucleation and the Fatigue Life Behavior of the Ti-10V-2Fe-3Al Beta Titanium Alloy," presented at **Fatigue 2002: Eight International Fatigue Congress**, Stockholm, Sweden, 2nd to 7th June 2002..
86. S. Shankar and K. S. Ravi Chandran, "The role of beta annealing on the fatigue crack nucleation and fatigue life in Ti-10V-2Fe-3Al Beta Titanium Alloy," presented at **Fatigue 2002: Eight International Fatigue Congress**, Stockholm, Sweden, 2nd to 7th June 2002.



87. K. Panda and K. S. Ravi Chandran, "Synthesis of Ti-TiB FGM for Armor Applications", **2002 International Conference on Functionally Graded Materials: Technology Leveraged Applications**, May 6-7, 2002, Denver, CO
88. K. S. Ravichandran, S. S. Sahay, R. Atri, B. Chen and J. Rubin, "Microstructure and Mechanical Properties of in-situ Processed Ti-TiB Composites," Presented at **New Developments in Metal Matrix Composites**, 1999 TMS Fall Meeting, Cincinnati, OH.
89. K. S. Ravichandran, J. M. Larsen and Xu-Dong Li, "Significance of Crack Shape or Aspect Ratio on the Behavior of Small Fatigue Cracks", Presented at **Small Fatigue Cracks: Mechanics and Mechanisms Conference**, 6-11 December, 1998, Kona, Hawaii
90. Xu-Dong Li and K. S. Ravichandran, "The Role of Crystal Anisotropy on the Stress Intensity Factor Distribution of Small Elliptical Cracks," Presented at **Small Fatigue Cracks: Mechanics and Mechanisms Conference**, 6-11 December, 1998, Kona, Hawaii
91. K. S. Ravichandran and S. K. Jha, "Mean Stress Effects on Fatigue crack growth of titanium Alloys: Overview of mechanics and materials issues", Presented at the **Symposium on Fatigue of Titanium Alloys**, TMS Fall Meeting, 11-15 October, 1998, Chicago, IL
92. P. S. Shankar and K. S. Ravichandran, "Microstructural Aspects of Fatigue Crack Initiation and Growth in Ti-10V-2Fe-3Al", Presented at the **Symposium on Fatigue of Titanium Alloys**, TMS Fall Meeting, 11-15 October, 1998, Chicago, IL
93. S. K. Jha and K. S. Ravichandran, "The Mean Stress Dependence of Fatigue Crack Growth Behavior in the Beta-Titanium Alloy: Ti-10V-2Fe-3Al: The effect of aging", Presented at the **Symposium on Fatigue of Titanium Alloys**, TMS Fall Meeting, 11-15 October, 1998, Chicago, IL
94. S. K. Jha and K. S. Ravichandran, "Origin Dependent Fatigue Crack Initiation in the Beta Titanium Alloy: Ti-10V-2Fe-3Al", Presented at **Small Fatigue Cracks: Mechanics and Mechanisms Conference**, 6-11 December, 1998, Kona, Hawaii
95. W. A. Gooch, M. S. Burkins, R. Palicka, J. Rubin and K. S. Ravichandran, "Development and Ballistic Testing of Functionally Gradient Ceramic/Metal Applique," **17th International Symposium on Ballistics**, Midrand, South Africa, March 23-27, 1998
96. K. S. Ravichandran, K. An, R. E. Dutton and S. L. Semiatin, "Thermal conductivity of Plasma Spray Deposited Al<sub>2</sub>O<sub>3</sub>/ZrO<sub>2</sub> Multilayer Coatings," **United Thermal Spray Conference, UTSC-97**, Indianapolis, IN, September 15-18, 1997
97. K. S. Ravichandran, K. An, and R. Taylor, "Issues in the Measurement of Thermal conductivity of Thermal Barrier Coatings," **United Thermal Spray Conference, UTSC-97**, Indianapolis, IN, September 15-18, 1997.
98. K. S. Ravichandran, "Applicability of Paris Law to the Case of Small Fatigue Cracks in Ti-8Al," **Symposium on High Cycle Fatigue of Structural Materials**, Indianapolis, IN, September 15-18, 1997
99. K. S. Ravichandran, K. An, R. E. Dutton and S. L. Semiatin, "Thermal conductivity of Al<sub>2</sub>O<sub>3</sub>/ZrO<sub>2</sub> Multilayer Coatings made by Electron-Beam Physical Vapor Deposition," **99th Annual Meeting and Exposition of The American Ceramic Society**, Cincinnati, OH, May 4-7, 1997
100. K. S. Ravichandran, "Thermal conductivity of Two Phase Composites: A Microstructure-Based Model and Effects of Interface Thermal Resistance," **99th Annual Meeting and Exposition of The American Ceramic Society**, Cincinnati, OH, May 4-7, 1997

101. K. S. Ravichandran, J. Li, G. Nelson, R. Brennan and A. Ezis, "Microstructure and Mechanical Behavior of a Graded Material in the Ti-B System," **99th Annual Meeting and Exposition of The American Ceramic Society**, Cincinnati, OH, May 4-7, 1997
102. K. S. Ravichandran, K. An and R. Taylor, "Assessment of Thermal Conductivity of Plasma Sprayed Thermal Barrier coatings," **TBC'97, Thermal Barrier Coatings Workshop**, Cincinnati, OH, May 19-21, 1997
103. K. S. Ravichandran, "A senior undergraduate design problem for mechanical metallurgy courses: material selection and design for gas turbine blades," Presented in **Design in Material Education**, Symposium @ 1999 TMS Fall Meeting, 31 Oct. - 4 Nov., Cincinnati, OH
104. K. S. Ravichandran, "A senior undergraduate design problem in process and physical metallurgy: carburizing of steel," Presented in **Design in Material Education**, Symposium @ 1999 TMS Fall Meeting, 31 Oct. - 4 Nov., Cincinnati, OH
105. K. S. Ravichandran, S. S. Sahay and J. G. Byrne, "Processing of Microscale Brass/Steel Multilayer Composites and Tensile Properties," **Processing and Fabrication of Advanced Materials, Symp. at TMS Fall Meeting**, Cincinnati, OH, October 1996
106. K. S. Ravichandran, "Processing of Multilayer Composites by Cold Rolling," Department of Metallurgical Engineering, **University of Utah, Salt Lake city, UT**, January 1996
107. K. S. Ravichandran, "Thermal Barrier Coatings," Department of Metallurgical Engineering, **University of Utah, Salt Lake city, UT**, October 1995
108. K. S. Ravichandran, "Microstructure and Mechanical Behavior of Intermetallics & Composites," Department of Metallurgical Engineering, **University of Utah, Salt Lake City, UT**, 1995
109. K. S. Ravichandran, "Simple Models of Deformation Behavior of Composites with Discontinuous Reinforcements," **Symp. on High Performance Composites**, TMS Fall Meeting, October 1994, IL
110. K. S. Ravichandran, "Progress in Understanding the Growth Behavior of Small cracks in  $\alpha_2$  Titanium Aluminides," **Symp. on Fatigue and Fracture of Intermetallics II**, TMS Fall Meeting, 1994, IL
111. K. S. Ravichandran, D. B. Miracle and M. G. Mendiratta, "Fracture Toughness of Cr<sub>2</sub>Hf+Cr In-situ Intermetallic Composites," Presented at **Intermetallic composites III**, Materials Research Society Symposium, Spring Meeting, San Francisco, April 1994.
112. K. S. Ravichandran and J. M. Larsen, "Effects of Microstructure on the Propagation of Small Fatigue Cracks in Ti-24Al-11Nb," Presented at **AEROMAT'91, Advanced Aerospace Materials/Processes Conference**, 20-23 May 1991, Long Beach, CA.
113. K. S. Ravichandran and J. M. Larsen, "Microstructural Aspects of Small cracks in Titanium Aluminides," Presented at **Fatigue'93, Int. Conf. on Fatigue Thresholds**, 3-7 May 1993, Montreal, Canada.
114. K. S. Ravichandran and J. M. Larsen, "Effect of Microstructure on Fatigue Crack Growth Behavior of Small and Large Cracks in Titanium Aluminide, Ti-24Al-11Nb," Presented at **Int. Conf. on High Temperature Aluminides and Intermetallics**, 16-19 September, 1991, San Diego, CA.
115. K. S. Ravichandran, "Fatigue Crack Growth Behavior Near Threshold in Ti-6Al-4V alloy," Presented at **Fatigue 90, Proc. of 4th Int. Conf. on Fatigue and Fatigue Thresholds**, May 1990, Honolulu, Hawaii.
116. K. S. Ravichandran and D. Banerjee, "Effects of Microstructural Morphology on the Near Threshold Fatigue Crack Growth Characteristics on a Near Alpha Titanium Alloy: Ti-6Al-3Mo-

1.5Zr-0.25Si,” Presented at **Fatigue 90, Proc. of 4th Int. Conf. on Fatigue and Fatigue Thresholds**, May 1990, Honolulu, Hawaii.

117. Jira, K. S. Ravichandran and J. M. Larsen, “Growth Characteristics of Small Surface Flaws in Ti-24Al-11Nb Titanium Aluminide,” Presented at the **TMS-AIME Fall Meeting**, October 1989, Indianapolis, IN.
118. K. S. Ravichandran and E. S. Dwarakadasa, “Micromechanisms of Fatigue Crack Growth in a High Strength Steel,” Presented at the **Annual National Metallurgists Day Meeting**, November 1987, Trivandrum, India.