Rajendra Bordia: Professional Bio-Sketch

Professor Raj Bordia joined the Department of Materials Science and Engineering at Clemson University in April 2013 as Professor and Chair of the Department. Before that, he was a faculty member in the Materials Science and Engineering Department at the University of Washington, Seattle since 1991. He was the Acting Chair (1996-1998) and the Chair (1998-2005) of his Department. Prior to joining the University of Washington, he was a Research Scientist in the Central Research & Development department of DuPont Co. (1986 -91). During 2007-08, he had a series of Visiting Professor appointments at the Indian Institute of Technology Kanpur, the Indian Institute of Science, Bangalore and the Friedrich-Alexander Universität, Erlangen-Nürnberg, Germany. He received his undergraduate degree in Mechanical Engineering from Indian Institute of Technology, Kanpur (1979) and his M.S. (1981) and Ph.D. (1986) degrees in Materials Science and Engineering (minor: Solid Mechanics) from Cornell University, Ithaca, NY.

Prof. Bordia is an internationally recognized scholar whose research is at the intersection of Materials Science and Mechanics and is focused on fundamental and applied studies in the processing and properties of complex material systems for energy, environmental and high temperature applications. Current emphasis is on integrating multi-scale simulations and experimental research to design complex microstructures. He was a key and pioneering contributor in the development of a new continuum mechanics based approach for the **constrained sintering of ceramics**. This general approach has been applied to sintering of composites, constrained films and coatings and to sintering under applied stresses (e.g. hot pressing, hot isostatic pressing and sinter forging). Recent work has focused on processing of multilayered ceramics for energy applications. His work on processing and microstructural control of **complex oxides** led to the processing of superconductors with high purity and controlled microstructures. These in turn helped address important questions related to the physics of superconductivity in polycrystalline oxides. More recently, work has focused on materials for solid oxide fuel cells and thermoelectric oxides. In the area of **porous materials**, using well designed and model microstructures and fracture mechanics based theoretical analysis, a clear understanding was developed on the effect of porosity on the mechanical properties of ceramics. Current focus is on porous materials for environmental and energy applications. Finally, he has made significant contributions on **polymer-derived ceramics** routes to make nanoscale composite microstructures. Current focus is on multifunctional composites for high temperature applications and ceramic coatings. He has authored or co- authored over 120 peer-reviewed technical publications and has presented over 250 invited lectures and seminars in Asia, Europe, Africa and North America. He is or has been the PI or Co-PI for over $ 17 million in external research funding.

As the *Acting Chair* (1996-1998) and then the *Chair* (1998- 2005) at the University of Washington, he led his Department through many significant changes and growth. Early on, using a very inclusive approach, he led the development of a comprehensive strategic plan, which was successfully implemented and realized under his leadership, achieving all of its objectives. The overall accomplishment was the transformation of the Department from a Metallurgy and Ceramics department to a high performing, truly integrated Materials Science and Engineering department which is well integrated with broader materials research at the University. Specific significant accomplishments included a more than 400% increase in per faculty research expenditure, an approximately 50% increase in number of Ph.D. students, a 25% increase in the number of UG students, combining of two UG degrees (Ceramics and Metallurgy) into a single degree in Materials Science and Engineering, and a stellar 10 year review of the Department by a committee of experts (in 2004). *A shining testament of this transformation is that according to a report from Thomson Reuters for the 2001-2011 period, the University of Washington's Materials research has been ranked # 1 in the world in impact (most citations per paper).* In addition to these exciting and notable accomplishments, he developed a highly collaborative, collegial and nurturing environment. Under his leadership, the Department became truly *student-centered with an emphasis on mentoring at all levels*. As a result, the Department's reputation among its peers increased substantially. From not being ranked in the top 30 before 1998, the Department was ranked number 19 nationally in 2006. As Department Chair, he also led or participated in the development

of collaborative multidisciplinary educational and research programs in Nanotechnology, Photonics, Energy and Composites with colleagues from other Departments.

Enhancing the diversity at all levels has been an important goal of his career both as a faculty member and as the Department Chair. Using well-designed outreach programs, under his leadership, the Department had the highest percentage of underrepresented ethnic minority and the second highest percentage of women undergraduate students in the College of Engineering. He also developed innovative programs to engage alumni and industry partners and significantly increased the participation of and contributions from alumni and corporations in the fund raising efforts of the Department. Finally, under his leadership, the department was a leader in developing highly effective international collaborations in research and education.

In 2002, he was elected as a Fellow of the American Ceramic Society, in 2010 a Fellow of the Indian Institute of Metals and in 2012 as an Academician in the World Academy of Ceramics. He has received other prestigious awards including: Humboldt Senior Scientist Research award from the Alexander von Humboldt Foundation, Germany (2007); National Young Investigator award (NSF) (1992- 1997); DuPont Young Professor award (E. I. duPont Co.) (1993-1996); International Expert award from Technical Univ. Hamburg-Harburg, Germany (1996, 2001 and 2002). He is also a dedicated teacher and mentor. Bordia was selected as the Teacher of the Year seven times by students in his Department at the University of Washington (1994, 1995, 1996, 2000, 2006. 2009, 2011 and 2012); was the sole recipient of the Marsha Landolt Distinguished Graduate Mentor award from the University of Washington (2007) and was the sole recipient of the Outstanding Educator of the Year by the Ceramic Education Council of the American Ceramic Society (2012).

Prof. Bordia is an Associate Editor of the Journal of the American Ceramic Society (1988-present); Editor of the Journal of Ceramic Processing Research (1999-present) and Editor-in-Chief of the Ceramics International Journal (2009 – present). He was a member of the Board of Directors of the American Ceramic Society (2008-2010).

Work Address

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Education

- Cornell University, Ithaca, NY, Ph.D., Materials Science & Engineering (minor in Solid Mechanics), 1986
- Cornell University, Ithaca, NY, M. S., Materials Science & Engineering (minor in Solid Mechanics), 1981
- Indian Institute of Technology, Kanpur, India, Bachelor of Technology, Mechanical Engineering, 1979

Work Experience

April 2013 – Present:	Professor and Chair, Department of Materials Science & Engineering, Clemson University, Clemson, SC
2003 – April 2013:	Professor, Department of Materials Science & Engineering, University of Washington, Seattle, WA
2007 – 2008:	Visiting Professor, Indian Institute of Technology, Kanpur, India (09/07 to 11/07 and 01/08 to 02/08); Visiting Professor, Indian Institute of Science, Bangalore, India (11/07 to 01/08); Guest Professor, Friedrich-Alexander Universität, Erlangen-Nürnberg, Germany
1996 – 2005:	Acting Chair (1996-1998) and Chair (1998-2005), Department of Materials Science & Engineering, University of Washington, Seattle, WA
1991 – 2003:	Associate Professor, Department of Materials Science & Engineering, University of Washington, Seattle, WA
1986 – 1991:	Research Scientist, Central Research & Development Dept., E. I. duPont de Nemours & Co. Inc., Wilmington, DE

Awards and Honors

- Humboldt Research Award for Senior Scientists, Alexander von Humboldt Foundation, Germany (2007).
- Outstanding Educator of the Year Award of the American Ceramic Society (2012) (only one person is selected for this award. The selection is made by the Ceramic Education Council)
- Marsha Landolt Graduate Mentor Award, University of Washington (2007). This is the highest award given by the Graduate School at the University of Washington. Only one recipient is selected every year.
- Fellow of the American Ceramic Society (2002).
- Selected as an Academician by the World Academy of Ceramics (2012).
- Fellow of the Indian Institute of Metals (2010).
- Distinguished Professor selected jointly by Mexican Academy of Science (AMC) and the Mexico-United State Foundation for Science (FUMEC) (2012).

- McMahon Lecturer, Alfred University (2013).
- Member, Board of Directors, American Ceramic Society (2008 – 2010).
- National Young Investigator Award, National Science Foundation, (1992 – 1997).
- Faculty of the Year, Department of Materials Science & Engineering, University of Washington, (1994, 1995, 1996, 2000, 2006, 2009, 2011 and 2013). The recipient of this award is selected by the students in the department.
- Associate Editor of the Journal of the American Ceramic Society (1988-Present).
- Editor of the Journal of Ceramic Processing Research (1999 – Present).
- Editor-in-Chief of the Ceramics International Journal (2009 – Present).
- DuPont Young Professor Award (E. I. duPont Co.) (1993 – 1996).
- Chair of the Gordon Conference on Solid State Studies in Ceramics (2002).
- NORCUS Professor at Pacific Northwest Labs, Richland, WA (1996 – 2000).
- Member of the Young Investigator Advisory Committee to the Institute of Mechanics and Materials at University of California, San Diego. (1995 – 1997).
- Received the International Expert Award from TUHH, Germany to spend three weeks at their institution. (July 1996, July 2001 and December 2002).
- Invited participant in the NSF workshop on Critical Research Issues in Ceramics (1997).
- Member of the External Review Team for the Center for Advanced Materials Research at Oregon State University (1999).
- Chair of the Basic Science Division of the American Ceramic Society (2004 – 2005).
- Chair of the Publications Committee of the American Ceramic Society (2005 – 2006).
- Member of the Emerging Opportunities Committee of the American Ceramic Society (2005 – 2006).
- Member of the Peer Review Team for the Energy Science and Technology Division of the Pacific Northwest National Laboratories (2001).
- Member of the Strategic Planning and Emerging Opportunities Committee of the American Ceramic Society (2005 – 2006).
- Co-Chair of the International Conference on Advances in Sintering Science and Technology, (2008).

Current Research Interests (details in Section I)

The research and scholarship in my research group currently focuses on integrating multi-scale simulations and experimental research to design complex microstructures for energy, environment and high temperature applications. A unifying theme of our highly collaborative research has been that it is at the interface between solid mechanics and materials science. Application of continuum mechanics to processing has been a distinguishing feature of our research. We have conducted both theoretical and experimental research which covers the spectrum from basic to applied.

Currently and in the reent past research has been funded by AFOSR, DoE, NSF, AFRL, Micron Foundation, NextGen Aero, Saint-Gobain Co., and Zampell Corp. Currently, I am the PI or Co-PI on current funding of over $ 2.1 Million. A summary of current research projects and past research accomplishments is provided in **Section I.**

Academic Leadership (details in Section II)

❖ Department Chair 1998 – 2005; Department Acting Chair (1996 – 1998). Led the Department through many significant changes and growth. The Department transformed from a Metallurgy and Ceramics department to a high performing, truly integrated

interdisciplinary Materials Science and Engineering department with research programs well coordinated with the other materials research at the University. As a result, the Department ranked 19th in the country in 2006 (in 1998, it was not in the top 30). In addition, according to a recent report from Thomson Reuters, UW's materials research in the past 10 years (2001 – 2011) has been ranked #17 in the world in receiving total citations (#5 in US). It has also been ranked #1 in the world in total impact (received the most citations per paper). Many of the key faculty members who contributed papers that led to this ranking were hired, both in the MS&E Department and in other departments, during the time I was the Chair.

- ❖ Led or participated in developing interdisciplinary programs in Nanotechnology, Photonics, Energy and Aerospace Materials. Led the development of a broad range of international educational and research collaborations. Developed educational and collaborative research programs for aerospace and electronics industry
- ❖ University of Washington Co-PI and PI for NSF funded Engineering Coalition of Schools for Excellence in Education and Leadership (ECSEL) Program (Co-PI: 1995 – 1996; 1997 – 1998 and PI: 1998 – 2001).
- ❖ Co-PI for NSF funded Integrative Graduate Education and Research Traineeship (IGERT) program titled "Multinational Collaborations on Challenges to the Environment" (2005 – 2011).
- ❖ Professional Society Leadership: Significant leadership roles in the American Ceramic Society.
- ❖ Service Leadership: Member of the Board of Directors of the Indian Institute of Technology, Kanpur Foundation (2011 – present) and Co-Chair of the Sponsorship and Fundraising Committee for the Golden Jubilee of the Indian Institute of Technology, Kanpur (2009 – 2010)

Graduate Student, Post-Doc and Visiting Scholar Mentoring (details in Section III)

- Graduated ten PhD students (two women, two African-American man), currently mentoring four PhD students (one Hispanic women)
- Graduated 12 Masters students (three women, 1 African-American man and 1 Native-American man)
- Mentored eight post-doctoral research associates (two currently)
- Mentored eight Visiting Scientists and Professors (two currently), and four Visiting Students

Publications, Book Editing, Book Chapters and Patents (details in Section IV)

Author or co-author of over 115 refereed publications, which include 81 archival Journal Papers, 25 referred Conference Proceedings, 5 book chapters, co-editor of two books and three special sections of a Journals. Two patents have been granted.

Research and Program Funding (details in Section V)

Research Funding: Funding from the Washington Technology Center, Seattle, Specialty Ceramics Corporation, National Science Foundation, Clean Washington Center, DuPont Co., MTS Corp, K2 Corp., Kyocera Industrial Ceramics, Boeing Corp. Sandia National Laboratories, Department of Energy, National Institute of Standards and Technology, Army Research Office, Micron Technology Foundation and Air Force Office of Scientific Research. I have been a PI or Co-PI for a total of over $ 17 million in research funding since joining the University of Washington in December 1991. (Currently, I am the PI or Co-PI for research funding over $ 2.1 million).

Program Funding: As the Department Chair, I procured funding for the Department from IBM, Boeing, Intel, Micromeretics, Kimberly Clark, Weyerhauser Corp. and Microsoft. Some of the funding was in the form of equipment donation. The total funding was over $ 2 million.

Research Collaborations (details in Section VI)

The research in my group is very collaborative. Details of our past and current significant collaborations are provided in Section VI.

Invited Seminars and Talks (details in Section VII)

Over 250 invited talks and seminars at national and international meetings, universities, national laboratories and research labs. A list of invited talks since 2005 is in Section VII

Teaching Interests and Contributions (details in Section VIII)

Developed courses and taught classes in the areas of processing of inorganic materials, mechanical properties of materials, composites, design in materials engineering, materials science and engineering laboratories. I thoroughly enjoy teaching and have been selected Faculty of the Year by under-graduate students in the Department six times.

Mentoring Approach and Philosophy (details in Section IX)

Mentoring of graduate and under-graduate students is a significant and highly rewarding part of my academic career. I have developed a mentoring philosophy and approach which is supported by pedagogical research and has been highly effective in mentoring students who have worked with me. An evidence of this is my selection as the Marsha Landolt Graduate Mentor Award of the University of Washington (2007). This is the highest award given by the Graduate School at the University of Washington. Only one recipient is selected every year.

Professional Societies Involvement and Leadership (details in Section X)

Currently member of the American Ceramic Society, American Society of Engineering Educators, TMS, and Keramos. I have had high-level engagement and leadership roles in the American Ceramic Society.

Service (details in Section XI)

Served as proposal and manuscript reviewer and consultant. I have been a member of several expert panels and have also served on various Departmental, College and University Committees.

SECTION I: CURRENT RESEARCH PROGRAM AND IMPACT OF SCHOLARLY CONTRIBUTIONS

I.1 Current Research Focus

Currently, we have research programs in the area of molecular precursor derived ceramics, processing of solid oxide fuel cells, composite systems for use in high efficiency, low emission energy conversion devices and systems, hierarchical porosity ceramics, thermoelectric oxides, and porous materials for biomedical and health applications.

Our current projects are briefly described below.

Molecular Precursor Derived Hierarchical Nanostructured Composite Ceramics (recently completed - funded by AFOSR)

In a collaborative project (with Prof. Tovar, Purdue School of Engineering & Technology at IUPUI and Prof. Tomar, Purdue University) we are investigating the feasibility of developing numerically designed nanoscale composites with optimized high temperature properties. Our collaborators are using multiscale modeling (molecular dynamics and optimization protocols) to design the microstructure and we are developing the processing techniques to make a broad range of microstructures and characterizing their thermomechanical properties. The goal is to develop a new paradigm for the design of optimal microstructures. In this project we are using precursor-derived ceramics (from the carbosilane and the silazane families) to tailor and control the microstructure at different length scales.

Si-C-X Ceramics for Nuclear Applications (currently funded by DoE - NEUP)

In this collaborative project (with Dr. Henager, PNNL and Prof. Tomar, Purdue), we are working on developing precursor derived Si-C-X ceramics for a broad range of next generation nuclear applications. The focus is on developing processing approaches for both porous and dense ceramics and to investigate their performance as load bearing materials and also as materials for the long-term storage of radioactive gases.

Hierarchical Porous Ceramics for Electrochemical Applications (currently funded by NSF - DMR Materials World Network Program)

In this collaborative project (with Dr. Martin, CNRS, France), we are developing mesoscale models to optimize hierarchical microstructures for electrochemical applications. In addition, we are developing a broad range of experimental approaches to make hierarchical porosity ceramics. The goal is to design optimal microstructures (numerically), make them and investigate their properties.

Processing of Multilayered Systems (recently completed funded Saint-Gobain Co.)

We are continuing to develop the theoretical framework and the experimental parameters needed to understand, quantify and mitigate the effect of constraints on the sintering of ceramic multilayered systems. This project involves both experimental and theoretical research. Recently we have also started multiscale numerical simulations (using discrete element and finite element modeling).

Advanced Composite Corrosion Resistant Coatings (recently completed funded by Zampell Corp.)

We are investigating polymer-derived ceramic coatings (from the silicon oxycarbide family) for protecting metals and ceramics from high temperature corrosion and erosion. We are also developing composite ceramic coatings for protection against acidic corrosion.

Engineered Porous Ceramics (funded by AFRL and NextGen Aero)

We are developing graded porosity ceramics for optimized mechanical and thermal properties. This is an integrated simulations and experimental project on hybrid materials for aerospace

applications. We are investigating different approaches to make ceramics with hierarchical and anisotropic porosity.

High Temperature Thermoelectric Oxides (funded by DoE – UCR and Micron Foundation)

In collaboration with Prof. Ohuchi (UW, MS&E), we are investigating a novel class of 'n' type thermoelectric oxides that are stable at high temperature in the coal-fired flue gas environment. It will focus on thermoelectric oxides with high figures of merit, employing the recent observation in the literature that thermoelectric figure of merit increases rapidly in the vicinity of the Curie temperature for ferroelectric materials (thermoelectric-ferroelectric coupling).

Multi-Scale Fundamental Investigation of Sintering Anisotropy (funded by NSF – CMMI DMREF Program)

The goal of this collaborative program is to establish a new methodology to optimize the sintering of a broad range of multilayered material systems including solid oxide fuel cells, sensors, actuators, and packages for solar cells packaging. The project will contribute to the general framework of development of processing approaches that are informed by experimentally validated simulations and which significantly accelerate the development of new materials and processes. The project is in collaboration with Prof. Olevsky from the San Diego State University.

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I.2 Significant Scholarly Contributions

I was instrumental in developing a new continuum mechanics based theory for the sintering of ceramics. This general approach has been applied to sintering of composites, constrained films and coatings and to sintering under applied stresses (e.g., hot pressing, hot isostatic pressing and sinter forging) . I have been working in this area for more than 20 years and some of my most cited papers are in this field. In 1988, together with Prof. Scherer, I wrote a series of review papers which provided a unified framework for this approach and compared the various theoretical models that had been proposed. Most recently, I have co-authored another theoretical paper on this topic which extends the earlier models to more realistically account for the experimental observations. Our group has continued to work in this field with the most recent research focusing on the processing of solid oxide fuel cells, the use of discrete element simulations for constrained and stress assisted sintering problems, and investigation of the densification and defect formation in constrained ceramic films and coatings. The most significant publications in this field are:

- **Acta Metallurgica,** **32**, [7], 1003-1019 (1984) *(number 9 in list of publications, Section IV).*
- **J Am. Cer. Soc.,** **68**, [6], 287-292 (1985) *(number 10 in list of publications, Section IV).*
- **Acta Metallurgica,** **36**, 2393-2397 (1988) *(number 16 in list of publications, Section IV).*
- **Acta Metallurgica,** **36**, 2399-2409 (1988) *(number 17 in list of publications, Section IV).*
- **Acta Metallurgica,** **36**, 2411-2416 (1988) *(number 18 in list of publications, Section IV).*
- **J. Am. Cer. Soc.,** **86** [7] 1099-1105 (2003) (*number 52 in list of publications, Section IV).*
- **Acta Materialia** **54** 111-118 (2006) (*number 58 in list of publications, Section IV).*
- **Phys. Rev. E** **77**, 031307-15 (2008) ((*number 68 in list of publications, Section IV).*
- **Acta Materialia** **57** 549-558 (2009) (*number 69 in list of publications, Section IV).*
- Chapter in the book **Sintering of Advanced Materials** (published in 2011) (*number 6 in list of publications, Section IV).*

We have also made significant contributions in the area of the processing of complex oxides. Our work on processing and microstructural control in polycrystalline superconductors was key to producing superconductors with high purity and controlled microstructures. These, in turn, helped address important questions related to the physics of superconductivity in polycrystalline oxides including the role of oxygen stochiometry. Current research in this field has focused on processing of intermediate temperature electrolytes for SOFCs, manganite based oxides for thermoelectric and optical properties, and calcium phosphate based biocomposites. The significant publications in this field are:

- **Solid State Comm., 66**, 953-959 (1988) (*number 21 in list of publications, Section IV).*
- **Phys. Rev. B, 38**, 11382-11390 (1988) (*number 22 in list of publications, Section IV).*
- **Phys. Rev. B, 39**, 2322-2332 (1989) (*number 23 in list of publications, Section IV).*
- **Mat. Res. Bull. 39**, 141-155 (2004) (*number 53 in list of publications, Section IV).*
- **J. Am. Ceram. Soc.** (2010) (*number 75 in list of publications, Section IV).*

Our group has made important contributions in the field of the processing and mechanics of porous materials. Using well-designed and model microstructures, a clear understanding was developed on the effect of porosity on the mechanical properties of ceramics. For example, the effect of grain size and pore size on the strength was decoupled and it was shown, both experimentally and theoretically, that the grain size has the dominant effect on the strength of porous ceramics. The important publications in this area are:

- **J. Amer. Cer. Soc., 81**1852-60 (1998) (*number 33 in list of publications, Section IV).*
- **J. Amer. Cer. Soc.**, **81** 2449-57 (1998) (*number 34 in list of publications, Section IV).*
- **J. Euro. Cer. Soc. 20** 2561-68 (2000) (*number 45 in list of publications, Section IV).*
- **Ad. Mat. Res. 89-91** 551-55 (2010) (*number 74 in list of publications, Section IV).*

Finally, our group has made important contributions in developing novel processing routes for ceramics and composites. Our research has focused on using polymer derived ceramics routes to make nanoscale composite microstructures. We have also made fundamental contributions in the area of processing of nanoscale ceramic reinforced polymers. The significant publications on this topic are:

- **Composites: Part B, 30**, 647-655 (1999) (*number 38 in list of publications, Section IV).*
- **J. Phys. Chem. B, 104** 2810-16 (2000) *(number 40 in list of publications, Section IV).*
- **J. Euro. Cer. Soc., 25** 175-180 (2005) (*number 56 in list of publications, Section IV).*
- **J. Mat. Res., 21**, [7], 1759-69 (2006) (*number 57 in list of publications, Section IV).*
- **J. Mat. Res. 22** 1959-66 (2007) (*number 65 in list of publications, Section IV).*
- **J. Am. Ceram. Soc. 91** 41-45 (2008) (*number 66 in list of publications, Section IV).*
- Chapter in the book **Handbook of Fiber Structures** (2010) (*number 2 in list of publications, Section IV).*
- Chapter in the book **Polymer Derived Ceramics** (2010) (*number 4 in list of publications, Section IV).*

Section II. ACADEMIC LEADERSHIP EXPERIENCE AND ACCOMPLISHMENTS

II.1 Department Chair at University of Washington

As the *Acting Chair* (1996 – 1998) and then the *Chair* (1998 – 2005) of the Department of Materials Science & Engineering at University of Washington, I led the Department through many significant changes and growth. During my tenure as the Chair, the Department transformed from a metallurgy and ceramics department to a high performing, truly integrated materials science and engineering department. Some of my significant accomplishments as Department Chair are:

- From not being ranked in the top 30 in 1998, the Department ranked number 19 in the country in 2006.
- According to the most updated report from Thomson Reuters, UW's materials research in the past 10 years (2001 – 2011) has been ranked #17 in the world in receiving total citations (#5 in US). It has also been ranked #1 in the world in total impact (received the most citations per paper). Many of the key faculty members who contributed papers that led to this ranking were hired, both in the MS&E Department and in other departments, during the time I was the Chair.
- Development of a comprehensive strategic plan in 1998 and accomplishment of all of the six strategic goals by 2004.
- More than 400% increase in the research expenditure, from approximately $ 100 K/faculty in 1995-96 to about $ 510 K/faculty in 2005-06 (10th among MS&E departments in the country).
- Approximately 50% increase in number of Ph.D. students. In 2005, the three - year running average of number of PhDs awarded was six (it was two in 1996). The Department ranked 5th among MS&E departments in the country in PhDs/faculty.
- Significant increase in the number of publications from the Department. In 2005, the Department faculty published 6.6 ISI papers/faculty.
- Significant broadening of the research portfolio of the Department to include new programs in bio-materials, polymers, electronic materials, molecular electronics, nano-materials and magnetism, while maintaining our traditional strength in ceramics and metals.
- Significant leadership from the Department in multidisciplinary research programs in photonics (resulted in an NSF funded STC), molecular biomimetics (resulted in an NSF funded MRSEC), spintronics and magnetism, and biomaterials.
- Significant participation and leadership in the campus wide Center for Nanotechnology (CNT). CNT has faculty from three colleges (Engineering, Arts and Sciences, and Medicine) . In 2004, eight of the 10 tenure-track faculty members in the Department were members of the CNT faculty. 14% of all CNT faculty were from our Department, 7 out of 40 CNT courses were MS&E courses, 25% of all students in the dual PhD program were from MS&E, and of the total of 81 graduate students that had received financial support from CNT, 21 were from MS&E.
- Development of a TA training program and targeted fund raising to increase TA salaries to be the same as that of RAs.
- Approximately 25% increase in UG students (leading to the highest ratio of UG degrees/faculty in MS&E in the country).
- Combining two UG degrees (in Ceramics and Metallurgy) into a single degree in Materials Science and Engineering with specific improvements in the curriculum, including focus on experiential learning. About 25 % of the total departmental credits are from laboratory classes and all Seniors and approximately 20 % of the Juniors participate in research. The curriculum offers flexibility for internships and study abroad.
- Significant increase in underrepresented minorities (including women) in the UG program.

- Development of an advising and mentoring program leading to a 15% decrease in average graduation time and an increase of about 25% in placement of students at the time of graduation. Almost all the students are placed within six months of graduation.
- Instituted a variety of mechanisms to get feedback from students including individual exit interviews with all the graduating students (undergraduate and graduate), quarterly lunch time meetings with students and the Chairs of appropriate program committees (undergraduate and graduate) and feedback sessions with trained professionals from the Center of Instructional Development and Research (CIDR).
- Instituted annual reviews of faculty and staff.
- A stellar 10-year review of the Department by a committee of experts (2004).
- Significant alumni engagement in development activities. These efforts resulted in a 100% increase in the support for students (scholarships and fellowships) and donations for the upgrade of the Department's UG and graduate laboratories. The total amount raised between 1996 and 2005 was over $ 2.7 million.

In addition to these exciting and notable accomplishments, we developed a highly collaborative, collegial and nurturing environment. Under my leadership, the Department became truly *student-centered with emphasis on mentoring at all levels*. Specific examples of the success of this approach include:

- Selection of four faculty members (out of10) to the status of Fellow in professional societies.
- Selection of three faculty members to the College of Engineering Educator of the Year and one to the University of Washington Educator of the Year award.
- Development of mentoring program for Assistant Professors. Also started work on developing a mentoring program for post-docs.
- Significant increase in awards for students. For example, during the later part of my tenure, approximately 20% of the graduate students had National or University level competitive fellowships.

II.2 Institutional Interdisciplinary, International and Industrial Collaborations and Initiatives

One of the most important outcomes, for me, of my almost ten years in the leadership roles has been a heightened awareness that interdisciplinary, inter-institutional and international collaborations are key to making any significant impact. I led and was an active member of a range of initiatives. A few representative ones are listed below.

<u>Interdisciplinary</u>

In addition to strategic recruitment in the area of photonics, bio-materials, magnetisms and nanotechnology that led to significant interdisciplinary programs in these areas, I was involved in the following significant initiatives:

- Worked with Chairs of the Bio-Engineering and the Chemistry Departments to help launch the Nanotechnology initiative. This resulted in an IGERT, a joint program with Pacific Northwest National Labs and the development of a dual PhD degree program. My department had and continues to play a leading role in this Center.
- Worked with Chairs of Chemical Engineering and Chemistry on cluster recruitment in the area of organic and molecular photonics and electronics. This lead to the development of one of the strongest research programs in the country in this area.
- Worked with Chairs of Chemical, Mechanical and Electrical Engineering to initiate discussions to bring together faculty working on emerging energy conversion science and technologies. This has led to the development of interdisciplinary research programs with significant participation from the Department faculty. This has evolved

into a significant campus wide activity. Details of the current activities can be found at http://www.washington.edu/research/energy/

- Worked with Chairs of the Mechanical and Aerospace Engineering to develop an FAA funded program on composite materials and structure for commercial aerospace. Details can be found at http://depts.washington.edu/amtas/

International

During the time I was the Chair, the Department led the development of innovative international programs. I participated actively in developing these programs and implementing them. Notable international initiatives were:

- A Freshmen level engineering design course in collaboration with Tohoku University in Japan. Two teams of students, one at University of Washington and another at Tohoku University, worked on complementary aspects of the same problem and exchanged results. This highly regarded program ran from 2000 to 2005. I worked on this program with Prof. Gretchen Kalonji (from the Department) and Dean Denton who led in its development. We have recently revived this program and ran it again in 2009. Details of the recent version of this course can be found at http://ce.eng.tohoku.ac.jp/
- Worked closely with Prof. Kalonji who led the development of interdisciplinary collaborative program on interactions between human and natural systems with Profs. Hinckley (Forest Resources), Harrell (Anthropology) and Korshin (Environmental Engineering). Colleagues from South Africa, Vietnam and China were collaborators on this program. This led to the Development of the IGERT discussed below (in Section I.3).
- Worked closely with Prof. Kalonji who led the development of an exchange program with Sichuan University in China with Profs. Hinckley (Forest Resources) and Harrell (Anthropology). In this program, students from University of Washington spend their Junior year at Sichuan University and vice versa. Every year approximately 20 University of Washington students participate in this program. Further details of this ongoing program are at http://depts.washington.edu/uwww/UEP/overview.php
- I led the University of Washington activities and participation in the early stages of the development of the Worldwide Universities Network. This network now has 15 research-intensive universities on five continents. Details on the current focus on WUN are at http://www.wun.ac.uk/about

Industrial

During the time I was the Chair, I encouraged and facilitated the development of targeted partnerships in research and education with industry colleagues. The significant ones among these are:

- Research programs with the Boeing Company on composites. Boeing is a major industrial partner in the FAA funded center on composite materials and structure for commercial aerospace. It continues to support research on composites by faculty in the Department.
- Research programs with the Intel Corporation. Initially, the collaboration was focused on process control and computational materials science. More recently it has focused on organic electronics and photovoltaics.
- Development of an industry mentored, two-quarter capstone design course sequence in 2003. This course sequence has been continuously taught since 2003 and has included participating engineers from Boeing, Intel, Microsoft, Exponent, Commercial Aircraft Interiors, Life Sciences Oncology, Inter Point, Toyo Tanso Inc. and Cascade Engineering Services.

- Development of a Department faculty led certificate program on composite materials. In this program, department faculty have partnered with retired Boeing engineers to develop a training program for practicing engineers.

II.3 Research and Education Program Leadership

I have played major leadership roles in two large NSF funded interdisciplinary research and educational programs. The first was the Engineering Coalition of Schools for Excellence in Education and Leadership (ECSEL) Program, for which I was Co-PI from 1995-1996 and 1997 - 98 and PI from 1998 – 2001. This program was a multi-institution program and for six years, I led the University of Washington part of the program. The two goals of this program were to enhance the design component of UG engineering curriculum and to enhance the diversity of engineering students and faculty. The ECSEL program funding ended in June 2001 but most of the curricula enhancements have been institutionalized and are now part of the regular curriculum. As a result, currently almost 75 % of all Engineering undergraduates at University of Washington take at least one ECSEL modified course during their studies.

The second NSF funded program, which was completed in August 2010 and for which I was a Co-PI, is an Integrative Graduate Education and Research Traineeship (IGERT) program that seeks to train Ph.D. scientists and engineers in the interdisciplinary background and the technical, professional and personal skills needed to address the global questions of the future. Our program was titled "Multinational Collaborations on Challenges to the Environment". This project had faculty and students from Anthropology, Biology, Civil Engineering and Forest Resources in addition to Materials Science & Engineering. Further details are at http://depts.washington.edu/uwww/IGERT/overview.php

II.4 Professional Society and Service Leadership

I have held significant leadership positions in the American Ceramic Society (details are presented in Section X). I was the Chair of the Basic Science Division (2004-2005). One of the most important accomplishments was a focused effort on recruiting and engaging graduate students in the Division. One sustaining legacy of this is the Graduate Excellence in Materials Science (GEMS) award. The award continues to this day. From 2008-2010, I was a member of the Board of the American Ceramic Society. During this time, I continued my focus on the student members and on publications of the Society. After stepping down from the Board, I have taken on the responsibility of chairing the committee on the Volunteer Structure of the Society (2010 – Present). This is an 11-member Presidential committee charged with critically examining the structure of the American Ceramic Society with particular focus on whether or not the structure meets the needs of the members. We have been charged to suggest changes in the structure, if needed, to the Board. This is a major undertaking since the Society is very large (over 5000 members) and old (over 100 years old). The work involves both critically evaluating if the structure meets the current needs of the members and respecting the traditions and values of this very successful flagship professional organization.

I was the Co-Chair of the Sponsorship and Fundraising Committee for the Golden Jubilee of the Indian Institute of Technology, Kanpur (IITK) (2009 – 2010). This committee raised funds and sponsorships from IITK alumni and corporations for the Golden Jubilee (50^{th} anniversary) of the Institute. This was an entirely voluntary group with no support from the Institute. Currently, I am a member of the Board of Directors of the Indian Institute of Technology, Kanpur Foundation (2011 – present). In this role, my focus is on developing and leading an Academic and Research alumni network. This network is currently focused on developing meaningful educational and research partnerships between IITK and US universities and in partnering with IITK leadership in their effort to recruit the best faculty members.

SECTION III: GRADUATE STUDENT, POST-DOC AND VISITING SCHOLAR MENTORING

III.1 Doctoral Students

Student	Dissertation Title	Current Employer	Year of Completion
Donald Ellerby	Processing and Mechanical Properties of Metal-Ceramic Composites	NASA, Ames	May 1999
Kyle Flannigan	Processing and Mechanical Properties of Nano-Scale Reinforced Bio-Polymers	Intel Corp.	March 2000
Feng Zheng	Phase Stability and Processing of Sr and Mg Doped Lanthanum Gallate	Central South University, China	June 2000
Margaret Stackpoole	Processing and Mechanical Properties of Polymer Derived Si_3N_4 Matrix Composites and their use in Coating and Joining Ceramics and Ceramic Matrix Composites	NASA, Ames	Oct. 2002
Samuel Salamone	The Influence of Grain Growth During Sintering on the Constitutive Parameters and the Densification of Ceramic Matrix Composites	M-Cubed Corp., Wilmington	Sept. 2003
Dustin Frame	Microstructure Development and Crack Growth in Constrained Electrolytes	United Tech. Res. Cent.	August 2006
Jessica Torrey	Polymer Derived Composite Ceramic Coatings	NIST Boulder	Nov. 2006
Nik Hrabe	Graded Porosity Titanium for Biomedical Applications	NIST Boulder	June 2010
Kaishi Wang	Nanoscale Reinforced Ceramic Matrix Composite Coatings	Univ. of Washington	August 2010
Cliff Leslie	Doped Copper Manganite Spinels	AFRL	November 2011
*Shelly Arreguin**	*Nanostructured Si-C-X Materials for Nuclear Applications*	*UW*	*May 2014 (Exp.)*
*Kevin Strong**	*Optimized Nanoscale Si_3N_4 – SiC Composites*	UW	*May 2014 (Exp.)*
*Aaron Lichtner**	*Hierarchical Porous Electrochemical Ceramics*	UW	*September 2014 (Exp.)*

**Current Students*

III.2 Masters Students

Student	Dissertation Title	Current Employer	Year of Completion
Teresa Sebert	Reinforcement for a Silicon Nitride Ceramic Matrix Composite.	Intel Corp.	Feb. 1996
James Holbery	Rapid Cure Thermoset Preimpregnated Composite Dev. and Charact. for the Sporting Goods Industry	PNNL	March 1996
Margaret Stackpoole	Time Dependent, Environmentally 6 Assisted Deformation Behavior of Fiber-Reinforced Matrix Composites	NASA, Ames	May 1996
Kyle Flannigan	The Effect of Multiple Processing Iterations on the Processing Parameters, Properties and Structure of Two Thermo-plastic Systems	Intel Corp.	June 1996
Christopher Barlow	Fracture and Impact Resistance of Microcellular Polymer Foams	Active Voice	June 1997
Scott Hollenback	Reactive Pyrolysis of Pre-Ceramic Polymer to Produce Ceramic Matrix Composites	Micron Corp.	June 1997
Jung-Min Kwon	Effect of Ductile Layer Thicknesses on the Fracture Properties of Toughened Fiber Reinforced Composites	GE Aircraft Engines	June1999
Jennifer Power	Thermo-forming of Thermoplastic Matrix Fiber Reinforced Composites	IBM Corp.	April 2000
Munjal Chheda	Processing of Creep Resistant Silicon Nitride Matrix Nano-Composites	Ceradyne Corp.	May 2001
Geoffry Butler	Design of Fiber Reinforced Composite Sleeve for Earthquake Damage Protection of Concrete Columns	Boeing Co.	March 2003
Timothy Chin	Processing and Properties of Oxide Gate dielectrics	MIT	June 2004
Alex Turner	Finite Element simulation of Porous Metal for Load Bearing Biomedical Applications	Kyoto Univ., Japan	June 2009

III.3 Other Research Supervision

Researcher	Department	Duration
Dr. B. Flinn	Post-Doctoral Research Associate	Oct 1992 – Sep 1995
Mr. D. Clifton	Research Engineer	Mar 1993 – June 1996
Mr. T. Ostrowski	Visiting Graduate Student Technical Univ., Darmstadt, Germany	Sep 1995 – Jan 1996 and Oct 1996 – May 1996
Mr. A. Zimmerman	Visiting Graduate Student Technical Univ., Darmstadt, Germany	Jan 1996 – May 1996
Mr. R. Kauerman	Visiting Graduate Student Technical Univ., Hamburg-Harburg, Germany	Oct 1996 – Feb 1997 and Sep 1997 – Nov 1997
Prof. Park	Visiting Professor, Chosun Univ., Korea	Sep 1996 – July 1997, Feb 2005 – Jan 2006, Jan 2013 - Present

Dr. M. Locatelli	Post-Doctoral Research Associate	Feb 2002 – Dec 2002
Dr. S. Sofie	Post-Doctoral Research Associate	Sep 2002 – June 2003
Dr. S. Salamone	Post-Doctoral Research Associate	June 2003 – June 2004
Dr. B.S. Rao	Post-Doctoral Research Associate	Feb 2002 – Aug 2007
Dr. M. Scheffler	Visiting Scientist, University of Erlangen, Germany	June 2004 – June 2006
Prof. Hector Camacho-Montes	Visiting Professor, Universidad Autonoma de Ciudad Juarez, Mexico	June 2005 – July 2005; May 2006 – June 2006 and July 2009 – June 2010
Dr. O. Guillon	Visiting Scientist, Technical Univ., Darmstadt, Germany	July 2006 – Feb 2007
Dr. C. Martin	Visiting Scientist, Institut National Polytechnique de Grenoble France	Sep 2006 – Aug 2007
Mr. B. Fuchs	Visiting Graduate Student, University of Erlangen, Germany	Oct 2008 – April 2009
Prof. J. K. Lee	Visiting Professor, Chosun Univ., Korea	Feb 2010 – January 2011
Dr. Nik Hrabe	Post-Doctoral Research Associate	June 2010 – February 2011
Dr. Haixia Shang	Post-Doctoral Research Associate	August 2010 – August 2013
Dr. Kaishi Wang	Post-Doctoral Research Associate	August 2011 – August 2013
Prof. J. Drennan	University of Brisbane, Australia	June 2011 – August 2011
Prof. H. Zhang	Xinjiang Technical Institute of Physics and Chemistry	January 2011 – December 2011
Ms. Maya Cheriff	Ecole NationaleSuperieurede Physique, Electrnique, Materiaux	February 2012 – August 2012
Ms. Yuqing Peng	Visiting Student, Donghua University	January 2012 – June 2013
Ms. W. Zhang	Visiting Student, Huazhong University of Science and technology	January 2012 – December 2012
Dr. Chen-Chih Tsai	Post-Doctoral Research Assocaite	September 2013 – Present
Dr. Thomas Konegger	Visiting Scientist	September 2013 – Present
Dr. Engin Ciftyurek	Post-Doctoral Research Assocaite	February 2014 – Present

Under-Graduate Research Supervision: I have supervised the research of 4 to 5 under-graduate students every year since 1992. Since 2004, every year on average 3 of my under-graduate students have presented their research at the University of Washington's Annual Under-Graduate Research Symposium.

III.4 Awards Received by Students Supervised

1. Ms. Margaret Stackpoole: ASUW scholarship from Pacific Northwest National Labs (June 1994 – Sep 1994 and June 1995 – Sep 1995).
2. Mr. Don Ellerby: Outstanding Student Award, Sandia National Labs (1995 – 1998).
3. Mr. Kyle Flanigan: ASUW Scholarship from Pacific Northwest National Labs, (Oct 1996 – March 1997)

4. Mr. Feng Zheng: ASUW Scholarship from Pacific Northwest National Labs, (Oct 1996 – March 2000).
5. Mr. Kyle Flanigan: Award from SAMPE to present his paper at the national meeting (1998).
6. Ms. Margaret Stackpoole: Outstanding Student Paper Award, American Ceramic Society, Fall Meeting (1998).
7. Mr. Feng Zheng: Outstanding Student Paper Award, American Ceramic Society, Fall Meeting (1998).
8. Ms. Jennifer Power: Ford Fellowship of the College of Engineering (1998 – 1999).
9. Ms. Margaret Stackpoole: Society of Women Engineers, Outstanding Graduate Student (1999).
10. Ms. Margaret Stackpoole: Outstanding Student Poster Award, Gordon Research Conference (2000).
11. Mr. Rafael Leckie: NSF Graduate Fellowship (2001). Mr. Leckie conducted his under-graduate research with me.
12. Mr. Tim Chin: Goldwater Fellowship (2001), Mary Gates Fellowship for Under Graduate Research (2001 – 2003) and the Marsh Scholarship (2002 – 2003).
13. Mr. Tim Chin: NSF Graduate Fellowship (2003).
14. Ms. Jessica Torrey: Early Bird Nanotechnology Award, Center for Nanotechnology, Univ. of Washington and Pacific Northwest National Labs (2002).
15. Ms. Jessica Torrey: Graduate Opportunities and Minority Achievement Program Fellowship, Graduate School, University of Washington (2002 – 2003).
16. Ms. Jessica Torrey: Achievement Award for College Scientists (ARCS) Fellowship, University of Washington (2002 – 2005).
17. Mr. Cliff Leslie: Graduate Opportunities and Minority Achievement Program Fellowship, Graduate School, University of Washington (2003 – 2004).
18. Mr. Cliff Leslie: Achievement Award for College Scientists (ARCS) Fellowship, University of Washington (2003 – 2006)
19. Mr. Cliff Leslie: NSF Graduate Fellowship (2004 – 2007).
20. Ms. Jessica Torrey: Ford Fellowship, College of Engineering, University of Washington (2004 – 2005).
21. Mr. Dustin Frame: IGERT Fellowship (2004 – 2006)
22. Ms. Jessica Torrey: Outstanding Student Poster Award, Gordon Research Conference (2004).
23. Mr. Nik Hrabe: Early Bird Nanotechnology Award, Center for Nanotechnology, Univ. of Washington and Pacific Northwest National Labs (2004).
24. Mr. Nik Hrabe: Achievement Award for College Scientists (ARCS) Fellowship, University of Washington (2004-07)
25. Ms. Jessica Torrey: Outstanding Female Graduate Student, Society of Women Engineers, University of Washington (2005).
26. Ms. Jennifer Power: Ford Fellowship of the College of Engineering (2004 – 2005).
27. Mr. Nik Hrabe: Graduate School Fund for Excellence and Innovation (2005).

28. Ms. Megan Brewster: NSF Graduate Fellowship (2006). Ms. Brewstwer conducted her under-graduate research with me.
29. Mr. Nik Hrabe: Ford Fellowship of the College of Engineering (2006 – 2007).
30. Dr. Dustin Frame: National Research Council Postdoctoral Fellowship (2006).
31. Dr. Jessica Torrey: Humboldt Post Doctoral Fellowship (2007).
32. Mr. Nik Hrabe: East Asia and Pacific Summer Institutes Fellowship, National Science Foundation (2007).
33. Mr. Cliff Leslie: National Defense Science and Engineering Graduate Fellowship (2007 – 2009).
34. Mr. Cliff Leslie: Mickey Leland Energy Fellowship, Department of Energy (2009).
35. Ms. Shelly Arreguin: Mickey Leland Energy Fellowship, Dept. of Energy (2009).
36. Ms. Shelly Arreguin: NASA Space Grant Fellowship (2009).
37. Mr. Kevin Strong: Early Bird Nanotechnology Award Recipient, Center for Nanotechnology, Univ. of Washington and Pacific Northwest National Labs (2009).
38. Dr. Jessica Torrey: National Research Council Postdoctoral Fellowship (2010).
39. Dr. Nik Hrabe: National Research Council Postdoctoral Fellowship (2010).
40. Cliff Leslie: National Research Council Postdoctoral Fellowship (2011).

SECTION IV: REFEREED PUBLICATIONS AND PATENTS

IV.1 Featured Articles

1. D. Jauffres, C.L. Martin, A. Lichtner and R.K. Bordia, "Simulation of the Elastic Properties of Porous Ceramics with Realistic Microstructure", *Feature Article* **Modelling and Simulation in Materials Science and Engineering**, **20** [4], 045009-045027 (2012).
2. G. S. Rohrer et al. (a total of 26 co-authors including R. K. Bordia), "Challenges in Ceramic Science: A Report from the Workshop on Emerging Research Areas in Ceramic Science", Feature Article **Journal of the American Ceramic Society**, **95** [12], 3699-3712 (2012).

IV.2 Book Chapters and Books Edited

3. Srinivasa Rao Boddapati and Rajendra K. Bordia, "Ceramic Hollow Spheres", in *Cellular Ceramics: Structure, Manufacturing, Properties and Applications***, Eds. Paolo Colombo and Michael Scheffler,** 177-92, WILEY-VCH Weinheim, Germany (2005).
4. Günter Motz and Rajendra K. Bordia, "Processing, Structure and Properties of Ceramic Fibers", in *Handbook of Textile Fiber Structure, Vol 2: Natural, Regenerated, Inorganic and Specialist Fibers***, Eds. S.J. Eichhorn, J.W.S. Hearle, M. Jaffe and T. Kikutani,** 378, Woodhead Publishing Ltd., Cambridge, UK (2009).
5. R. Bordia and E. Olevsky, Guest Editors for "Advances in Sintering Science and Technology", special issue of the **Journal of the American Ceramic Society, 92** [7] (2009).
6. Jessica Torrey and Rajendra K. Bordia, "Filler Systems (Bulk Components and Nano-Composites)", in *Polymer Derived Ceramics***, Eds. Paolo Colombo, G.D. Sorarü and R. Riedel,** 329-340, DEStech Publications, Lancaster, USA (2010).
7. *Advances in Sintering Science and Technology,* **Eds. R.K. Bordia and E. Olevsky,** Ceramic Transactions, **209**, The American Ceramic Society (2010).
8. Olivier Guillon, Rajendra K. Bordia and Christophe L. Martin, "Constrained Sintering of Ceramic Films and Coatings", in *Sintering of Advanced Materials*, **Ed. Z. Z. Fang,** 414-433 Woodhead Publishing Ltd. (2011).
9. Rajendra K. Bordia and Hector Camacho-Montes, "Sintering: Fundamentals and Practice", in *Ceramics and Composites Processing Methods*, **Eds. Narottam Bansal and Aldo R. Boccaccini**,3-42 John Wiley & Sons (August 2012).
10. Suk-Jong L. Kang, Rajendra K. Bordia, Didier Bouvard and Eugene. Olevsky, Guest Editors for "Advances in Sintering Research", special section of the **Journal of the American Ceramic Society, 95** [8] (August 2012).
11. *Advances in Sintering Science and Technology II*, **Eds. Suk-Jong L. Kang, Rajendra K. Bordia, Didier Bouvard and Eugene. Olevsky,** Ceramics Transactions **232**, The American Ceramic Society (September 2012).
12. Suk-Jong L. Kang, Rajendra K. Bordia, Didier Bouvard and Eugene. Olevsky, Guest Editors for "Progress in Research on Sintering and Microstructural Development", special section of the **Journal of Materials Science, 47** [20] (October 2012).

IV.2 Archival Journal Papers

13. R. K. Bordia, "A Theoretical Analysis of Random Packing Densities of Mono-Sized Spheres in Two and Three Dimensions", **Scripta Met., 18**, 725 (1984).

14. R. Raj and R. K. Bordia, "Sintering Behavior of Bi-Modal Powder Compacts", **Acta Metallurgica, 32**, [7], 1003-1019 (1984).
15. R. K. Bordia and R. Raj, "Sintering Behavior of Ceramic Films Constrained by a Rigid Substrate", **Journal of the American Ceramic Society, 68**, [6], 287-292 (1985).
16. R. K. Bordia and R. Raj, "Analysis of Sintering of a Composite with a Glass or Ceramic Matrix", **Communications of the American Ceramic Society, 69**, [3], C55-C57 (1986).
17. R. K. Bordia and R. Raj, "Role of Shear in the Sintering of Composites", **Materials Science Research, 20**, 27-40 (1986).
18. R. K. Bordia and R. Raj, "The Sintering of TiO_2 (Al_2O_3) Composites: A Model Experimental Investigation", **Journal of the American Ceramic Society, 71**, [4], 302-310 (1988).
19. R. K. Bordia and R. Raj, "Hot Isostatic Pressing of Ceramic/Ceramic Composites at Pressure Below 10 MPa", **Advanced Ceramic Materials, 3**, [2], 122-126 (1988).
20. M. K. Crawford, W. E. Farneth, R. K. Bordia and E. M. McCarron, III, "Far Infrared Spectroscopy of $RBa_2Cu_3O_X$ with Variations in R and x", **Physics Review B, 37,** 3371-3374 (1988).
21. R. K. Bordia and G. W. Scherer, "Constrained Sintering: I. Constitutive Models for a Sintering Body", **Acta Metallurgica, 36**, 2393-2397 (1988).
22. R. K. Bordia and G. W. Scherer, "Constrained Sintering: II. Comparison of Constitutive Models", **Acta Metallurgica, 36**, 2399-2409 (1988).
23. R. K. Bordia and G. W. Scherer, "Constrained Sintering: III. Rigid Inclusions", **Acta Metallurgica, 36**, 2411-2416 (1988).
24. H. S. Horowitz, R. K. Bordia, R. B. Flippen, R. E. Johnson and U. Chowdhry, "Degradation of Sinterability and Superconducting Properties of Fine $YBa_2Cu_3O_{7-y}$ by Exposure to Moisture", **Materials Research Bulletin, 23**, 821-830 (1988).
25. R. K. Bordia and G. W. Scherer, "Sintering of Composites: A Critique of the Available Analyses", **Ceramic Transactions, 1**, Eds., G. L. Messing, E. R. Fuller, Jr., and H. Hausner, 872-886 (1988).
26. W. E. Farneth, R. K. Bordia, E. M. McCarron, III, M. K. Crawford and R. B. Flippen, "Influence of Oxygen Stoichiometry on the Structure and Superconducting Transition Temperature of $YBa_2Cu_3O_X$", **Solid State Communications, 66**, 953-959 (1988).
27. M. K. Crawford, W. E. Farneth, E. M. McCarron, III and R. K. Bordia, "Isotopic and Isomorphic Substitution of $YBa_2Cu_3O_X$: Far Infrared Spectroscopy and Assignment of Phonons", **Physical Review B, 38**, 11382-11390 (1988).
28. J. Vega, W. E. Farneth, E. M. McCarron and R. K. Bordia, "Cu NQR of $YBa_2Cu_3O_{7-y}$ with Varying Oxygen Content", **Physical Review B, 39**, 2322-2332 (1989).
29. H. S. Horowitz, R. K. Bordia, C. C. Torardi, K. J. Morrissey, M. A. Subramanian, J. B. Michel, T. R. Askew, R. B. Flippen, J. D. Bolt and U. Chowdhry, "The Effect of Synthesis Methods on the Processing and Properties of $YBa_2Cu_3O_{6+x}$", **Solid State Ionics, 32/33**, 1087-1099 (1989).
30. K. R. Mikeska, G. W. Scherer and R. K. Bordia, "Constitutive Parameters of Sintering Materials", **Ceramic Transactions, 7**, 200-214 (1990).
31. R. K. Bordia, H. S. Horowitz, C. R. Fincher and S. J. McLain, "Sintered Superconductors: Dependence of Microstructure and Transport Properties on Processing Conditions", **Ceramic Transactions, 13**, 205-241 (1990).

32. A. Jagota, K. R. Mikeska and R. K. Bordia, "Isotropic Constitutive Models for Sintering Particle Packings", **Journal of the American Ceramic Society, 73**, [8], 2266-73 (1990).
33. R. K. Bordia, B. J. Dalgleish, P. G. Charalambides and A. G. Evans, "Cracking and Damage in a Notched Unidirectional Fiber-Reinforced Brittle Matrix Composite", **Journal of the American Ceramic Society, 74**, [11], 2776-80 (1991).
34. R. K. Bordia and A. Jagota, "Crack Growth and Damage in Constrained Sintering Films", **Journal of the American Ceramic Society, 76**, [10], 2475-2485 (1993).
35. C. H. Henager, Jr., R. H. Jones, C. F. Windisch, Jr., M. M. Stackpoole, R. K. Bordia, "Time-Dependent, Environmentally Assisted Crack Growth In Nicalon-Fiber-Reinforced SiC Composites at Elevated Temperatures", **Metallurgical and Materials Transactions A, 27A**, [4] pp. 839-49. (1996).
36. S. M. Salamone and R. K. Bordia, "Effect of Non-Densifying Inclusions on the Densification of Ceramic Matrix Composites", **Sintering Technology**, Eds. R. M. German, G. L. Messing and R. G. Cornwall, pp. 497-504 (1996).
37. B. D. Flinn, R. K. Bordia and J. Rödel, "Evolution of Strength Determining Flaws During Sintering", **Sintering Technology**, Eds. R. M. German, G. L. Messing and R. G. Cornwall, pp. 13-20 (1996).
38. T. Ostrowski, A. Ziegler, R. K. Bordia and J. Rödel, "Evolution of Young's Modulus, Strength and Microstructure During Liquid Phase Sintering", **Journal of the American Ceramic Society, 81** [7], pp. 1852-60 (1998).
39. A. Zimmerman, M. Hoffman, B. D. Flinn, R. K. Bordia, T.-J. Chuang, E. R. Fuller, Jr., and J. Rödel, "Fracture of Alumina with Controlled Pores: Effect of Grain Size", **Journal of the American Ceramic Society**, **81** [9], 2449-2457 (1998).
40. M. M. Stackpoole, R. K. Bordia, C. H. Henager, Jr., C. F. Windish and R. H. Jones, "Stability of Carbon Interphases and Their Effect on the Deformation of Ceramic Matrix Composites", **Ceramic Microstructures - 96**. Eds. A. P. Tomsia and A. Glaeser, Plenum Press, pp 713-720 (1998).
41. C. Barlow, R. K. Bordia, B. D. Flinn, J. Weller, and V. Kumar, "The Effects of Microstructure on the Fracture Behavior of Microcellular Polycarbonate", **Transactions of the American Society of Mechanical Engineers**: Porous Cellular and Microcelluar Materials, 82, 35-44 (1998).
42. C. Barlow, J. Weller, V. Kumar, R. K. Bordia and B. D. Flinn, "The Effect of Density and Cell Size on the Impact Strength of Microcellular Polycarbonate", **Transactions of the American Society of Mechanical Engineers**: Porous Cellular and Microcelluar Materials, 82, 45-51 (1998).
43. A. W. Wiemer and R. K. Bordia, "Processing and Mechanical Properties of Nanophase Reinforced Silicon Nitride Composites", **Composites: Part B, 30**, 647-655 (1999).
44. M. M. Stackpoole, R. K. Bordia, C. H. Henager, Jr. and R. H. Jones, "Stability of BN Interphases and Their Effect on the Deformation of Fiber Reinforced Ceramic Matrix Composite Materials", **Ceramic Transactions, 98,** 341-350 (1999).
45. L. Q. Wang, J. Liu, G. J. Exarhos, K. Y. Flanigan and R. K. Bordia, "Conformation Heterogeneity and Mobility of Surfactant Molecules in Intercalated Clay Minerals Studied by Solid-State NMR", **Journal of Physical Chemistry B, 104** [13] 2810-2816 (2000).
46. M. S. Chheda, B. D. Flinn, R. Leckie, R. K. Bordia, "Effect of Sub-Micron Sized Reinforcements on the High Temperature Behavior of Si_3N_4 Composites", **Ceramic Transactions**, **103**, 223-236 (2000).

47. M. Stackpoole and R. K. Bordia, Reactive Processing and Mechanical Properties of Si_3N_4 Matrix Composites", **Ceramic Transactions**, **108**, 111-119 (2000).
48. M. A. Sorensen, M. M. Stackpoole, A. L. Frenkel, R. K. Bordia, G. V. Korshin and T. H. Christensen, " Aging of Iron (Hydro) Oxides by Heat Treatment and Effects on Heavy Metal Binding", **Environmental Science and Technology 34** [18], 3991-4000 (2000).
49. M. A. Sorensen, C. B. Koch, M. M. Stackpoole, R. K. Bordia, M. M. Benjamin and T. H. Christensen, " Effects of Thermal Treatment on Mineralogy and Heavy Metal Behavior in Iron Oxide Stabilized Air Pollution Control Residues", **Environmental Science and Technology 34** [21], 4620-4627 (2000).
50. B. D. Flinn, R. K. Bordia, A. Zimmerman and J. Rödel, "Evolution of Defect Size and Strength of Porous Alumina During Sintering", **Journal of European Ceramic Society 20** [14-15] 2561-2568 (2000).
51. M. A. Sorensen, M. Stackpoole, C. Bender-Koch, R. K. Bordia, M. M. Benjamin and T. H. Christensen, "Thermal Treatment of iron oxide stabilized APC Residues from Waste Incineration and the Effect on Heavy Metal Binding", **Waste Management Services: Waste Materials in Construction**, 1 281-286 (2000).
52. C. Barlow, V. Kumar, B. Flinn, R. K. Bordia and J. Weller, "Impact Strength of High Density Solid-State Microcellular Polycarbonate Foams", **Journal of Engineering Materials and Technology (ASME) 123** [2] 229-233 (2001).
53. C. S. Park, F. Zheng, S. Salamone and R. K. Bordia, "Processing of Composites in the Ti-Si-C System", **Journal of Materials Science, 36** [13] 3313-3322 (2001).
54. J. D. Holbery and R. K. Bordia, "Accelerated Cure of Thermoset Fiber Composites Utilizing Latent Cure Agents", **Journal of Materials Science, 36**, 5301-5308 (2001).
55. C. S. Park, F. Zheng, M. M. Stackpoole, S. Salamone, and R. K. Bordia, "Synthesis and Oxidation of Composites in the Ti-Si-C System", **Ceramic Transactions: Ceramic Processing Science VI**, **112**, 725-730 (2001).
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IV.4 Refereed Conference Proceedings

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2. M. K. Crawford, W. E. Farneth, R. K. Bordia and E. M. McCarron, III, "Far Infrared Spectroscopy of RBa2Cu3Ox with Variations in R and x", **Proc. of Mat. Res. Soc. Symp., 99**, 833-836 (1988).
3. H. S. Horowitz, R. K. Bordia, R. B. Flippen and R. E. Johnson, "Effect of Ambient Atmosphere on YBa2Cu3O7-y ", **Proc. of Mat. Res. Soc. Symp., 99**, 903-906 (1988).
4. W. E. Farneth, R. K. Bordia, M. K. Crawford, L. Abrams and E. M. McCarron, III, "Kinetics and Thermodynamics of Reaction of Molecular Oxygen with YBa2Cu3O7-y", **Proc. of Mat. Res. Soc. Symp., 99**, 977-980 (1988).
5. R. K. Bordia, H. S. Horowitz, M. A. Subramanian, J. B. Michel, E. M. McCarron, III, C. C. Torardi, J. D. Bolt, U. Chowdhry, E. Lopdrup and S. J. Poon, "Sintering and Microstructure - Property Relations for YBa2Cu3O7 ", **Proc. of Mat. Res. Soc. Symp., 99**, 245-248 (1988).
6. A. Jagota, E. D. Boyes and R. K. Bordia, “Sintering of Glass Powder Packings with Metal Inclusions”, **Proc. of Mat. Res. Soc. Symp., 249**, pp 475-480 (1992).
7. S. A. Hollenback and R. K. Bordia "Reactive Processing of SiC Composites", **Proceedings of the Tenth International Conference on Composite Materials**, Vol. IV, pg. 569-575, August 1995.
8. M. M. Stackpoole, R. K. Bordia, C. H. Henager, Jr., C. F. Windisch and R. H. Jones, "Time Dependent, Environmentally Assisted Deformation Behavior of Fiber Reinforced Ceramic Matrix Composites”, **Proceedings of the Tenth International Conference on Composite Materials**, Vol. IV, pg. 735-741, August 1995.
9. J. D. Holbery, B. D. Flinn and R. K. Bordia, "Processing and Properties of Rapid Cure Preimpregnated Composite Systems", **Proceedings of the Tenth International Conference on Composite Materials**, Vol. III, pg. 93-100, August 1995.
10. T. G. Sebert and R. K. Bordia, "Processing of Particulate Reinforced Silicon Nitride Ceramic Matrix Composites", **Proceedings of the Tenth International Conference on Composite Materials**, Vol. IV, pg. 617-624, August 1995.
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12. D. Ellerby, B. D. Flinn, W. Scott, R. K. Bordia, K. Ewsuk, R. Loehman and W. G. Fahrenholtz, "Investigation of the Effect of Microstructure on the R-Curve Behavior of Metal-Ceramic Composites", **Proceedings of the Tenth International Conference on Composite Materials**, pg. 703-710, August 1995.

13. D. Clifton, K. Y. Flanigan, B. D. Flinn and R. K. Bordia, "Effect of Recycling on the Processing Parameters and Properties of Post-Consumer Thermoplastics", **Proceedings of the Tenth International Conference on Composite Materials**, Vol. III, pg. 349-356, August 1995.
14. J. Weller, V. Kumar and R. K. Bordia, "The Development of a Project-Based Introduction to Manufacturing Laboratory Involving a Sterling Engine", **Proceedings of the American Society of Engineering Education**, June 1998.
15. C. Barlow, J. Weller, R. Bordia and V. Kumar, "Solid-State Microcellular CPET Foams: effect of Nucleating Agents and Impact Modifiers", **Annual Tech. Conf. – ANTEC Conference Proceedings Vol. 2**, 1944-48 (1998).
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17. D. Frame and R. K. Bordia, "Stress assisted sintering: evolution of anisotropic microstructures". **Proceedings of the Fourth International Conference on Sintering**, Grenoble, France (2005).
18. Srinivasa Rao Boddapati, Michael Scheffler, Franziska Scheffler, Colin Fyfe and Rajendra K. Bordia, "Ceramic MICRO/NANO Structures from preceramic polymers", **Proceedings of the International Conference Porous Ceramic Materials (PCM 2005)** Bruges, B, Published on CD-ROM (2005).
19. Michael Scheffler, Franziska Scheffler, Colin Fyfe and Rajendra K. Bordia, "Hierarchically built porous materials from volcanic materials", **Proc. of the International Conference Porous Ceramic Materials (PCM 2005)** Bruges, B, Published on CD-ROM (2005).
20. H. Camacho, C. A. Martínez, P. E. García, and R.K. Bordia, "A Continuum Approach Comparison for Viscous Densification and Deformation during Sintering for Amorphous and Polycrystalline Ceramics" **Proceedings of 1st International Congress on Ceramics**, Ed. S. Freiman, ICC-P-0097-2006 (2006).
21. Srinivasa Rao Boddapati, Linh Q. Nguyen and Rajendra K. Bordia, "Processing of 8 mol% Yttria Stabilized Zirconia Coatings on 316 Stainless Steel Substrates by Dip Coating", **Proceedings of Materials Science and Technology (MS&T) Symposium on Innovative Processing and Synthesis of Ceramics, Glasses and Composites**, Ed. N. P. Bansal and J. P. Singh. 413-419 (2006).
22. S. R. Boddapati, and R.K. Bordia, "Effect of Withdrawal Speed on Thickness and Microstructure of 8 Mol % Yttria Stabilized Zirconia Coatings on Inorganic Substrates", **Advanced Ceramic Coatings and Interfaces II: Ceramic Engineering and Science Proceedings,** Eds. U. Schulz and H.-T. Lin, **Volume 28** [3], 243-252 (2008)
23. S. R. Boddapati, and R.K. Bordia, "Aligned Pore Channels in 8 Mol % Yttria Stabilized Zirconia by Freeze Casting", in **Developments in Porous, Biological and Geopolymer Ceramics: Ceramic Engineering and Science Proceedings,** Eds. M. E. Brito, M. Case, and W.M. Kriven, [9], 57-65 (2008)
24. S. Ramakrishna, R. Ramaseshan, R. Jose, L. Susan, B.R. Suresh and R. Bordia, "One-Dimensional Nanostructured Ceramics for Healthcare, Energy and Sensor Applications", **Invited review paper for Ceram. Engr. And Sci. Proceedings, 29** [8], 1-18 (2009).
25. V. Reschke, A. Laskowsky, M. Kappa, K. Wang, R.K. Bordia, M. Scheffler, "Polymer derived ceramic foams with additional strut porosity", **Epitőanyag**, **63** 57-60 (2011).

Non-Refereed Proceedings and Extended Abstracts Not Included

IV.4 Patents

1. R.J. Smith, J.R. Loscutova, E.A. Whitsitt, C.E. Coker, A.R. Barron, M. Wiesner, S.A. Costantino and R.K. Bordia, ‘Composition and Method of Making a Proppant”, Patent Number 7,459,209 (2008).
2. R.J. Smith, J.R. Loscutova, E.A. Whitsitt, C.E. Coker, A.R. Barron, M. Wiesner, S.A. Costantino and R. Bordia, ‘Composition and Method of Making a Proppant”, Patent Number 7,491,444 (2009).
3. M. Scheffler, R. Bordia, Method for fast crosslinking of silicone compounds at low temperature by in situ water generation, 7030P.1US (Provisional Patent).

SECTION V: RESEARCH FUNDING

VI.1 Current Projects

1. PI (two other Co-PIs from other institutions): Nuclear Energy University Program, Department of Energy, “Precursor Derived Nanostructured Si-C-X Materials for Nuclear Applications”, $899,518 (UW/Clemson share $533,187) August 2010 – August 2014.
2. PI (one other Co-PI from France): NSF-DMR, “Materials World Network: Designed Porous Ceramics for Electrochemical Applications”, $ 535,000 (all for UW/Clemson, the funding for the French partner is from the French counter part of NSF (ANR) September 2010 – September 2014.
3. Co-PI (PI Prof. Ohuchi, MS&E, UW): Department of Energy, “High Temperature Thermoelectric Oxides Engineered at Multiple Length Scales for Energy Harvesting”, $ 300,000 (November 2011 – October 2014).
4. Sole PI for Clemson (PI Dr. Shiv Joshi NextGen Aero): AFRL SBIR, “Composite Thermal Protection System”, $ 148,000 (for Clemson), December 2013 – December 2014.
5. PI (a Co-PI from another institution, Prof. Olevsky, SDSU): NSF-CMMI “Collaborative: DMREF: Multi-Scale Fundamental Investigation of Sintering Anisotropy”, $ 600,000 (UW share $ 300,000) September 2012 – August 2015.

V.2 Completed Projects

6. Sole PI: Washington Technology Center, “Mechanical Properties of Ceramic Matrix Composites”, $40,000, July 1992 – June 1993.
7. Sole PI: Graduate School Fund, University of Washington, “Densification of Ceramic Matrix Composites”, $7,000, July 1992 – March 1993.
8. Sole PI: Seattle Speciality Ceramics Corp., Woodinville, WA, “Research Agreement on the Characterization of Ceramic Powders”, $18,000, Sept. 1992 – Sept. 93.
9. Sole PI: National Science Foundation, “Densification of Ceramic Matrix Composites”, $100,000, Oct. 1992 – Sept. 1995.
10. Sole PI: National Science Foundation, “National Young Investigator Award” $312,500, Sept. 1992 – Sept. 1998.
11. Sole PI: College of Engineering Computing Committee, University of Washington “Faculty Workstation Initiative”, $ 6,000, Feb 1993 – Feb 1994.
12. PI (Co-PI Vipin Kumar, Mechanical Engineering, UW): Clean Washington Center, Dept. of Trade and Economic Dev., State of Washington “Characterization of Recycled Plastics”, $26,000, Mar 1993 – June 1994.
13. PI (Co-PI Vipin Kumar, Mechanical Engineering, UW): Washington Technology Center, “Characterization of Recycled Plastics” $5,000, Mar 1993 – June 1994.
14. PI (Co-PI Fumio Ohuchi, MS&E, UW) Clean Washington Center, Dept. of Trade and Economic Dev., State of Washington “Workshop and Curriculum Dev. on Materials Aspect of Recycling Technology”, $7,200, Mar 1993 – June 1993.
15. Sole PI: Royalty Research Fund, University of Washington, “Reactive Processing of Ceramic Composites”, $25,000, March 1993 – March 1994.

16. Sole PI: E. I. duPont de Nemours & Co. Inc., Wilmington, DE, “DuPont Young Professor Award”, $75,000, June 1993 – June 2003.
17. Sole PI: MTS Corporation, Minneapolis, MN, “Equipment Donation: Microprofiler Controller for MTS Testing Machine”, $22,500, August 1993.
18. Sole PI: Washington Technology Center, “Rapid Cure Composite System for Alpine Skis”, $65,000, July 1993 – June 1995.
19. Sole PI: K2 Corporation, Vashon, WA, “Rapid Cure Composite System for Alpine Skis”, $45,000, July 1993 – June 1994.
20. Co-PI (PI Fumio Ohuchi, MS&E, UW): Washington Technology Center, “Nanophase Reinforcement for Improved Si3N4 Properties”, $80,000, July 1993 – June 1995.
21. Co-PI (PI Fumio Ohuchi, MS&E, UW): Kyocera Industrial Ceramics Corp., “Nanophase Reinforcement for Improved Si3N4 Properties”, $90,000, July 1993 – June 1995.
22. PI: Washington Technology Center, “Processing and Properties of Recycled Polymers”, $28,942, July 1994 – June 1995.
23. PI: National Science Foundation, “Acquisition of Simultaneous Thermo-Gravemetric and Differential Thermal Analysis System”, $102,000, July 1993 – June 1995.
24. Co-PI (PI Gretchen Kalonji, MS&E, UW): National Science Foundation, "ECSEL Design for Manufacturing Education Program Technology Reinvestment Project (TRP)”, $198,000, April 1994 – Dec. 1995.
25. PI: Washington Technology Center, "Rapid Cure Epoxy System for Alpine Skis ”, $20,000, July 1994 – June 1995.
26. PI: Seattle Speciality Ceramics, “Maintenance Agreement on Characterization of Ceramic Powders”, $27,000, March 1995 – March 1996.
27. Institutional PI (Co-PI Bill Rogers, Chemical Engineering, UW), Sept. 95 to June 96 and June 1997 – Aug. 98; Institutional Sole PI August 98 to June 2001, National Science Foundation, “ECSEL Engineering Coalition”, $477, 524 per year for University of Washington, October 1995 – June 2001.
28. Sole PI: Boeing Co. “Young Investigator Meeting of the Institute of Mechanics and Materials”, $20,000, June 1996 – September 1996.
29. Sole PI: Institute of Mechanics and Materials (NSF funded Center at UCSD), “Young Investigators Institute of Mechanics and Materials”, $20,000, June 1996 – Sept. 1996.
30. Sole PI: Sandia National Laboratories, “Constrained Sintering of Ceramics” $ 25,000, March 1998-March 2000.
31. PI (Co-PIs Gretchen Kalonji and Lucien Brush): Intel Corp., “Computational Materials Science Laboratory”, $170,000, March 1999 – March 2004.
32. Sole PI: Royalty Research Fund, “A Novel Low Temperature Technique for Joining Ceramics and Ceramic Matrix Composites”, $29,000, Sept. 2000 – Sept. 2002.
33. PI for UW activities, Co-PI for the project (PI: Chuck Henager, Jr., Pacific Northwest National Laabs), Office of Industrial Technology, Department of Energy, “Advanced Composite Coatings for Industries of the Future” $1,395,000 (UW share is $ 315,313), Sept. 2001 – Sept. 2006.
34. Sole PI: National Institute of Standards and Technologies, “Models for Densification of Low Temperature Co-fired Multilayer Ceramics”, $98,000, Feb. 2002 – Feb. 2003.
35. Sole PI: National Science Foundation, “Gordon Research Conference on Solid State Studies in Ceramics”, $15,000, July 2002-June 2003.

36. Sole PI: Army Research Office, “Gordon Research Conference on Solid State Studies in Ceramics”, $7,500, July 2002-June 2003.
37. Co-PI (PI Brian Flinn, MS&E, UW): Washington Technology Center, “Mobility Enhancing Alloy-Augmented Armor”, $109,000, January 2003-October 2004.
38. Sole PI: University Coal Research, Department of Energy, “Nanoscale Reinforced Polymer Derived Ceramic Matrix Coatings”, $ 199,250, July 2005 – June 2009.
39. PI for UW activities, Co-PI for the project (PI: Joseph Hartvigsen, Ceramatec Inc., Salt Lake City, UT), Department of Energy, “Large Area Cell for Hybrid SOFC Hydrogen Co-Generation”, $1,090,000 (UW share is $ 164,000), July 2005 – June 2008.
40. Co-PI (PI Anderson, Mechanical Engineering, UW): National Science Foundation, “3D Printing of Dental Ceramics”, $ 59,994, July 2005 – June 2006.
41. Co-PI (PI; Gregory Korshin, Civil and Environmental Engineering, UW, two other Co-PIs): Murdock Foundation, “Facilities for Testing Trace Impurities in Water”, $ 500,000, October 2006 – September 2007.
42. Sole PI: University of California, “Grain Boundary Faceting, Migration and Rotaion”, $ 23,000, June 2006 – June 2007.
43. Sole PI: Hydrogen Power, Inc., Seattle, WA, “Optimization of Hydrogen Generation”, $ 100,000, September 2006 – September 2007.
44. Sole PI: Andrews Space, Inc., Seattle, WA, “Optimization of Filled Polymer Derived Ceramics”, $ 105,000, March 2007 – September 2008.
45. Co-PI (PI Brian Flinn, MS&E, UW): Washington Technology Center, “Functionally Graded Pre-ceramic Polymer Coatings for Corrosion Resistance”, $ 5,000, March 2009 – June 2009.
46. Co-PI (PI: Thomas Hinckley, College of Forrest Resources, UW, three other Co-PIs): National Science Foundation, “IGERT Multinational Collaborations on Challenges to the Environment”, $ 3,664,274, September 2004 – August 2010.
47. Co-PI (PI Brian Flinn, MS&E, UW): Washington Technology Center and Modumetal, Inc., “Functionally Graded Polymer Ceramic Coatings for Corrosion Protection”, $120,000, June 2009 – June 2010.
48. Sole PI for US (PI for Egypt Dr. Mohamed): National Science Foundation, “Synthesis and Sintering of TiC Based Ceramics”, $ 30,000, February 2008 – August 2011.
49. Co-Coordinator for the US partners (Coordinator is Tom Webster from Brown University): Indo-US Science and Technology Forum, “Indo-US Public Private Join Center on Biomaterials for Health Care”, $ 47,000 (majority of the funding is for research in India), December 2008 – August 2011.
50. Sole PI for US (PI for overall project, Michael Scheffler, University of Cotbus, Germany), DAAD, “Cellular Ceramics with Tailored Bimodal Porosity”, $ 20,000, June 2009 – December 2011.
51. Sole PI: University of Washington, Technology Gap Innovation Fund, “Implants with Engineered Gradient Stiffness”, $ 50,000, January 2010 – March 2011.
52. Sole PI for UW (PI Dr. Shiv Joshi NextGen Aero): Air Force Research Labs, “Porous Hybrid Composites for Enhanced Thermal Protection”, $ 35,000 (for UW), December 2011 – October 2012.

53. Sole PI for UW (PI Al Detrick, United Technology Corp.): Air Force Research Lab, “Processing and Failure Criteria for Polymer Derived Ceramic Foams”, $ 117,907 (for UW), June 2012 – May 2013.

54. Co-PI (PI: Fumio Ohuchi, MS&E, UW, three other Co-PIs): Micron Technology Foundation, “Laboratory for Combinatorial Materials Exploration”, $ 1,500,000, September 2004 – October 2013.

55. PI for UW activities (PI Prof. Tovar, Purdue School of Engineering & Technology at IUPUI, one other Co-PI): Air Force Office of Scientific Research, “Design of SiC-Si_3N_4 Nanocomposites with Engineered Microstructures at Different Length-Scales”, total funding $ 832,297 (funding for UW/Clemson $450,000), September 2009 – October 2013.

56. Sole PI: Zampell Corp., “Polymer Derived Ceramic Coatings for Waste to Energy Conversion Systems”, $ 76,000, October 2009 – October 2013.

57. Sole PI: Saint-Gobain Advanced Materials, “Processing of Solid Oxide Fuel Cells”, $328,000, February 2010 – January 2014.

58. Sole PI for Clemson (PI Dr. Shiv Joshi NextGen Aero): NASA SBIR, “Ablative Ceramic Foam Based TPS”, $ 35,000 (for Clemson), August 2013 – December 2013.

SECTION VI: RESEARCH COLLABORATIONS

We actively collaborate with colleagues from industry, academia and national laboratories. In addition to the obvious programmatic advantage of collaborations, I believe that the collaborations have a significant positive impact on the education and development of graduate students and post-docs. The following is a partial list of the colleagues, with a brief description of the nature of collaboration, with whom we have had significant collaborations (in the form of joint publications and/or joint funding).

VI.1 Currently Active Collaborations

- Prof. Jürgen Rödel, Technische Universitat, Darmstadt, Germany on "Processing and Mechanical Properties of Controlled Porosity Ceramics and Constrained Ceramic Films " (1994 – Present). He has visited us six times and I visited them four times. Two graduate students from his group (Mr. Ostrowski and Mr. Zimmermann) spent extended periods visiting our group and conducting research (spending a total of 12 months with us). A visiting scientist from his group (Dr. Guillon) has spent six months with us. Two graduate students from my group (Mr. Ellerby and Mr. Frame) spent three months each with Professor Rödel. We have several joint publications.
- Prof. Peter Griel, University of Erlangen -Nuernberg, Germany on "Polymer Derived Composites Ceramics" (2002 – Present). One scientist from his group was with us for two years. His visit was funded by DFG. I spend six months of my sabbatical with his group. A new collaboration has been initiated with his group on solid freeform fabrication of biomaterials (2009 – Present). One of his students has spent four months with us. We have a few joint publications.
- Prof. Helmut Schubert (2002 – 2012) and Dr. Olivier Gorke (2012 – Present), TU Berlin, Germany on "Processing of Porous Materials for Biomedical and Energy Applications". Three students from our group have spent six months each with his group. A new collaboration has been initiated with his group on the thermal-chemical fatigue in batteries (2009 – Present). We have a few joint publications.
- Prof. Hector Camacho Montes, Univerisdad Autonoma de Ciudad Juarez, Mexico on "Continuum Modeling of Sintering of Ceramics". (2003 – Present). He has spent two summers and his sabbatical (2009-10) with our group. We have a few joint publications
- Prof. Michael Scheffler, Brandenburg Technical University, Cottbus, Germany on "Hierarchical Porosity Ceramics" (2003 – Present). One of his students has spent four months in our group. Several joint publications and a jointly funded project have resulted from this collaboration.
- Prof. Bikramjit Basu, Indian Institute of Technology, Kanpur, India on "Processing and Properties of Bio-materials and Modeling of Wear". (2005 – Present). I spent three months of my sabbatical with this group. We have a jointly funded project and a few joint papers.
- Dr. Christophe Martin, Institut National Polytechnique de Grenoble, France on "Modeling of Constrained Sintering and Porous Microstructures" (2006 – Present). He was a visiting scientist with us for one year and I have visited his lab a few times. We have a few joint publications.
- Dr. Zaki Mohamed, Central Metallurgical R&D Institute, Egypt on "Processing and Mechanical Properties of Ceramic Matrix Composites". (2007 – Present). I have visited their lab and they have visited us. We have a joint publication and joint funding.
- Dr. Guenter Motz, University of Bayretuth (2010 – Present) on "Polymer Derived Ceramics". Joint publications, proposals and student exchange.
- Prof. Brian Flinn, MS&E, University of Washington on "Corrosion Resistant Coatings". (2009 – Present). This is a new collaboration on a jointly funded project.

VI.2 Completed Collaborations (since 1992)

- Prof. Park, Chosun University, Korea "Processing and Mechanical Properties of on Carbide Matrix Composites" (1996 – He spent his two sabbatical leaves with our 2006). research group.
- Professor Nils Claussen, Technische Universitat, Hamburg-Harburg, Germany on "Processing of Stable Porous Ceramics for Ceramic Matrix Composites and Catalysts". (1996 – 2004) . I have been invited as an international expert (three visits) to his group. One graduate student from his group (Mr. Kauermann) spent eight months working with our group.
- Drs. R. E. Loehman and K. Ewsuk, Sandia National Labs on "Reactive Processing of Ceramic Composites". (1995 – 1998) . One graduate student from my group (Mr. Ellerby) worked with them at Sandia National Labs during two summer quarters.
- Dr. Jun Liu, Pacific Northwest National Labs on "Polymer-Ceramic Composites for Bio-medical Applications" (1996 – 2000). One graduate student from my group (Mr. Flannigan) worked with them during summer quarters.
- Prof. V. Kumar, ME, University of Washington on "Processing and Properties of Micro-cellular Polymers". (1995–1997).
- Prof. B. Flinn, MS&E, University of Washington on "Processing and Mechanical Properties of Ceramics". (1995 – 2005).
- Dr. Chuck Henager, Jr., Pacific Northwest National Labs on "High Temperature Mechanical Properties of Fiber Reinforced Ceramic Matrix Composites". (1993 – 1996). One graduate student from my group (Ms. Stackpoole) worked with them during summer quarters.
- Prof. Thomas Christensen, Technical University of Denmark, Denmark on "Heavy Metal Binding on Iron Oxide Particles" (1998 – 2002). We have joint publications with his group.
- Dr. Chuck Henager, Jr., Pacific Northwest National Labs on "Polymer Derived Ceramic Composite Coatings". (2001 – 2008). One graduate student from my group (Ms. Torrey) has worked on this joint project and conducted part of her research at PNNL.
- Dr. Charles Lewisohn, Ceramatec Inc. on "Large Scale Combined Cycle SOFC". (2004-2008). We had joint funding on this project.
- Prof. Tetsuo Shoji, Tohoku University, Japan on "Crack and Defect Growth in Constrained Sintered Films". (2004 – 2009). One graduate student from my group (Mr. Frame) spent four months working with him at Tohoku.
- Prof Vikram Jayaram, Indian Institute of Science, Bangalore, India on "Processing and Mechanical Properties of Ceramic Coatings". (2005 – 2009). I spent three months of my sabbatical with his group.

SECTION VII: INVITED TALKS AND SEMINARS

I have presented more than 250 invited talks and seminars at technical meetings, universities, national labs and industrial research labs. Talks presented since 2005 are listed below.

2005

1. R.K. Bordia, "Constrained and Stress Assisted Sintering of Ceramics", Saint Gobain Research Center, Northboro, April 2005
2. R.K. Bordia, "Corrosion Resistant Coatings", DoE, Office Of Industrial Technology Program Review Meeting, June 2005
3. R.K. Bordia, "Processing of Multi-Layered Ceramic Systems', GE Research Labs, Niskayuna, July 2005
4. Michael Scheffler, Franziska Scheffler, Colin Fyfe and Rajendra K. Bordia, "Hierarchically Built Porous Materials from Volcanic Materials, International Conference Porous Ceramic Materials (PCM 2005) Bruges, B, October 20-21th, 2005.
5. R.K. Bordia, "Polymer Derived Ceramics", Department of Chemical and Materials Engineering, University of California, November 2005.
6. Michael Scheffler, Craig S. Terry, John Morris, and Rajendra K. Bordia, "Degradation Behavior of Polymer-Derived CNT/Ceramic Matrix Composite Materials", MRS Fall Meeting 2005, Boston, MA, November 28-December 02.

2006

7. R.K. Bordia, "Polymer Derived Composite Ceramics", ECI Conference on Novel and Emerging Ceramics and Composites, June 2006.
8. R.K. Bordia, "Nanostructured Polymer Derived Ceramic Coatings", DoE, Office Of Coal Research Program Review Meeting, June 2006.
9. R.K. Bordia, "Polymer Derived Ceramic Composite Coatings and Joints", THERMEC, Vancouver, Canada, July 2006.
10. R.K. Bordia and G. Korshin, "Clean Drinking Water: Challenges and Opportunities", University of Washington, Osaka University Summer Program, August 2006.
11. R.K. Bordia, "Polymer Derived Ceramic Composites and Coatings", Second International Workshop on Polymer Derived Ceramics, Boulder, CO, August 2006.
12. R.K. Bordia, "Processing of Composite Ceramics", Corning Research and Development, August 2006.
13. R.K. Bordia, "Theoretical and Experimental Research in Processing of Ceramics", Department of Mechanical Engineering, University of Colorado, Boulder, CO, August 2006.
14. R.K. Bordia, "Processing of Multilayered and Constrained Ceramics", School of Mechanical and Materials Engineering, Washington State University, Pullman, WA, November 2006.

2007

15. R.K. Bordia, "Polymer Derived Composite Ceramics", Second International Conference on Recent Advances in Composite Materials, New Delhi, India, February 2007 (Keynote Lecture).
16. R.K. Bordia, "Multilayered Functional Ceramics: Processing and Properties", Mechanical Engineering, Indian Institute of Technology, Delhi, India, February 2007.

17. R.K. Bordia, “Polymer Derived Ceramic Composites and Coatings”, National Physical Laboratories, New Delhi, India, February 2007.
18. R.K. Bordia, “Polymer Derived Nanostructured Ceramics”, National Institute of Materials Science, Japan, March 2007.
19. R.K. Bordia, “Polymer Derived Nanostructured Ceramics”, Pacific Northwest National Labs, Richland, USA, May 2007.
20. R.K. Bordia, Invited to give a talk on “Polymer Derived Nanocomposites” at the Engineering Ceramics 2007 From Engineering to Functionality Workshop, Slovakia, May 2007. Declined due to scheduling conflict.
21. R.K. Bordia, “Polymer Derived Nanostructured Ceramics”, Praxair Corp., Buffalo, USA, August 2007.
22. R.K. Bordia, “Energy and Environment: Challenges and Opportunities”, Indian Institute of Technology, Kanpur, India, September 2007 (Institute Lecture).
23. R.K. Bordia, “Polymer Derived Nanostructured Ceramics”, International Workshop on Nanoceramics and Nanocomposites, Kanpur, India, September 2007.
24. R.K. Bordia, “Fuel Cells”, Workshop on Emerging Energy Conversion Technologies, Indian Institute of Technology, Kanpur, India, September 2007.
25. R.K. Bordia, “Ceramics for Emerging Energy Technologies”, Bharat Heavy Electrical Limited, Bangalore, India, October 2007.
26. R.K. Bordia, “Energy and Environment: Challenges and Opportunities”, C-STEP, Bangalore, India, October 2007.
27. R.K. Bordia, “Polymer Derived Nanostructured Ceramics”, Departmental Seminar, Materials Engineering, Indian Institute of Sciences, Bangalore, October 2007.
28. R.K. Bordia, “Energy and Environment: Challenges and Opportunities”, M.S. Ramaiah School of Advanced Studies, Bangalore, India, October 2007.
29. R.K. Bordia, “Polymer Derived Nanostructured Ceramics”, Departmental Seminar, Applied Mechanics, Indian Institute of Technology, Delhi, India, November 2007.
30. R.K. Bordia, “Polymer Derived Nanostructured Composite Ceramics”, National Aeronautical Laboratories, Bangalore, India, November 2007.
31. R.K. Bordia, “Polymer Derived Nanostructured Composite Ceramics”, National Physical Laboratories, New Delhi, India, November 2007.
32. R.K. Bordia, “Polymer Derived Nanostructured Composite Ceramics”, Advanced Research Ceramics Institute, Hyderabad, India, December 2007.
33. R.K. Bordia, “Polymer Derived Nanostructured Composite Ceramics”, Defense Materials Research Laboratories, Hyderabad, India, December 2007.
34. R.K. Bordia, “Continuum Formulation for Constrained and Stress Assisted Sintering”, Defense Materials Research Laboratories, Hyderabad, India, December 2007.
35. R.K. Bordia, “Polymer Derived Nanostructured Composite Ceramics”, Nonferrous Materials Technology Development Center, Hyderabad, India, December 2007.
36. R.K. Bordia, “Constrained Sintering: Development and Current Status of the Continuum Approach”, Jack Walsh Development Center, General Electric, Bangalore, India, December 2007.
37. R.K. Bordia, “Polymer Derived Nanostructured Ceramics”, CEO Lecture Series, Jack Walsh Development Center, General Electric, Bangalore, India, December 2007.

38. R.K. Bordia, Invited to give a talk at the Processing and Fabrication of Advanced Materials Conference, PFAM-16, Singapore, December, 2007. Declined due to scheduling conflict.
39. R.K. Bordia, "Anisotropic Microstructures in Constrained and Stress-Assisted Sintering: Experimental Results and Continuum Formulation", Focused Workshop on Contemporary Topics in Sintering, Orange County Resorts – Coorg, India, December 2007.

2008

40. R.K. Bordia, Invited to give a talk on "Thermoelectric Oxides: Processing and Properties" at the 32nd International Conference & Exposition on Advanced Ceramics and Composites, Daytona Beach, Florida, January 2008. Declined due to scheduling conflict.
41. R.K. Bordia, "Continuum Formulation for Constrained and Stress Assisted Sintering", Departmental Seminar, Metallurgical Engineering and Materials Science, Indian Institute of Technology, Mumbai, India, January 2008.
42. R.K. Bordia, "Polymer Derived Nanostructured Composite Ceramics", Metallurgical Engineering and Materials Science, Indian Institute of Technology, Mumbai, India, January 2008.
43. R.K. Bordia, "Energy and Environment: Challenges and Opportunities", Institute Lecture, Indian Institute of Technology, Mumbai, India, January 2008.
44. R.K. Bordia, "Continuum Formulation for Constrained and Stress Assisted Sintering", Departmental Seminar, Materials Science and Engineering, Indian Institute of Technology-Madras, Chennai, India, January 2008.
45. R.K. Bordia, "Polymer Derived Nanostructured Composite Ceramics", Material Science and Engineering, Indian Institute of Technology-Madras, Chennai, India, January 2008.
46. R.K. Bordia, "Energy and Environment: Challenges and Opportunities", Materials Advantage Chapter, Indian Institute of Technology – Madras, Chennai, India, January 2008.
47. R.K. Bordia, "Polymer Derived Nanostructured Composite Ceramics", General Motors Research Laboratories, Bangalore, India, January 2008.
48. R.K. Bordia, "Energy and Environment: Challenges and Opportunities", Workshop on Global Warming, BBDIT, Ghaziabad, India, February 2008.
49. R.K. Bordia, "Energy and Environment: Challenges and Opportunities", Birla Institute of Technology and Science, Pilani, India, February 2008.
50. R.K. Bordia, "Polymer Derived Nanostructured Ceramics", Birla Institute of Technology and Science, Pilani, India, February 2008.
51. R.K. Bordia, "Polymer Derived Nanostructured Ceramics", Departmental Seminar, Metallurgical and Materials Engineering, Indian Institute of Technology, Kanpur, India, February 2008.
52. R.K. Bordia, "Continuum Formulation for Constrained and Stress Assisted Sintering", Central Metallurgical Research and Development Institute, Cairo, Egypt, February 2008.
53. R.K. Bordia, "Polymer Derived Nanostructured Composite Ceramics", Central Metallurgical Research and Development Institute, Cairo, Egypt, February 2008.
54. R.K. Bordia, Invited to give a talk in Symposium Q Coupled Thermal-Electrical-Mechanical Behavior of Materials at the 2008 Spring Meeting of MRS, March 2008. Declined sue to scheduling conflict.

55. R.K. Bordia, “Energy and Environment: Challenges and Opportunities”, Technical University of Hamburg-Harburg, Germany, April 2008.
56. R.K. Bordia, “Sintering of Constrained Systems”, Technical University of Hamburg-Harburg, Germany, April 2008.
57. R.K. Bordia, “Constrained and Stress-Assisted Sintering”, University of Bremen, Germany, April 2008.
58. R.K. Bordia, ““Crack and Pore Growth (and Healing) in Constrained and Stress-Assisted Sintering”, Technical University of Berlin, Germany, May 2008.
59. R.K. Bordia, “A Mechanics Approach to Constrained Sintering”, University of Erlangen-Nuernburg, May 2008.
60. R.K. Bordia, “Constrained and Stress-Assisted Sintering”, University of Bayreuth, Germany, May 2008.
61. R.K. Bordia, “Processing of Multilayered Ceramics: Densification and Defects”, University of Erlangen-Nuernburg, May 2008.
62. R.K. Bordia, “Sintering of Constrained Films: Controlled Anisotropy”, Max Planck Institute of Colloids and Interfaces, Pottsdam, Germany, May 2008.
63. R.K. Bordia, “A Mechanics Approach to Constrained and Stress-Assisted Sintering”, Fraunhofer Institute for Mechanics and Materials, Freiburg, Germany, June 2008.
64. R.K. Bordia, “Continuum Formulation for Constrained and Stress Assisted Sintering”, University of Saarlandes, Saarbrucken, Germany, June 2008.
65. R.K. Bordia, “A Mechanics Approach to Constrained Sintering”, University of Karlsruhe, Germany June 2008.
66. Kaishi Wang and R.K. Bordia, “Nanoscale Reinforced Polymer Derived Ceramic Matrix Coatings”, University Coal Research Contractors Review Conference, Pittsburgh, USA, June 2008.
67. R.K. Bordia, “Origin and Analysis of Anisotropy in Constrained and Stress-Assisted Sintering Systems”, University of Darmstadt, Germany, July 2008.
68. R.K. Bordia, “Processing and Mechanics of Ceramics with Multiscale Porosity”, University of Erlangen-Nuernburg, July 2008.
69. R.K. Bordia, “Processing of Constrained Films and Multilayered Ceramics”, Bosch Research Center, Stuttgart, Germany, July 2008.
70. R.K. Bordia, “Processing of Composites and Multilayered Ceramic Systems”, Fraunhofer Institute for Ceramic Technologies and Systems, Dresden, Germany, August 2008.
71. R.K. Bordia, “Polymer Derived Nanostructured Ceramics”, Saint-Gobain Research Center, Paris France, August 2008.
72. R.K. Bordia, “Crack and Pore Growth (and Healing) in Constrained and Stress-Assisted Sintering”, Saint-Gobain CREE, Cavaillon, France, August 2008.
73. R.K. Bordia, “Crack and Pore Growth (and Healing) in Constrained and Stress-Assisted Sintering”, CNRS, Grenoble, France, August 2008.
74. R.K. Bordia, “Processing of Constrained Films and Multilayered Ceramics for Energy Systems”, SINTEF, Oslo, Norway, August 2008.
75. R.K. Bordia, “Polymer Derived Nanostructured Ceramics”, SINTEF, Oslo, Norway, August 2008.

76. R.K. Bordia, Invited to give a talk in the Symposium on “The Effect of Electrical (and Electromagnetic) Fields and Stress (and Capillarity) on Diffusional Transport in Ceramics and Related Phenomena", at MS&T-08, Oct 5-9, 2008, Pittsburgh, PA. Declined due to scheduling conflict
77. R.K. Bordia, “Processing of Constrained Films and Multilayered Ceramics for Energy Systems”, Indian Institute of Technology, Delhi, India, December 2008.
78. R.K. Bordia, “Polymer Derived Nanostructured Ceramics”, Indian Institute of Technology, Delhi, India, December 2008.
79. R.K. Bordia, “IIT Research – Inputs and Outputs”, Research Track Panel, Pan IIT 2008, Indian Institute of Technology, Chennai, India, December 2008.

2009

80. R.K. Bordia, “Polymer Derived Ceramic Coatings”, Zampell Corporation, Boston, February 2009.
81. R.K. Bordia, “processing nad Performance of Polymer Derived Ceramic Coatings”, National Energy Technology Laboratory, Albany, OR, March 2009.
82. R.K. Bordia, “Polymer Derived Ceramics”, Department of Aerospace and Mechanical Engineering, Notre Dame, April 2009.
83. R.K. Bordia, Jessica Torrey and Kaishi Wang, “Polymer Derived Ceramic Coatings”, PACRIM Meeting, Vancouver, BC, May 2009.
84. R.K. Bordia, “Processing of Constrained Ceramics”, Dept. Seminar, Materials and Metallurgical Engineering, Indian Institute of Technology, Kanpur, India, August 2009.
85. R.K. Bordia, “Nanostructured Porous and Composite Ceramics from Molecular Precursors”, Indian Institute of Technology, Kanpur, India, August 2009.
86. R.K. Bordia, “Crack and Pore Growth (and Healing) in Constrained and Stress Assisted Sintering”, EUROMAT 2009, Glasgow, Scotland, September 2009 (Keynote Paper).
87. R.K. Bordia and M. Scheffler, “Polymer Derived Nanostructured Ceramics”, MS&T, Pittsburgh, October 2009.

2010

88. M. Scheffler and R.K. Bordia, “Polymer Derived Ceramics: A Novel and Versatile Processing Route”, Second International Conference on Polymer Processing and Characterization (ICPPC – 2010), January 2010, Kottayam, India.
89. A. Turner, N. Hrabe and R.K. Bordia, “Optimized Design of Porous Titanium for Bio-medical Applications”, 2010 TMS Annual Meeting & Exhibition, February 2010, Seattle.
90. John E. Renaud, Vikas Tomar, and Rajendra K. Bordia, “Nanocomposite Materials Design Optimization with Experimental Validation for Engineered Microstructures at Multiple Length Scales”, AFOSR High Temperature Advanced Materials Program Review, February 2010, Arlington, VA
91. R.K. Bordia, “Ceramics for Energy Conversion Systems”, Puget Sound Chapter of ASM, International, March 2010, Seattle, WA
92. R.K. Bordia, “Sintering of Multilayered Ceramics and Ceramic Coatings”, Departmental Seminar, Materials Science and Engineering, Alfred University, March 2010, Alfred, NY
93. R.K. Bordia, “Polymer Derived Composite Ceramics”, Saint – Gobain Research and Development Center, March 2010, Marlborough, MA

94. R.K. Bordia, “Processing of Multilayered Ceramics”, Departmental Seminar, Materials Science and Engineering, University of Florida, May 2010, Gainsville, Fl
95. R.K. Bordia and G. Motz, “Polymer Derived Nanostructured Functional Ceramics”, CMOS Emerging Technologies Workshop, May 2010, Whistler, BC, Canada
96. R.K. Bordia, O. Guillon and C. Martin, “Processing of Ceramic Coatings and Multilayered Ceramics”, CIMTEC, 12th. International Ceramics Congress, June 2010, Montecatini Terme, Italy.
97. R.K. Bordia, “Polymer Derived Nanostructured Composite Ceramics”, Department of Chemical Engineering, University of Nebraska, July 2010, Lincoln, NE.
98. R.K. Bordia, K. Wang and J. Torrey, “Mechanics of Polymer Derived Ceramic Matrix Coatings”, 5th. Polymer Derived Ceramics Workshop, August 2010, Boulder, CO.
99. R.K. Bordia, “Polymer Derived Ceramics”, NIST, August 2010, Boulder, CO.
100. R.K. Bordia, “Polymer Derived Composite Ceramics”, Department of Materials Science and Engineering, Rutgers University, August 2010, Piscataway, NJ
101. R.K. Bordia, “Polymer Derived Composite Ceramics”, United Technologies Research Center, August 2010, East Hartford, CT.
102. R.K. Bordia, J. Torrey and K. Wang, “Polymer Derived Ceramic Coatings: Processing, Properties and Performance”, 7th. High Temperature Ceramic Matrix Composites International Meeting, September 2010, Bayreuth, Germany
103. R.K. Bordia and M. Scheffler, “Multifunctional Hierarchical Porosity Ceramics”, Materials Science and Technology (MS&T) 2010, October 2010, Houston, TX.
104. R.K. Bordia and G. Motz, “Polymer Derived Ceramic Fibers and Coatings”, Materials Science and Technology (MS&T) 2010, October 2010, Houston, TX.
105. R.K. Bordia, “Ceramics for Energy Conversion Systems”, Indian Institute of Metals, Plenary talk, November 2010, Bangalore, India.

2011

106. R.K. Bordia, “Features of Successful International Research Collaborations”, NSF Workshop *Investigating the International Experience in STEM: Graduate Education and Beyond*, February 2011, Arlington, VA
107. R.K. Bordia, “Polymer Derived Composite Ceramics”, New England Chapter of the American Ceramics Society, April 2011, Marlborough, MA
108. H. Shang, X. Liu, C. L. Martin and R.K. Bordia, “Hierarchical Porosity Ceramics”, Engineering Ceramics 2011, May 2011, Smolenice, Slovakia
109. R.K. Bordia and K.Wang, “Mechanics of Polymer Derived Ceramic Coatings”, European Ceramic Society 2011, June 2011, Stockholm, Sweden.
110. R.K. Bordia, “Polymer Derived Composite Ceramics”, PACRIM 2011 Keynote Lecture, July 2011, Cairns, Australia.
111. R.K. Bordia, “Polymer Derived Nanostructured Ceramic Composites, University of New South Wales, July 2011, Sydney, Australia.
112. R.K. Bordia, “Polymer Derived Composite Ceramics”, Composites at Lake Louise 2011, October 2011, Lake Louise, Canada
113. M. Scheffler, G. Motz and R.K. Bordia, Functional Coatings from Preceramic Polymers”, Materials Innovation in Surface Engineering, October 2011, Melbourne, Australia.

114. R.K. Bordia, “Control of Hierarchical Microstructures in Ceramics”, University Days at Saint-Gobain Co., November 2011, Marlborough, MA.
115. Andreas Tovar, Vikas Tomar, and Rajendra K. Bordia, “Nanocomposite Materials Design Optimization with Experimental Validation for Engineered Microstructures at Multiple Length Scales”, AFOSR High Temperature Aerospace Materials Program Review, November 2011, Arlington, VA
116. F. Wakai and R.K. Bordia, “Microstructural Evolution and Anisotropic Shrinkage in Constrained Sintering”, Intl. Conf. on Energy Efficient Materials, Manufacturing and Machinery for Ceramic Industries”, December 2011, Agra, India

2012

117. R.K. Bordia, “Evolution of Anisotropic Porous Microstructures”, International Symposium on Plasticity, January 2012, San Juan, Puerto Rico
118. R.K. Bordia, “Ceramics with Designed Microstructures for Energy Conversion Systems”, Northboro Research and Development Center, Saint-Gobain Co., January 2012, Northboro, MA
119. H. Shang, A. Lichtner, D. Jauffres, C. L. Martin and R.K. Bordia, “Control of Hierarchical Microstructures in Ceramics”, Mechanical Engineering Department, University of Houston, February 2012, Houston, TX.
120. H. Shang, A. Lichtner, D. Jauffres, C. L. Martin and R.K. Bordia, “Control of Hierarchical Microstructures in Ceramics”, School of Materials Science and Engineering, Clemson University, March 2012, Clemson, SC.
121. G. Motz, M. Günther, K. Wang and R.K. Bordia, “Thermal and Environmental Barrier Nono-ceramic Composite Coatings”, International Conference and Workshop on Nanostructured Ceramics and other Nanomaterials, March 2012, New Delhi, INDIA
122. H. Shang, A. Lichtner, D. Jauffres, C. L. Martin and R.K. Bordia, “Quantification and Simulation of the Evolution of the Hierarchical Microstructures in Ceramics”, NSF Workshop on Grand Challenges for Research in Ceramics, Glasses and Carbon, March 2012, Arlington, VA.
123. H. Shang, A. Lichtner, D. Jauffres, C. L. Martin and R.K. Bordia, “Harnessing Hierarchical Microstructures in Ceramics”, School of Materials Engineering, Purdue University, April 2012, West Lafayette, IN.
124. H. Shang, A. Lichtner, D. Jauffres, C. L. Martin and R.K. Bordia, “Harnessing Hierarchical Microstructures in Ceramics”, School of Materials Science and Engineering, Georgia Institute of Technology, May 2012, Atlanta, GA.
125. R.K. Bordia, “Sintering: Current Status, Challenges and Opportunities”, Thermal and Nuclear Science Workshop, May 2012, Albuquerque, NM.
126. H. Shang, A. Lichtner, D. Jauffres, C. L. Martin and R.K. Bordia, “Harnessing Hierarchical Microstructures in Ceramics”, Sandia National Laboratories, May 2012, Albuquerque, NM.
127. R. K. Bordia, “Polymer Derived Composite Ceramic Coatings: Processing, Properties and Performance”, 10^{th} CMCee Conference, May 2012, Dresden, GERMANY.
128. R. K. Bordia, “Polymer Derived Composite Ceramic Coatings: Processing, Properties and Performance”, 10^{th} Workshop on the Design of Ceramic Fiber Based Composites for Service Above 1400 ^{0}C, June 2012, Boulder, CO.
129. R.K. Bordia, H. Shang, A. Lichtner, C. Dandeneau, F. Ohuchi, D. Jauffres and C. Martin, “Hierarchical Porous Ceramics for Energy Applications”, Workshop on

Nanotechnology at Kazan National Research Technological University, June 2012, Kazan, RUSSIA.

130. R.K. Bordia, "Molecular Precursor Derived Nanostructured Ceramics", Workshop on Nanotechnology at Kazan National Research Technological University, June 2012, Kazan, RUSSIA.
131. H. Shang, A. Lichtner, D. Jauffres, C. L. Martin and R.K. Bordia, "Control of Hierarchical Microstructures in Ceramics for Energy Conversion Applications", World Academy of Ceramics Forum 2012 – New Frontiers of Ceramics for Sustainable Society, June 2012, Perugia, ITALY.
132. H. Shang, A. Lichtner, D. Jauffres, C. L. Martin and R.K. Bordia, "Hierarchical Porous and Multilayered Microstructures for Energy Applications", Institute of Materials and Joining, Otto-von-Guericke University, July 2012, Magdeburg, GERMANY.
133. K. Wang and R.K. Bordia, "Polymer Derived Ceramic Coatings; Processing, Properties and Performance", Institute of Materials and Joining, Otto-von-Guericke University, July 2012, Magdeburg, GERMANY.
134. H. Shang, A. Lichtner, D. Jauffres, C. L. Martin and R.K. Bordia, "Hierarchical Porous and Multilayered Microstructures for Energy Applications", Technical University, July 2012, Berlin, GERMANY.
135. H. Shang, A. Lichtner, D. Jauffres, C. L. Martin and R.K. Bordia, "Hierarchical Porous and Multilayered Microstructures for Energy Applications", Universität Bayreurth, July 2012, Bayreuth GERMANY.
136. K. Wang and R.K. Bordia, "Polymer Derived Ceramic Coatings; Processing, Properties and Performance", Universität Bayreurth, July 2012, Bayreuth GERMANY.
137. K. Wang and R.K. Bordia, "Polymer Derived Ceramic Coatings", R&D Center, Tata Steel, July 2012, Haarlem, Netherlands.
138. H. Shang, A. Lichtner, D. Jauffres, C. L. Martin and R.K. Bordia, "Hierarchical Porous and Multilayered Microstructures for Electrochemical Applications", Gordon Research Conference – Solid State Studies in Ceramics, August 2012, Mount Holyoke College, MA.
139. K. Wang and R.K. Bordia, "Polymer Derived Ceramic Coatings; Processing, Properties and Performance", GE Global Research Center, August 2012, Niskayuna, NY.
140. R.K. Bordia, "Short Course on Sintering", GE Global Research Center, August 2012, Niskayuna, NY.
141. H. Shang, A. Lichtner, D. Jauffres, C. L. Martin and R.K. Bordia, "Hierarchical Porous and Multilayered Microstructures for Electrochemical Applications", GE Global Research Center, August 2012, Niskayuna, NY.
142. G. Motz, M. Günthner, K. Wang, and R. K. Bordia, "Environmental Barrier Ceramic Composite Coatings", The 2nd International Conference on Competitive Materials and Technology Processes (IC-CMTP-2), October 2012; Miskolc-Lillafüred (HUNGARY).
143. H. Shang, A. Lichtner, D. Jauffres, C. L. Martin and R.K. Bordia, "Hierarchical Porous and Multilayered Microstructures for Electrochemical Applications", Saint-Gobain Northborough Research and Development Center, November 2012, Northborough, MA.

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144. R. K. Bordia, "Polymer Derived Ceramics and Composites", Indian Institute of Technology, Gandhinagar, January 2013, Gandhinagar, India.

145. H. Shang, A. Lichtner, D. Jauffres, C. L. Martin and R.K. Bordia, “Hierarchical Porous and Multilayered Microstructures for Energy Applications”, Instituto de Ingeniería y Tecnología, Universidad Autónoma de Ciudad Juárez, January 2013, Juárez, Mexico.
146. R.K. Bordia, “Polymer Derived Ceramic Coatings; Processing Properties and Perfromance”, Instituto de Ingeniería y Tecnología, Universidad Autónoma de Ciudad Juárez, January 2013, Juárez, Mexico
147. R.K. Bordia, “Short Course on Sintering”, Instituto de Ingeniería y Tecnología, Universidad Autónoma de Ciudad Juárez, January 2013, Juárez, Mexico.
148. H. Shang, A. Lichtner, D. Jauffres, C. L. Martin and R.K. Bordia, “Hierarchical Porous and Multilayered Microstructures for Energy Applications”, Eco-Materials and Energy Department Universidad Autónoma de Nuevo León, Mexico, January 2013, Monterrey, Mexico.
149. R.K. Bordia, “Polymer Derived Ceramic Coatings; Processing Properties and Perfromance”, Eco-Materials and Energy Department Universidad Autónoma de Nuevo León, Mexico, January 2013, Monterrey, Mexico.
150. (Plenary) R.K. Bordia, “Polymer Derived Ceramic Coatings; Processing Properties and Performance”, Fourth International Conference on Recent Advances in Composite Materials, February 2013, Goa, India
151. R.K. Bordia, “Awards and Professional Recognition from the American Ceramic Society”, NSF Ceramics PI Workshop, June 2013, Arlington, VA
152. (Plenary) C.L. Martin, R.K. Bordia and O. Guillon, “Simulations of Particle Packing Effects on Sintering Defects and Deformation”, 12th International Conference on Ceramic Processing Science (ICCPS-12), August 2013, Portland, OR
153. R.K. Bordia and E.A. Olevsky, “DMREF-Collaborative Research: Multi-Scale Fundamental Investigation of Sintering Anisotropy”, Designing Materials to Revolutionize and Engineer our Future, DMREF 2013 Workshop September 2013, Arlington, VA
154. (Plenary) R. K. Bordia and K. Wang, “Processing of Polymer Derived Ceramic Coatings”, High Temperature Ceramic Matrix Composites 8, September 2013, Xi’an, China.
155. R. K. Bordia, “Composite Ceramic Coatings and Joints”, High Temperature Ceramic Matrix Composites 8, September 2013, Xi’an, China
156. H. Shang, A. Lichtner, D. Jauffres, C. L. Martin and R.K. Bordia, “Hierarchical Porous and Multilayered Microstructures for Energy Applications”, Shanghai Jao Tung University, September 2013, Shanghai, China
157. H. Shang, A. Lichtner, D. Jauffres, C. L. Martin and R.K. Bordia, “Hierarchical Porous and Multilayered Microstructures for Energy Applications”, International Forum on Advanced Ceramics and Composites, Shanghai Institute of Ceramics, September 2013, Shanghai, China
158. H. Shang, A. Lichtner, D. Jauffres, C. L. Martin and R.K. Bordia, “Hierarchical Porous and Multilayered Microstructures for Energy Applications”, Northwestern Polytechnic University, September 2013, Xi’an, China
159. H. Shang, A. Lichtner, D. Jauffres, C. L. Martin and R.K. Bordia, “Hierarchical Porous and Multilayered Microstructures for Energy Applications”, Clemson University, October 2013, Clemson, SC

SECTION VIII: TEACHING INTERESTS AND CONTRIBUTIONS

A highly satisfying aspect of my academic career is the direct interaction with students and being able to contribute to their education and professional development. I thoroughly enjoy classroom teaching, working with students on their research projects and mentoring them in their development as young professionals. A few important contributions in this area have been:

VIII.1 Development and Modification of a Large Number of Courses

I have developed several courses at the University of Washington. These include:

- MSE 599 Toughening Mechanisms for Ceramics (graduate elective, 3 credits): Developed a new graduate course and taught it a couple of times. This course focused on the current understanding of toughening mechanisms for ceramics and ceramic composites. It was taken by students from MS&E and ME Departments.
- MSE 330 Processing of Inorganic Materials (UG required, 3 credits)*:* Developed, in collaboration with Prof. Brush, a new course on Processing of Inorganic Materials. The course presented the processing of inorganic materials in a unified manner emphasizing the common principles and techniques in the processing of inorganic materials. This course is a required part of the curriculum.
- Development of a Laboratory Section and Other Modifications for the Introductory Course on Composites, MSE 475 (UG elective, 4 credits): The UG course on Fiber Reinforced Composites has been completely redone in consultation with other faculty in the COE who teach other courses on composites (Prof. Tuttle, ME and Prof. Lin, A&A). In addition to the changes in the course content, using a grant from NSF, the laboratory section was developed for the composites class. The development included establishment of the laboratory, laboratory exercises and organization of presentation from working composite engineers at Boeing, Intec and K2. I have taught the enhanced version of this course since Winter 1997. A laboratory manual was developed and has been shared with seven colleagues at other institutions.
- MSE 544 Mechanical Properties of Materials (graduate elective, 3 credits)**:** Developed an entirely new graduate level course on the Mechanical Properties Materials. This course is designed to introduce students to important concepts regarding the mechanical properties of all classes of materials. The course covers the fundamentals of elasticity, anelasticity, viscoelasticity, plasticity and fracture. Graduate students from different departments, including MS&E, CivE and ME, take this course.
- Development of the Materials Science Part of the Curriculum for a Joint Course on Electronic Packaging and Materials, MSE 485 (UG elective, 4 credits)**:** This is joint course with the EE and ME departments. Prof. Stoebe and I developed about forty percent of the curriculum for this course and jointly taught it for five years.
- Development of a New Three Course Integrated Laboratory Sequence for Juniors, MSE 311, 312 and 313 (UG required, 2 credits each)**:** Developed an entirely new Junior level three-course laboratory sequence. These new lab courses are part of the UG degree in Materials Science and Engineering. These courses are the only labs the students take in the Junior year and are the only required labs in the entire UG curriculum. Thus, these labs have been designed to familiarize the students with all the essential laboratory experiences. They were developed in consultations with other faculty members and were informed by laboratory courses at other MS&E departments. Together, the three courses cover processing, characterization and properties of all classes of materials. These labs have been taught every year since the 2002-03 academic year.
- Development of a New Two Course Design Sequence for Seniors, MSE 491 and 492 (UG

required, 2 credits each): In order to provide our students with a capstone design experience, a two course "Design in Materials Engineering" course sequence was developed with Prof. Stoebe and colleagues from industry. This innovative course provides an opportunity for students to work in teams on design problems generated by mentors from the industry. The students work closely with the mentors. They also get experience in a broad range of professional components of relevance to materials engineering. This course has been regularly taught in the Department since 2004.

- Development of a Course for Freshmen Focusing on International Research, GEN 197 (UG elective, 2 credits)**:** With colleagues from other engineering departments and University of Tohoku, we have developed a team based international engineering research course. Two teams of freshmen, one at Tohoku University in Japan and another one at the University of Washington, work on complementary aspects of the same problem and share their research and findings electronically. This course was offered regularly from 1999 to 2004. We have revived it and offered it again in the 2009-10 academic year.

VIII.2 Curriculum Enhancement

I led two major initiatives to transform UW MSE Department's UG program:

- Establishment of a Single UG Degree: Over a two year period, I led a complete review and reformulation of all the UG courses and the graduation requirements. The goal of this review was to develop the curriculum for a single UG degree in Materials Science and Engineering (instead of the two UG degrees that we used to offer: BS in Ceramic Engineering and BS in Metallurgical Engineering). The Department used this opportunity to reflect on the core competencies required for a major in our field and then established a curriculum that would teach these competencies. This change was completed and approved at all levels of the University. In June 2003, the first batch of students with BS in Materials Science and Engineering graduated. Based on feedback from a wide constituency, we believe that this change significantly improved the education of our students and better prepared them for their careers.
- Development of a Departmental Minor Program: As the Chair of the UG program committee (1994-1996), I led the development of a minor program in the Department. The complete curriculum with five different minor tracks was developed and implemented.

VIII.3 Recognition of Teaching

I teach a full course load and my teaching evaluations have consistently been among the highest in the Department. I was selected as the Faculty of the Year by students in the Department eight times (1994, 1995, 1996, 2000, 2006, 2009, 2011 and 2013).

VIII.4 Involvement of UG Students in Research

I regularly supervise the research of 4 to 6 UG students every year. One measure of the quality of their work is that many of them have presented their results at technical meetings. Since 2004, 80 % of the UG students who have worked with me have presented posters or talks at the Annual UW Undergraduate Research Symposium. In addition, since 1992, 20% of the UG students working with me have presented their research at technical meetings (Annual Meeting of the American Ceramic Society, Pacific Coast Meeting of the American Ceramic Society, Cocoa/Daytona Beach Meeting and MS&T).

SECTION IX: MENTORING OF STUDENTS

Summary

I have an excellent track record of recruiting and mentoring a diverse group of students at all levels. I started my academic career eighteen years ago. During this time, I have graduated 9 PhDs (2 women, 1 African American) and 11 Masters students (3 women, 1 African Americans and 1 Native American). In addition, over 100 UG students have conducted research in my group. Currently there are 3 PhD students (1 Hispanic women, 1 African American), 3 post-doctoral research fellows and 6 UG students in my group. I have also established an excellent track record of mentoring students. Students working under my supervision have been selected for several highly competitive awards. For example, two graduate students from my group have received the highly competitive NSF Graduate Fellowship. In 2007 I received the Distinguished Mentor Award from the University of Washington (sole winner of this award). This is the highest award given by the University for mentoring of graduate students. It is primarily based on support letters and testimonials from current and former graduate students.

At the Institutional level, I am an active participant in and contributor to programs designed to engage members of under represented groups in science and engineering. I have been actively involved in the mentoring program for Women in Science and Engineering (http://www.engr.washington.edu/curr__students/studentprogs/wise.html) and the pre-college and internship programs of Minority in Science and Engineering Program (MSEP) (http://www.engr.washington.edu/curr_students/studentprogs/msep.html).

Philosophy and Approach

Graduate program is where one gets transformed from being a consumer of knowledge to producer of knowledge. From my point of view, graduate education transforms a student to a colleague. The role of a mentor is to be an active part of this significant transformation. It is in the graduate school that these future scholars develop their professional identity and the mentor facilitates and catalyses this process. Although the end result of the graduate education is the same (transformation of a student to a colleague), the path that each student takes is different. As a mentor, I recognize and value these differences. It is this unique and individual aspect that makes this relationship most interesting, enjoyable and a great learning experience. I have learned immensely, about both the science and human interactions, from my students.

I consider the relationship between a graduate student and thesis supervisor as a very special one. The graduate students choose their own thesis supervisors and I consider it an honor that these bright women and men choose to work with me. With this honor comes the responsibility of guiding them so that they get the most from their experience.

Since the choice of a supervisor is so important, in my opinion, the mentoring of graduate students starts before they join my research group. When I talk to a new graduate student who shows interest to join my group, I make sure that they have as much information as possible to make a sound decision. I discuss in detail my research approach and available projects, and encourage them to talk to my current and former graduate students.

Once the student has decided to work with me, I make every effort to ensure that their graduate educational experience is the best it can be. The graduate school should prepare the students well for the professional career that they desire. In my opinion, the most important goal of research at a major research university is to prepare the next generation of scholars. During their graduate studies, it is my responsibility to assist in this preparation. I consider the graduate studies to be an intense individual learning experience. I seek opportunities to intellectually define and discuss problems with graduate students. This provides a forum for me and the graduate student to learn from each other. It is very heartening to witness the point in their intellectual development when they take ownership of the problem.

During the entire time that they work with me, we continually discuss the post-degree professional career. I am respectful of their desires and accept changes in their plan. Based on the career that the student aspires to pursue, the job opportunities as I see it, the background of the student and the expertise needed in their graduate research, I work with the students in developing a plan of study (e.g., the courses that they need to take). I also help the students in developing a time line for their studies. This includes major milestones (time for completing the course work, taking qualifying and general exams, writing papers and making presentations). Since graduate studies are all about getting excited about research, this plan is always fluid and we review and update it frequently to ensure that the students meet the highest standards.

I work on making sure that my research group is coherent and that the students discuss and learn from each other. I believe that some of the deepest professional contacts the students will have in their careers will be with their fellow graduate students. One of the very important lessons that I have learned is that the students need reinforcement that the work that they are doing is important and that they have access to the best facilities possible. I have found that I can achieve both these objectives by strategically collaborating with researchers at national labs and other universities and actively involving graduate students in this collaboration. Almost all of my Ph.D. students have spent well-defined time at a national lab or another university (usually outside US). When the students come back from these visits, they are very excited about their research. They realize that there are other scholars interested in their work, they make good professional contacts and get to use the facilities and expertise of some of the best researchers in their field. These colleagues also become additional mentors for the graduate students.

Developing strong professional network is an important aspect of professional development for students. One way I facilitate this is by ensuring that students attend and present at conferences and professional meetings. We take these presentations very seriously and spend significant time and effort preparing for these meetings. At these conferences, I make sure that they are introduced to my professional colleagues and other experts in their field. The meetings provide not only a forum to develop networks but also give students confidence that their research is important and respected colleagues care about their work.

It is very important that the good work the students do is recognized by awards and honors. I nominate students for a variety of awards and have been fortunate to have outstanding students who have been selected for some of these. These have included prestigious national awards like the NSF and NDSEG Fellowships.

A final aspect of mentoring the graduate students is to ensure that they have a very successful post-degree professional career. During the late stage of their studies, I work closely with them in their job search, providing them with the broad picture of the strengths that they have and the kinds of jobs that they should look into. I work with them on their resumes, cover letters, job search strategies, interview techniques and I contact my colleagues and other potential employers on their behalf. The association with graduate students has a lifelong effect on both me and the students. Once they graduate, they are my colleagues and friends. I have kept in close touch with all of my graduate students. We meet at technical meetings and get together when ever we can. It is a real pleasure to see them grow professionally, keep abreast of the personal and professional changes in their lives and advise and help them where needed.

Mentoring of Graduate Students as Department Chair

When I was the Chair of the Department, I personally worked on specific issues to facilitate the professional development of students. These included an open door policy for the students to come and discuss any aspect of the department and their professional development with me. We also involved students in important decision making including their participation in relevant departmental committees and significant involvement of graduate students in faculty searches (several of our faculty candidates positively commented on the high level of interactions that they had with graduate students during their visits to the department). I also supported and

encouraged student led initiatives like the departmental seminar series, nominating students for awards and fellowships, and working with industries and national labs to broaden the possible employer base for the graduates of the program. Finally, I worked on developing resources to supplement the stipend of the TAs so that their total compensation was the same as that for RAs.

One of my goals as Department Chair was to recruit high quality diverse students to the Department. In order to achieve this objective, we worked on different aspects of the issue. This included actively working with colleagues at other institutions (to have them recommend our graduate program to their UG students), instituting high level interactions with the students that we wanted to recruit including direct contact with appropriate faculty members and development of a campus visit program for prospective students, and, finally, focusing on developing fellowships to recruit the best students. The fellowships included recruiting fellowships and also support from alumni and industrial partners. We also used UG partnerships to recruit graduate students. One example of this is our UG student exchange program with Sichuan University. This program started a few years ago and as a part of the program, a few UG students from Sichuan spend their Junior year with us. For the past six years, every year we have recruited two outstanding graduate students from Sichuan University who were in the Department as Juniors.

SECTION X: PROFESSIONAL SOCIETY INVOLVEMENT AND LEADERSHIP

X.1 Professional Society Memberships

- The American Ceramic Society (1981 – Present), Fellow since 2002
- The American Society for Engineering Education (1996 – Present)
- KERAMOS (The Honor Society for Ceramics) (1992 – Present)
- University Materials Council (1996 – 2005)
- Materials Research Society (2004 – 2007)
- American Association for the Advancement of Science (2004 – 2007)
- ASM International (2005 – 2008)
- TMS (2005 – 2008, 2010 – Present)

X.2 Leadership in Professional Societies

Committees etc. (Since 1993)

- Chair of the Publications Committee of the Basic Science Division of the American Ceramic Society (1993 – 1997).
- Chair of the Nomination Committee of the Basic Science Division of the American Ceramic Society (1994 – 1995).
- Member of the Nomination Committee for the Sosman Award of the American Ceramic Society (1994 – 2001).
- Basic Science Division Representative to the Editorial Advisory Committee of the American Ceramic Society (1994 – 2002).
- Program Chair for the Pacific Coast Regional Meeting of the American Society (1995).
- Member of the Editorial Advisory Committee of the American Ceramic Society (1996 – 2000).
- Member of the Executive Committee of the Basic Science Division of the American Ceramic Society (1996 – 2008).
- Program Co-Chair for the Basic Science Division of the American Ceramic Society (1997 – 98).
- Chair of the Editorial Advisory Committee of the American Ceramic Society (1998 – 1999).
- Program Chair of the Pacific Coast Regional Meeting of the American Ceramic Society (1999).
- Member of the Publications Committee of the American Ceramic Society (2001 – 2006).
- Program Chair of the Pacific Coast Regional Meeting of the American Ceramic Society (2002).
- Secretary, Basic Science Division of the American Ceramic Society (2001 – 2002).
- Vice-Chair, Basic Science Division of the American Ceramic Society (2002 – 2003)
- Member of the Publications Committee of the American Ceramic Society (2002 – 2005)
- Chair-Elect, Basic Science Division of the American Ceramic Society (2003 – -2004).
- Chair, Basic Science Division of the American Ceramic Society (2004 – 2005).
- Chair, Publications Committee of the American Ceramic Society (2005 – 2006)
- Member of the Emerging Opportunities Committee of the Am. Ceram. Soc. (2005 – 2006)
- Director, Basic Science Division of the American Ceramic Society (2005 – 2008)
- Member Editorial Advisory Board, Recent Patents on Materials Science (2007 – Present).
- Member, Panel of Fellows of the American Ceramic Society (2008 – Present).
- Member, Nominating Committee of the American Ceramic Society (2010 – 2013)

- Chair, Volunteer Structure Committee of the American Ceramic Society (2010 – 2012).

X.3 Symposium and Meetings Organized and Sessions Chaired (Since 1995)

- Annual Meeting of the American Ceramic Society, April 1995. Organized the Symposium on the Mechanical properties of Ceramics.
- Organized the Technical Program for the Pacific Coast Regional Meeting, November 1995.
- International Symposium on Designing with Ceramics: Issues of Reliability and Life-Time Predictions, for the 47th Pacific Coast Meeting of the American Ceramic Society, Nov. 1-2, 1995, Seattle.
- Annual Meeting of the American Ceramic Society, Indianapolis, April 1996. Organized a Symposium on the Reactive Processing of Ceramics and Ceramic Composites.
- Chaired and organized the Young Investigator Meeting of the Institute of Mechanics and Materials, October 1997.
- Co-organized the technical Program for the Basic Science Division of the American Ceramic Society, Fall Meeting 1997.
- Co-organized the technical Program for the Basic Science Division of the American Ceramic Society, Annual Meeting 1998.
- Co-organized the technical Program for the Basic Science Division and the Pacific Coast Regional Joint Meeting of the American Ceramic Society, November 1999.
- Co-organized a Symposium at the 2001 Annual Meeting of the American Ceramic Society on the Mechanical Behavior of Ceramics.
- Organized a Session on the processing of Multilayered Systems at the PACRIM meeting of the American Ceramic Society, November 2001.
- Chair for the Gordon Research Conference on Solid State Studies in Ceramics, 2002.
- Co-organized the technical Program for the Basic Science Division and the Pacific Coast Regional Joint Meeting of the American Ceramic Society, November 2002.
- Member, Scientific Committee, Sintering 05, 4th International Conference on Science, Technology and Applications of Sintering, Grenoble, France, August 29-September 1, 2005.
- Session Chair, Symposium on Coatings, MS&T 2005, Pittsburgh, September 2005.
- Session Chair, Symposium on Degradation Processes in Nanostructured Materials (Symposium Q), MRS Fall Meeting, Boston, November 2005.
- Session Chair, THRMEC, Vancouver, Canada, July 2006
- Scientific Advisory Committee, International Conference on Design of Biomaterials, Indian Institute of Technology, Kanpur, December 2006.
- International Advisory Committee, Second International Conference on Recent Advances in Composite Materials, New Delhi, India, February 2007
- Session Chair, International Workshop on Nanoceramics and Nanocomposites, Kanpur, India, September 2007.
- Organized a Workshop on Emerging Energy Conversion Technologies, Indian Institute of Technology, Kanpur, September 2007.
- Program Co-Chair, International Conference on Sintering – Sintering 2008. 16 – 20, November 2008 – La Jolla, California.
- Member, International Advisory Committee for International Symposium for Research Scholars on Metallurgy and Materials Science and Engineering, Indian Institute of Technology, Chennai, India, December 2008.

- Panelist on the Research Track at PAN IIT 2008, Indian Institute of Technology, Chennai, India, December 2008.
- Session Chair for "Powder Synthesis and Processing", at EUROMAT Meeting, September 2009, Glasgow, Scottland
- Session Co-Chair for "High Performance Ceramics and Composites" at Material Science and Technology Meeting 2009, October 2009, Pittsburgh
- International Advisory Committee, International Conference on Hydrogen and Energy Storage, Indian Institute of Technology, Kanpur, December 2009.
- Advisory Board, 12 th. International Ceramics Congress, Symposium CB: "Novel Routes for Ceramic Synthesis and Processing", CIMTEC, June 2010, Motecatini Terme, Italy.
- Session Chair for Session CB-11.3 "SHS of Ceramic Powders" at the 12th. International Ceramics Congress, Symposium CB: Novel Routes for Ceramic Synthesis and Processing", CIMTEC, June 2010, Motecatini Terme, Italy.
- International Scientific Committee, 7th. International Conference on High Temperature Ceramic Matrix Composites, September 2010, Bayreuth, Germany
- Session Chair for "Polymer Derived Ceramics: Applications" at the 7th. International Conference on High Temperature Ceramic Matrix Composites, Bayreuth, Germany
- Session Co-Chair for "Porous Ceramics and Coatings" session in the Innovative Processing and Synthesis of Ceramics, Glasses and Composites Symposium at Material Science and Technology Meeting 2010, October 2010, Houston
- Session Chair for "Fiber Composites I" session in the Advances in Ceramic Matrix Composites Symposium at Material Science and Technology Meeting 2010, October 2010, Houston.
- Member of the Poster Evaluation Committee for the 12th Conference of the European Ceramic Society, June 2011, Stockholm, SWEDEN.
- Session Chair, for "Design and Development of Ceramic Matrix Composites" at PacRim 9 Meeting, July 2011, Cairns, AUSTRALIA.
- Session Chair for a session at the International Symposium on Plasticity, January 2012, San Juan, Puerto Rico.
- Member, organizing committee of the Symposium on Polymer Derived Ceramics at CMCEE 2012, May 2012, Dresden, GERMANY.
- Session Chair for Session III in the Symposium on Polymer Derived Ceramics at CMCEE 2012, May 2012, Dresden, GERMANY.
- Member of the Program Committee for CellMat 2012 (Cellular Materials 2012), November 2012, Dresden, GERMANY.
- Symposia Organizer, Polymer Derived Ceramics and Composites at 10th Pacific Rim Conference on Ceramic and Glass Technology (PACRIM 10), June 2013, San Diego, CA.
- Symposia Organizer, Polymer Derived Ceramics and Composites at High Temperature Ceramic Matrix Composites 8 in Xi'an, China, September 2013

SECTION XI: SERVICE

XI.1 Departmental Service at University of Washington

- Undergraduate Program Committee (March 1992 – June 1996)
- Chair, Undergraduate Recruiting Committee (March 1992 – September 1994)
- Faculty coordinator for the Departmental Open House and the High School Visitation program (1993 – 1996).
- Chair, Undergraduate Program Committee (September 1994 – June 1996)
- Department Planning Committee (September 1994 – June 1996)
- Faculty Search Committee (October 1994 – June 1995).
- Faculty Advisor to the Student Chapter of the American Ceramic Society (September 1992 – 2005)
- Acting Chair (July 1996 – April 1998)
- Chair (April 1998 – 2005)
- Budget and Space Committee (October 1996 – June 2000)
- Computer and Equipment Committee (October 1996 – June 2000)
- Faculty Advisor, University of Washington Chapter of Keramos (2000 – Present)
- Department Operations Committee (December 2001 – 2005)
- Faculty Search Committee (2005 – 2007)
- Department UG Committee (September 2005 – Present)
- Department ABET Committee (September 2005 – Present)

XI.2 College Service at University of Washington

- Disciplinary Committee (March 1992 – June 1996)
- College Executive Committee (1996 – 2005)
- Chair, Search Committee for the Chair of the Chemical Engineering Department (December 1999 – August 2000)
- Dean's Awards Committee (2000).
- Faculty Advisor to Engineering 100, Introduction to Design (September 2000 – 2003)
- College Council (September 2005 – June 2007)

XI.3 University Service at University of Washington

- Proposal Reviews for the Royalty Research Fund (March 1995 – Present)
- Graduate Education in Chemical Sciences Committee (April 2000 – 2004)
- University of Washington World Wide (2004 – Present)
- Associate Vice Provost Search committee (September 2005 – Present)
- Member, GISE Advisory Committee (2005 – Present)
- Member, Global Citizen Task Force (2007 – 2008)
- Member, Faculty advisory Team for Global Support Project (2007 – 2009)
- Member, Faculty Senate (2008 – 2010)
- Member, March Landlot Distinguished Graduate Mentor Award Selection Committee (2008 – Present)
- Member, UW Evaluation Committee for National Level Scholarships (2008 – Present)
- Member, Evaluation Committee for UG research Scholarships (2008 – Present)
- Member, ASLD (University of Washington Distinguished Alumni) Award Selection Committee (2008 – Present)

XI.4 Community Service

- Founding Member of the Asha Seattle Chapter (July 1994 – 2000)
- Member of the Steering Committee of Asha Seattle Chapter (July 1994 – June 1997)
- Volunteer at Madrona Elementary School (1992 – 1995), Laurelhurst Elementary School (1994 – 2000), Washington Middle School (1995 – 1998), Eckstein Middle School (2000 – 2002), Garfield High School (1999 – 2003), Roosevelt High School (2003 – 2007)
- Founder and Coordinator, Indian Institute of Technology, Academic and Research Alumni Network (March 2008 – Present)
- Co-Chair, Indian Institute of Technology, Golden Jubilee, Sponsorship Committee (November 2009 – July 2010)
- Member Board of Directors of Indian Institute of Technology, Kanpur Foundation (2011 – Present)

XI.5 Technical Consulting

- Micropump Corporation, Vancouver, WA
- Union Carbide Crystal Products, Washougal, WA
- NovaComp Engineering, Seattle, WA
- Quest Integrated, Inc., Kent, WA
- DuPont Co., Wilmington, DE
- Kyocera Industrial Ceramics, Vancouver, WA
- Easterline Inc., Seattle, WA
- Motorola Co., Albuquerque, NM
- Sandia National Laboratories, Albuquerque, NM
- Saint Gobain Co., Marlborough, MA (Current)
- GE Research (Current)
- Pacific Northwest National Laboratories, Richland, WA
- Hydrogen Power Inc, Seattle, WA (Member, Technical Advisory Board, 2005 – 2008)
- Oxane Materials Inc, Houston, TX (Member, Technical Advisory Board, 2006 – Present)
- Novogreen, India (Member Technical Advisory Board, 2008 – Present)

XI.6 Other Significant Professional Services

- Proposal Reviewer for NSF, USDA, DOE, Pacific Northwest National Labs, Sandia National Labs, Petroleum Research Fund, Civilian Research and Development Foundation, ASEE, National Research Council, National University of Singapore, Swiss National Science Foundation, German Science Foundation (DFG), San Diego State University Research Foundation, AAAS and City University of New York.
- Member of the MRSEC Proposal Review Panel for NSF (1996) and Member of the NIRT Proposal Review Panel for NSF (2001).
- Reviewer for the Journal of the American Ceramic Society, Materials Research Bulletin, Journal of Materials Research, Acta Materialia, Journal of the European Ceramic Society, International Journal of Applied Ceramics Technology, Scripta Materialia, Applied Physics A, Applied Physics E, Metallurgical and Materials Transactions A, Recent Patents on Materials Science, Journal of Composite Materials, Journal of Materials Science and Journal of Biomedical Materials Research: Part B, Acta Biomaterialia, Langmuir, Inverse Problems in Science and Engineering, Composites A, Sensors, Materials Science and Engineering C, Ceramics International, Surface and Coating Technology, Thin Solid Films, Ionics and Science of Sintering
- Invited participant at ALCOA Laboratories Centennial Technical Seminar (1986).

- Invited participant at DOE/Cornell workshop on High Temperature Structural Ceramics, June 1989.
- Discussion Leader, Workshop on Powder-Free Processing of Advanced Ceramics, Germany, November 1990
- Member of the NYI advisory committee for the Institute of Mechanics and Materials at University of California, San Diego (19993 – 1997).
- Discussion Leader, Gordon Conference on Solid State Studies in Ceramics, August 1989, August 1993, August 2000, and August 2001.
- Member of the National Technology University Materials Science and Engineering Faculty Board (2000 – 2004).
- Member of the Worldwide University Network Board (Materials Group) (2000 – 2008).
- Member, International Advisory Committee for a Council of Graduate Schools Project titled "Modeling Effective Research Ethics Education in Graduate International Collaborations: A Learning Outcomes Approach" (NSF funded) (2011 – Present)
- Leader of the Composites Group at the NSF Workshop on Grand Challenges in Ceramics Research, March 2012