Curriculum Vitae - MACIEJ S. KUMOSA

January 2026

Research Interests

Physical Properties, Life Prediction and Manufacturing of Advanced Materials and Structures for Extreme Applications, including High Voltage (HV), High Temperature (HT), High Strain (HS), combined HVTS, and other Extreme Functions

Teaching Interests

Introductory/Advanced Composite Materials, General Materials Science, Nanotechnology for Engineers, Mechanics of Materials, Finite Element Method, Machine Design, Fracture Mechanics, Mechanical Behavior of Solids, Stress Analysis of Structures, and others

Education

BS/MS and Ph.D., Applied Mechanics and Materials Science, Tech. University of Wroclaw, 1978 and 1982, Poland.

Current Employment

Retired Academic Professor in July 2024 and John Evans Professor (appointment for life) of the University of Denver, Department of Mechanical and Materials Engineering, University of Denver, 2390 South York Street, Denver, Colorado 80208, tel: (303) 871-3807, fax: (303) 871-4450; mkumosa@du.edu

Center Director, National Science Foundation Industry/University Cooperative Research Center for Novel High Voltage/High-Temperature Materials and Structures, https://erc-assoc.org/content/novel-high-voltagetemperature-materials-and-structures, https://www.linkedin.com/in/maciej-kumosa-b8659216/

Academic Honors

Editorial Board member of

- *Composites Science and Technology* (IF 9.8, #1or 2 in composites*), since 2002*
- *Structural Durability & Health Monitoring*
- *Fibers*

Awards

- John Evans Professor, the University of Denver's (DU) highest recognition for outstanding research or other creative, scholarly achievement, April 2006. http://www.du.edu/news/06-19-06facultyawards.html

- Best Scholar Award of the School of Eng. and Computer Science, DU, December 2004. Distinguished Teaching Award, Oregon Graduate Institute (OGI), Portland, OR, 1992-93

General Interests

Piano; Gardening; Bicycling; Mountain Living; Investment; Fly Fishing; Photography and Painting; World Literature, History, and Politics; and others.

Previous Positions

- August 1981 - August 1983
  Senior Research Assistant
  Institute of Materials Science and Applied Mechanics, Technical University of Wroclaw
  Wroclaw, Wyb. Wyspianskiego 27, Poland

- January 1981 - March 1981
  Visiting Scientist
  Department of Materials Science and Engineering, University of California - Los Angeles

- August 1983 - January 1985
  Assistant Professor
  Department of Materials Science and Applied Mechanics, Technical University of Wroclaw, Wroclaw, Wyb. Wyspianskiego 27, Poland

- January 1984 - December 1984
  Visiting Research Fellow
  Department of Materials Science and Engineering, University of Liverpool
  Liverpool, England

- December 1984 - March 1990
  Senior Research Associate
  Department of Materials Science and Metallurgy, University of Cambridge
  Cambridge, UK

- October 15 - November 15, 1994
  Visiting Professor
  Department of Mechanical Engineering, University of Paderborn
  Paderborn 33095, Germany

- May 1, 1990 - September 1, 1998
  Associate Professor
  Department of Materials Science and Engineering and Department of Electrical Engineering and Applied Physics, OGI, Portland, Oregon.

- April 1996 – September 1997, Research Professor
  September 1997- September 1999, Associate Professor
  September 1999-present, Full Professor with tenure, since 2006, John Evans Professor
  Department of Engineering, University of Denver
  Denver, Colorado

- Between April 1996 and September 1998 Dr. Kumosa had a dual appointment both at DU and OGI.

- September 15, 2006 - September 14, 2009
  Guest Professor of Harbin Engineering University, Harbin, China

Administrative Duties

1. **Chair**, Mechanical and Materials Engineering (MME) Department at DU, between September 1, 2007, and November 1, 2009; first Chair, built the department, stepped down in 2009 to concentrate on research and to manage the Center for Nanoscale Science and Engineering (see below).

2. **Director,** Center for Advanced Materials and Structures, between 1996 and 2007, built the Center jointly with Drs. P. Predecki and S. Carpenter, internationally recognized through composite research for NSF, AFOSR, EPRI, NASA, DoE, and several major US industries.

3. **Director,** Center for Nanoscale Science and Engineering, 2007-2012, built the "Nano-Center" involving seven DU departments/units engaging approximately. 25 faculty. Elected in 2007 for two years, and unanimously re-elected in 2009 for two more years.

4. **Overall Center Director**, since March 2014, initially for five years, National Science Foundation Industry/University Cooperative Research Center for Novel High Voltage/High Temperature Materials and Structures, also called the "HVT Center".
   Completed Phase I on September 30, 2024, transition to Phase II pending.

   The Center included the University of Denver (leading site), Michigan Technological University, the University of Illinois at Urbana-Champaign, and the University of Connecticut (added in Feb 2017), and 21 supporting major US industries since its inception. See the Appendix.

54711 citations according to Google Scholar; h-index 44 and i10-index 109

Graduate Student Advising54711 citations according to Google Scholar; h-index 44 and i10-index 109

Ph.D. Graduate Students

1. Jun Ding, Structure-Property Relationship of Advanced High-Temperature Materials, Ph.D., October 1994.

2. Shiliang Ding, Mixed Mode Failure Analysis of Adhesively Bonded Composite Systems using the Modified Iosipescu Test Method, Ph.D., March 1995, OGI.

3. Qiong Qiu, Brittle Fracture Mechanisms of Glass-Fiber Reinforced Polymer Insulators, Ph.D., September 1995, OGI.

4. Anurag Bansal, Finite Element Simulation and Mechanical Characterization of Composite Insulators, Ph.D., November 1995, OGI.

5. Gregory M. Odegard, Shear-Dominated Biaxial Failure Analysis of Polymer-Matrix Composites at Room and Elevated Temperatures, Ph.D., Department of Engineering, University of Denver, June 2000.

6. Kevin Searles, The Elastic and Inelastic Behavior of Woven Graphite Fabric Reinforced Polyimide Composites, Ph.D., OGI, October 2000.

7. Bart Benedikt, Analysis of Residual Stresses in Graphite Fiber/PMR-15 Composites, Ph.D., May 2003.

8. Mark Gentz, Mechanical Response of Graphite/polyimide Composites at Elevated Temperatures, Ph.D., Department of Engineering, University of Denver, August 2004, completed.

9. Peter Rupnowski, Multiscale Stress and Damage Initiation Analyses of Graphite Fiber/Polyimide Composites, Ph.D., Department of Engineering, University of Denver, May 2005.

10. Brian Burks, The Effect of Atmospheric Aging on a Hybrid Polymer Matrix Composites' Material Properties, Ph.D. thesis in Mechanical Engineering, Department of Mechanical and Materials Engineering, completed in May 2012.

11. Zachary Loftus, Electron Beam Direct Manufacturing of Ti-6Al-4V for Space Applications, Ph.D.; University of Denver and Lockheed Martin Corporation, completed in October 2013.

12. James Middleton, Aging of a Polymer Core Composite Conductor under Combined Ozone and Temperature Conditions, Ph.D. in Materials Science, DU, completed in July 2014.

13. Joseph Hoffman, On Thermal Aging Prevention in Polymer Core Composite Conductor Rods, Ph.D. in Nanoscale Science and Engineering, DU, completed in Sept. 2015.

14. Eva Hakansson, Galvanic Corrosion of Aluminum/Carbon Composite Systems, Ph.D. in Mechanical Engineering, DU, completed in June 2016.

15. Monika Bleszynski, Nanoengineering of Next Generation Silicone Rubber Materials for Extreme Applications, Ph.D. in Mat Sci, MME Dept, DU, completed in June 28, 2018.

16. Tianyi Lu, Synergistic Aging of GRP Composites, Ph.D. in Mat Sci, MME Dept., DU, completed in Dec. 2018

17. Chrissy Henderson, Protection of High-Voltage Transformer Bushings and Other Brittle Structures Against Impact, Ph.D. in Eng., completed in Sep 2019.

18. Daniel Waters; Monitoring of Polymer Core Composite Conductors under Excessive Mechanical Loads using Fiber Bragg Grating Sensors, Ph.D. in Mechanical Engineering, completed in Oct 2021.

19. Sabuj Khadka, Monitoring of Residual Stresses in Extreme Environment Materials Using FBG Sensors, Ph.D. in Mechanical Engineering, completed in Winter 2022.

20. Jide William, The Modernization of Large Power Transformer Tanks
Ph.D. in Materials Science, completed in May 2023.

21. Billy Grell, Fatigue and Fracture of Electron Beam Melting Ti-6Al-4V
Ph.D. in Mechanical Engineering, completed on July 7, 2023.

22. Matt Reil, Effect of Oxidation of Graphene on Agglomeration and the Mechanical Properties of Thermosetting Resins, completed in May 2024.

Master Graduate Students

1. Natarajan Sukumar, Finite Element Analysis of Mixed-Mode Fracture and Failure in Iosipescu Specimens, MS in Materials Science, Oregon Graduate Institute, October 1992.

2. Ibrahim Erdinc, Singular Stress Fields at Interfaces and Sharp Notches, M.S. in Materials Science, July 1992, Oregon Graduate Institute and University of Paderborn, Germany.

3. Andreas Schubert, Comprehensive Numerical and Experimental Studies of Internal Stresses in Composite (GRP) Substation Insulators, M.S. in Materials Science, October 1994, OGI and University of Paderborn, Germany.

4. M. V. Balakrishnan, Application of the Biaxial Iosipescu Test Fixture for the Mechanical Characterization of Unidirectional Composites, M.S. in Materials Science, September 1995, OGI.

5. Yong Zhao, An Electrical Study of the Brittle Fracture Failure of Composite Insulators, M.S. in Mechanical Engineering, Department of Engineering, University of Denver, November 1997.

6. Yongyu Han, Finite Element Analyses of Advanced Composite Structures, MS in Mechanical Engineering, Department of Engineering, University of Denver, November 1997.

8. Gregory M. Odegard, Biaxial Failure Investigation of Polymer Matrix Composites, M.S. in Mechanical Engineering, Department of Engineering, University of Denver, July 1998.

9. Joe Stowe, Material Property Predictions of Polymers Using Molecular Dynamics Simulations, M.S. in ME, MME Dep., DU, completed in May 2008.

10. Brian Burks, Short-Term Failure Analysis of Aluminum Conducting Composite Core Transmission Lines, MS in ME, MME Dep., DU, completed in July 2009.

11. Rebekah Kovarik, An Experimental Study of Optical Adhesive Bonds Subjected to Thermal Cyclic Environments, MME Dep., DU, University of Denver, completed in August 2010.

12 Bruce Allen, New Open Source Software for Building Molecular Dynamics Systems, MS thesis in Materials Science, MME Dep., DU, completed in May 2012.

13. Eva Hakansson, Galvanic Corrosion of High-Temperature Low Sag (HTLS) Conductors: New Materials - New Challenges, MME Dep., DU, completed in May 2013.

14. James Kosak. Stress Corrosion Cracking in Polymer Matrix Glass Fiber Composites. MS Thesis in Mechanical Engineering, MME Dep., DU, completed in May 2014.

15. Tianyi Lv, Degradation of High Voltage Glass Fiber-Reinforced Polymer Matrix Composites by Aggressive Environmental Conditions, MS in Materials Science, Department of Mechanical and Materials Engineering, DU, completed in July 2014.

16. Monika Bleszynski, Aging Assessment of High Voltage Single Component Room Temperature Vulcanized Silicone Rubber (RTV-1) Subjected to Aqueous Salt, MS in Engineering, MME Dep., DU, completed Dec 9, 2015.

17. Daniel Waters, Low-Velocity Impact to High-Temperature Low-Sag Overhead Conductors, MS in Mechanical Engineering, MME Dep., DU, completed in Feb 2016.

18. Edward Clark, Variable Oxidation & Defects in Ti-6Al-4V Material in Electron Beam Melting Additive Manufacturing, MME Dep., DU, completed in March 2017.

19. Robert Woll, Ice Adhesion Analysis of Severely Aged PDMS Rubbers; MS in Materials Science, MME Dept. , DU, completed in June 2018.

20. Matt Reil, Graphene/Oxide Interactions with Polymer Networks Modeled using Molecular Dynamics, MS in Materials Science, MME Dep., DU, completed in September 2020.

PhD Full and Part-Time Co-Advising

1. Barnes J. A, Torsion Testing of Filament Wound Composite Cylinders, Ph.D., 1986, the University of Cambridge (with D. Hull; M. Kumosa provided full-time academic advising).

2. Broughton W. R., Shear Properties of Unidirectional Carbon-Fibre Composites, Ph.D., November 1989, the University of Cambridge (with D. Hull; M. Kumosa provided full-time academic advising).

3. Huang Xue-Ning, Mode I and Mode II Intralaminar Fracture of Unidirectional Composites, Ph.D., October 1990, the University of Cambridge (with D. Hull; M. Kumosa provided full-time academic advising).

4. Tom Ely, Depth Profiling Residual Stresses in Thin Tungsten Films Using X-ray Diffraction, Ph.D., August 1999, the University of Denver (with P. K. Predecki; M. Kumosa provided part-time financial and academic support).

5. Danut Dragoi, Residual Stress Analysis of Graphite/Polyimide Composites using the Concept of the Metallic Inclusions, Ph.D., June 1999, Department of Engineering, the University of Denver (with P.K. Predecki; M. Kumosa provided significant financial support and part-time academic advising).

Courses Taught

- Introduction to Composites (Part I) and Advanced Composites (Part II),
- Introduction to Finite Elements (Part I) and Advanced Finite Elements (Part II)
- Introduction to Nanotechnology for Engineers (Part I) and Advanced Topics in Nanotechnology (Part II)
- Materials Science; Part I and Part II,
- Machine Design, Strength of Materials, Mechanical Behavior of Solids, Mechanics of Materials, Fracture Mechanics, etc.

Comments:

1. Course evaluations were usually higher than departmental averages; they can be provided on request.
2. Several courses were also taught outside of DU (for example, Nanotechnology I and II at Lockheed Martin, Fall 2008, Introduction to Composites, Lockheed Martin, Fall 2007, others).

Short Courses for Industry

1. Fracture and Fatigue: Principles and Analysis, M. Kumosa (OGI) with G. Glinka (University of Waterloo) and R. Gordon (EWI), April 10-11, 1991, 16 participants, course evaluation - excellent.

2. Fracture and Fatigue of Advanced Materials, M. Kumosa (OGI) with G. Glinka, S. Hudak (Southwest Research Institute), F.G. Buchholz (Univ. of Paderborn), and R. Stephens (Univ. of Iowa), 15 participants, course evaluation - excellent.

3. Structural Integrity of Composite Structures, M. Kumosa, F. G. Buchholz (University of Paderborn), and M. Kunze, October 25-October 29, 1994, University of Paderborn, Germany, 18 participants.

4. Non-Ceramic Insulators; Applications, Design, Testing and Analysis, M. Kumosa, E. Bennett (BPA), J.M. Braun (Ontario Hydro, Canada), T.S. McQuarrie (Glasforms, Inc.), course evaluation - very good, 35 participants (from 9 countries).

Invited Lectures, Conference Presentations, and Seminars

Since 1982, Dr. Kumosa has given approximately 400 presentations (including numerous invited lectures) at various academic and industrial institutions in several countries, including Poland, the United Kingdom, France, Germany, the United States of America, Austria, Japan, Singapore, Canada, and China**.**

Dr. Kumosa's Total Competitive Research Funding between 1990 and 2024

Approximately $8.0M (both federal grants and private/federal contracts and in-kind), including:

- Federal Grants: $2.520 M (5 NSF and 5 AFOSR grants, all with MK as PI)
- Private/Federal Contracts: $7.0M (including multiple BPA, WAPA, NASA Glenn, Mac Lean Power Systems, NGK, other individual contracts, and HVT memberships)
- In kind, at least $1 Million

Average per Year: ~ $220k in 32 years (with continuous funding ranging from approx. $150k to $500k per year), no in kind funding was considered.

Research Programs between 1990 and 2024

1. High-Temperature Fatigue Crack Growth in Cast Superalloys, M. S. KUMOSA PI, sponsored by G.E. Aircraft Engines and Precision Castparts Corp., $165,000 for one year (1990-1991).

2. High-Temperature Fatigue Crack Growth in Cast Superalloys, M. S. KUMOSA PI, sponsored by G.E. Aircraft Engines and Precision Castparts Corp., $105,000 for one year (1991-1992).

3. Deformation and Fracture of Titanium Aluminides, M. KUMOSA PI, $105.000 for 9 months, starting date January 1, 1992, sponsored by Precision Castparts Corp., and the Oregon Metal Initiative (OMI).

4. Interfacial Fracture Phenomena in Advanced Metallic Systems, M. KUMOSA PI, Precision Castparts Corp., $75,000 for one year, starting date July 1, 1992, including support from GE. Aircraft Engines ($15,000) and Rockwell International ($5,000).

5. Mixed Mode Failure Analysis of a Unidirectional Carbon/Epoxy Composite and Adhesively Bonded Composite Systems, M. KUMOSA PI, $120.000 for two years and six months, sponsored by the National Science Foundation, Solid and Geomechanics Program, starting date July 1, 1991.

6. Failure of Composite Insulators Caused by the Combined Action of Electrical, Mechanical, and Chemical Environments, M. KUMOSA PI, Bonneville Power Administration, DOE, $260.441 for two years (including support from EPRI, ($80,000, and WAPA ($50,000), starting date July 1, 1992.

7. Microstructure Studies of Titanium Aluminides, M. KUMOSA PI, Precision Castparts Corp. $25,000 for one year, starting date July 1, 1993.

8. Analytical and Experimental Studies of Substation NCIs, M. KUMOSA PI, Bonneville Power Administration, $54,000 for one year, starting date Dec. 15, 1993.

9. Suitable Crimping Techniques for Composite Insulators, M. KUMOSA PI, NGK (Japan), $20,000 for seven months, starting date, October 1, 1996.

10. Fracture Analysis of Composite Insulators, M. KUMOSA PI, Electric Power Research Institute, $345,157 total, July 1, 1994 - February 28, 1998.

11. Fracture Analysis of Composite Insulators, M. KUMOSA PI, Electric Power Research Institute, $128,000 total, March 1, 1998 - February 28, 1999.

12. Biaxial Analysis of Unidirectional Graphite Reinforced/Polyimide Composites, M. KUMOSA PI, Air Force Office of Scientific Research, $173,648 total, March 1, 1995 - June 30, 1999.

13. Micro-Fracture Mechanisms in Glass/Polymer Insulator Materials under the Combined Effect of Mechanical, Electrical and Environmental Stresses, M. KUMOSA PI, jointly sponsored by the Bonneville Power Administration (DOE), Western Area Power Administration (DOE), Alabama Power Company, Pacific Gas & Electric, and the National Rural Electric Power Association, $215,000, July 1996 - December 1998.

14. Failure Analysis of Unidirectional Composite Materials and Adhesive Joints Subjected to Biaxial Loadings, M. KUMOSA PI, National Science Foundation, Civil and Mechanical Systems, $200,000 total, October 1, 1994 - December 31, 1999.

15. Biaxial Failure Analysis of Graphite Reinforced Polyimide and Epoxy Fabric Composites, M. KUMOSA PI and P. Predecki, CO-PI, Air Force Office of Scientific Research, $101,000 total, June 1, 1997 - May 31, 2001.

16. Micro-Fracture Mechanisms in Glass/Polymer Insulator Materials under the Combined Effect of Mechanical, Electrical, and Environmental Stresses, M. KUMOSA PI, Western Area Power Administration, $20,000 for one year, starting April 1, 2000.

17. Micro-Fracture Mechanisms in Glass/Polymer Insulator Materials under the Combined Effect of Mechanical, Electrical, and Environmental Stresses, M. KUMOSA PI, Western Area Power Administration, $20,000 for one year, starting April 1, 2001.

18. Acquisition of Instrumentation for Research on Component Failure under High Temperature, Mechanical and Environmental Stress, M. KUMOSA PI, National Science Foundation, $422,170, September 1, 1999 – August 31, 2003.

19. Fundamental Issues Regarding the High-Temperature Failure Properties of Graphite/Polyimide Fabric Composites, M. KUMOSA, PI, Air Force Office of Scientific Research and NASA Glenn Research Center, $415,000, February 15, 2000 – October 31, 2004.

20. Failure Analysis of Composite High Voltage Insulators, M. KUMOSA PI, Electric Power Research Institute, $523,256, July 1, 2000 - December 31, 2003.

21. Investigation of Long-Term Structural Integrity of High-Temperature, Low-Sag Composite Conductors, Western Area Power Administration, Tri-State Generation, and Transmission Association, and Bonneville Power Administration, M. KUMOSA PI, approx. $750,000, 6/1/2008-9/1/2014.

22. Environmental Testing and Modeling of Composites, Polymer Coatings and RTV Sealants used in HV Transmission Line Insulators, MacLean Power Systems; M. KUMOSA PI, $190,000; Oct. 1, 2012 – June 30, 2014.

23. Titanium Electron Beam Direct Manufacturing**,** Lockheed Martin Corporation, M. KUMOSA PI, $165,500, September 1, 2012- March 31, 2015.

24. Investigation of Galvanic Reaction Barriers in High-Temperature High Voltage Conductors, Principal Investigator: M. KUMOSA PI, National Science Foundation, Grant Opportunities for Academic Liaison with Industry (GOALI); Total Award Amount: $357,338; September 1, 2012 – September 30, 2017.

25. **Collaborative Research: I/UCRC for Novel High Voltage/Temperature Materials and Structures"**, Principal Investigator: M. KUMOSA PI, March 2014 – October 2024

A. Membership Funds for the HVT Center at DU only; M. KUMOSA PI, between May 2014 and 2024.

- Bonneville Power Administration - $500k
- Western Area Power Administration - $500k
- Tri-State Generation and Transmission - $380k
- Lockheed Martin - $230k plus $250k in kind
- John Crane - $20k in cash and $20k in kind for 2014-2015
- Composites Technology Corporation - $500k
- Composites Technology Development – $5k and $35k in-kind in 2014-2015
- US Bureau of Reclamation - $400k/year in-kind between 2015 and 2018

B. National Science Foundation Funds

Original Award Amount: $602,660 (plus $600k for UIUC and MTU) as of March 15, 2014, for 5 years, $300k was added in Feb 2017 for UConn for 2 years

An additional $128k was added from August 2018 until March 2019 for DU; therefore, the total grant amount for DU and M. Kumosa was $730k

Total for M Kumosa from IUCRC between 2014 and 2024
NSF - $730,000, Private - $2,135,000, and $705 in kind

Sabbaticals

Sabbatical 2005
Between January 1 and August 31, 2005, M. Kumosa was on sabbatical, during which he was in Denver and Europe. In Europe, he spent two months visiting the University of Cambridge, the University of Bristol in the UK, and in Poland. In Poland, he visited the Technical University of Wroclaw and the Technical University of Poznan. During his sabbatical, Dr. Kumosa gave five invited lectures and presentations at Cambridge (http://www.msm.cam.ac.uk/gordon/seminars_lent05.html), Bristol, Poznan, and Wroclaw. He also made significant efforts to establish collaborative research programs with several leading European researchers.

Sabbatical 2013
M. Kumosa spent it at the DU building, the HVT I/UCRC. The Center was formally awarded on March 15, 2014.

Patents

1. "Testing Procedure for Evaluating Diffusion and Leakage Currents in Insulators" by Armentrout, D., Kumosa, L., and Kumosa, M., US Patent, US 7327132 b2, 2008.

2. “Fault Detection in Composite Core Transmission Lines using Electric Reflectometry" by Hakansson, E. and KUMOSA, M., Provisional Patent, 62/333,776, conf. 5855, May 2016.

3. “Silicone Rubber Sealant” by M. Bleszynski, M. Kumosa. Provisional Patent No. 62/457661 “Silicone, February 10, 2017, by DU.

Books

1. “Plagues and Miracles”, M. KUMOSA, autobiography, completed, awaiting international publication
2. “An Introduction to Extreme Materials”, M. KUMOSA (potentially with others), in preparation, expected completion in 2027-28

Dissertations

1. KUMOSA, M., TEM Investigation of Dislocations in Fe-3% Si, M.S. Thesis, Institute of Materials Science and Applied Mechanics, Technical University of Wroclaw, 1978, Poland.

3. KUMOSA, M., Crack and Slip Phenomena at the Tip of a Terminated Twin, Ph.D. Thesis, Institute of Materials Science and Applied Mechanics, Technical University of Wroclaw, 1982, Poland.

Published Papers in Refereed International Journals

Between 1980 and 1990

1. Golaski, L., KUMOSA, M. and Hull, D., Acoustic Emission Testing of Filament Wound Pipes under Repeated Loading, Journal of Acoustic Emission, Vol. 1, No. 2, (1982) pp. 95-101.

4. KUMOSA, M., Stress and Strain Fields around Inclusions, Prace Naukowe Instytutu Materialoznawstwa i Mechaniki Technicznej Politechniki Wroclawskiej Nr. 39, Studia i Materialy Nr 26, (1983) pp. 42-60 (in Polish).

5. Golaski, L., Hull, D., and KUMOSA, M., Acoustic Emission from Filament Wound Pipes under Long Term Loading Conditions, Mechanical Behavior of Materials (1084) pp. 557-563.

6. Jerzyk, I. and KUMOSA, M., Influence of Fibre Orientations on Acoustic Emission from Filament Wound Pipes, J. Materials Science, Vol. 20 (1985) pp. 3661-3667.

7. Hull, D., KUMOSA, M. and Price, J. N., Stress Corrosion of Aligned Glass-Fibre Polyester Composite Materials, Materials Science and Technology, Vol. 1 (1985) pp. 177-182.

8. KUMOSA, M., Crack and Slip Phenomena at the Tip of a Terminated Twin, Materials Science and Engineering , Vol. 77 (1986) pp. 37-44.

9. KUMOSA, M., Hull, D., and Price J. N., Acoustic Emission from Stress Corrosion Cracks in Aligned GRP, Journal of Materials Science Vol. 22 (1987) pp. 331-336.

10. KUMOSA, M., Acoustic Emission Monitoring of Stress Corrosion Cracks in Aligned GRP, Journal of Physics D: Applied Physics, Vol. 20 (1987) pp. 69-74.

11. Barnes, J., KUMOSA, M. and Hull, D., Development of Iosipescu Shear Test, Composites Science and Technology, Vol. 28, (1987) pp. 251-268.

12. KUMOSA, M. and Hull, D., Mixed Mode Fracture of Composites using Iosipescu Shear Test, International Journal of Fracture, Vol. 35 (1987) pp. 83-102.

13. KUMOSA, M. and Hull D., Finite Element Analysis of a Circumferentially Cracked Cylindrical Shell under Uniform Tensile Loading, Engineering Fracture Mechanics, Vol. 31, No. 5 (1988) pp. 817-826.

14. KUMOSA, M. and Hull, D., Finite Element Analysis of a Circumferentially Cracked Cylindrical Shell Loaded in Torsion, Engineering Fracture Mechanics, Vol. 32, No. 1 (1989) pp. 123-136.

15. Broughton, W. R., KUMOSA, M. and Hull, D., Analysis of the Iosipescu Shear Test as Applied to Unidirectional Carbon-Fibre Reinforced Composites, Composites Science and Technology, Vol. 38 (1990) pp. 299-325.

Between 1990 and 1996

16. Sigalas, J., KUMOSA, M. and Hull, D., Trigger Mechanisms in Energy Absorbing Glass Cloth /Epoxy Tubes, Composites Science and Technology, Vol. 40 (1991) pp. 265-287.

17. Wojnar, L. and KUMOSA, M., Quantitative Analysis of Overlapped Fracture Surfaces, Engineering Fracture Mechanics, Vol. 36, No. 4 (1990) pp. 597-609.

18. Wojnar, L. and KUMOSA, M., Advanced Quantitative Analysis of Fracture Surfaces, Materials Science and Engineering, Vol. A 128 (1990) pp. 45-53.

19. KUMOSA, M., Bulging Effects in Circumferentially Cracked Orthotropic Cylindrical Shells, Engineering Fracture Mechanics, Vol. 38, No. 4/5 (1991) pp. 255-262.

20. KUMOSA, M., Strain Energy of a Mechanical Twin in a -Iron, Journal of Physics D: Applied Physics, Vol. 24 (1991) pp. 1816-1821.

21. Sukumar, N. and KUMOSA, M., Application of the Finite Element Iterative Method to Cracks and Sharp Notches in Isotropic and Orthotropic Media, International Journal of Fracture, Vol. 58 (1992) pp. 177-192.

22. Sukumar, N. and KUMOSA, M., Stress Singularities at Sharp Notches: Interpolation Formulas, International Journal of Fracture Vol. 58, No. 3 (1992) pp. R45-R49.

23. Sukumar, N. and KUMOSA, M., Finite Element Analysis of Axial Splits in Composite Iosipescu Specimens, Int. J. Fracture Vol. 62 (1993) pp. 55-85.

24. Korusiewicz, L., Ding, J., and KUMOSA, M., High-Temperature Crack Growth Behavior in a Precipitate-Hardened Nickel-Base Superalloy under Constant K Conditions, Scripta Metallurgica, Vol. 29-5 (Sept. 1993).

25. Ding, S. and KUMOSA, M., Singular Stress Behavior at an Adhesive Interface Corner, Engineering Fracture Mechanics, Vol. 47, No. 4 (1994) pp. 503-519.

26. Ding, S., Meekisho, L. and KUMOSA, M., Analysis of Singular Stress Fields at a Bimaterial Wedge Corner, Engineering Fracture Mechanics, Vol. 49 (1994) pp. 569-585.

27. Bansal, A. and KUMOSA, M., Experimental and Analytical Studies of Failure Modes in Iosipescu Specimens under Biaxial Loadings, J. Composite Materials, Vol. 29, No. 3 (1995) pp. 334-358.

28. Bansal, A. and KUMOSA, M., Application of the Biaxial Iosipescu Test Method to Mixed-Mode Fracture of Unidirectional Composites, International Journal of Fracture, Vol. 71 (1995) 131-150.

29. Bansal, A., Schubert, A., Balakrishnan, M. V. and KUMOSA, M, Finite Element Analysis of Composite Substation Insulators, Composite Science and Technology, Vol. 55 (1995) pp. 375-389.

30. Ding, S., Erdinc, I., Buchholz, F. G., and KUMOSA, M., Optimization of the Adhesive Joint Iosipescu Specimen for Pure Shear Test, Int. J. Fracture, Vol. 76 (1996) pp. 1-20.

In 1997

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A. Reports to IAB of HVT Center

18. M. KUMOSA, Center Director's Report, Semi-annual Report to IAB of HVT IUCRC, University of Illinois at Urbana-Champaign, November 17-18, 2014.

19. M. KUMOSA, Center Director's Annual Report to IAB of HVT IUCRC, May 19-20, 2015, Michigan Technological University.

20. M. KUMOSA, et al, Annual Progress Reports to IAB of HVT IUCRC, May 19-20, 2015, Michigan Technological University, including:

20 a. Corrosion of Transmission Conductors, E. Hakansson, M. KUMOSA, et al., Annual Report to HVT Center.

20 b. Impact Damage to HTLS Conductors, Insulators, Transformers, Substation, D. Waters, M. Kumosa, et al., Annual Report to HVT Center.

20 c. Glass Fibers and their Polymer-Based Composites under Excessive Corrosion, UV and Temperature Conditions, E. Solis-Ramos, Taylor, Lu, M. KUMOSA, et al., Annual Report to HVT Center.

20 d. Nanotechnology of HTLS Polymer Core Conductor Materials for Aging Prevention, J. Hoffman, M. KUMOSA, et. al., Annual Report to HVT Center.

20 e. Multiscale Characterization and Modeling of Metal Matrix (Nano)Composites, E. Solis-Ramos, I. Jasiuk (UIUC), M. KUMOSA, et al., Annual Report to HVT Center.

20 f. Diagnostics of RTV1 and RTV2 HV Silicone Rubber Components, Nanocoatings and Silicone Rubber Nanocomposites for HV and other Applications, M. Bleszynski, B. Allen, M. KUMOSA, et al., Annual Report to HVT Center.

21. M. KUMOSA, Center Director's Annual Report to IAB of HVT IUCRC, May 17-18, 2017, University of Illinois at Urbana-Champaign.

22. M. MKUMOSA, et al., Annual Progress Reports to IAB of HVT IUCRC, May 17-18, 2017, University of Illinois at Urbana-Champaign including:

    22 a. Physical Damage to HV Transmission Infrastructure, C. Henderson, D. Waters, M. KUMOSA, et al., Annual Report to HVT Center.

    22 b. Additive Manufacturing, Novel Alloys and Composites, and Metallic Glasses, B. Grell, E. Clark, E. Solis-Ramos, M. KUMOSA, et al., Annual Report to HVT Center.

    22 c. Aging Prevention of Polymeric Materials using Nanotechnology and other Methods, J. Hoffman, M. KUMOSA, et. al., Annual Report to HVT Center.

    22 d. Synergistic Aging of Affordable Polymer Matrix Composite, T. Lu, E. Solis-Ramos, M. KUMOSA, et al., Annual Report to HVT Center.

    22 e. Galvanic Corrosion of Aluminum/Carbon Composite Systems, E. Hakansson, M. KUMOSA, et al., Annual Report to HVT Center.

    22 f. Diagnostics of RTV1 and RTV2 HV Silicone Rubber Components, Nanocoatings and Silicone Rubber Nanocomposites for HV and other Applications, M. Bleszynski, B. Allen, M. KUMOSA, et al., Annual Report to HVT Center.

23. M. KUMOSA, Center's Director, Annual Report to IAB of HVT I/UCRC, May 17-18, 2017, University of Denver.

24. M. KUMOSA et al, Annual Progress Reports to IAB of HVT I/UCRC, May 17-18, 2017, University of Denver, including:

    24 a. Aging Resistant RTV Silicone Rubbers and their Nanocomposites, M. Bleszynski, B. Allen, M. KUMOSA, et al., Annual Report to HVT Center.

    24 b. Durability Enhancements of Icephobic Barriers, J. Middleton, T. Woll, M. KUMOSA, et al., Annual Report to HVT Center.

    24 c. Effect of Powder Oxidation on Mechanical Properties of Ti-6Al-4V Parts Made by Additive Manufacturing, W. Grell, E. Solis-Ramos, M. KUMOSA, et al, Annual Report to HVT Center.

    24 d. Manufacturing of Materials for Aging Prevention of Fiber Reinforced PMC, J. Hoffman, S. Khadka, M. KUMOSA, et al., Annual Report to HVT.

    24 e. Synergistic Effects in Environmental Degradation of Glass and Basalt Composites, E. Solis-Ramos, T. Lu, M. KUMOSA, et al., Annual Report to HVT Center.

    24 f. Prevention of High Velocity Impact Damage to Substations, C. Henderson, C. DeFrance, M. KUMOSA, et al., Annual Report to HVT Center.

    24 g. HVT Monitoring using Fiber Bragg Gratings and other Techniques, J. Hoffman, D. Waters, S. Khadka, M. KUMOSA, et al., Annual Report to HVT.

25. M. KUMOSA, Center's Director Report to IAB of HVT I/UCRC, May 14 -16, 2018, University of Illinois at Urbana-Champaign

26. M. KUMOSA et al, Annual Progress Reports to IAB of HVT I/UCRC, May 14-16, 2018, University of Illinois at Urbana-Champaign, including:

    26 a. Aging Resistant Silicone Rubbers and their Composites, M. Bleszynski, B. Allen, and M. KUMOSA, Annual Report to HVT Center.

    26 b. Durability Enhancement of Icephobic Barriers, M. Bleszynski, J. Middleton, R. Woll, and M. KUMOSA, Annual Report to HVT Center.

    26 c. Current Issues in Metallic Additive Manufacturing, M. KUMOSA, W. Grell, et al, Annual Report to HVT Center.

    26 d. Aging Prevention and Sensing of HVT Polymer Matrix Composites, S. Khadka, J. Hoffman, and M. KUMOSA, Annual Report to HVT Center.

    26 e. Prevention of High Velocity Impact Damage to Substations, C. Henderson and M. KUMOSA, Annual Report to HVT Center.

    26 f. Health Monitoring of HVT Structures using FBG Sensors, J. Hoffman, D. Waters, and M. KUMOSA, Annual Report to HVT Center.

    26 g. Recycling Fiber Reinforced Polymer Matrix Composites, E. Edward and M. KUMOSA, Annual Report to HVT Center.

    26 h. Synergistic Effects in Environmental Degradation of Glass and Basalt Polymer Matrix Composites, E. Solis-Ramos, T. Lu, and M. KUMOSA, Final Report to HVT Center.

B. NSF Annual and Final HVT Reports from DU

27. M. KUMOSA, Annual Report to NSF from DU, HVT Center, February 2015.
28. M. KUMOSA, Annual Report to NSF from DU, HVT Center, February 2016.
29. M. KUMOSA, Annual Report to NSF from DU, HVT Center, February 2017.
30. M. KUMOSA, Annual Report to NSF from DU, HVT Center, February 2018.
31. M. KUMOSA, Annual Report to NSF from DU, HVT Center, February 2019.
32. M. KUMOSA, Annual Report to NSF from DU, HVT Center, February 2020.
33. M. KUMOSA, Annual Report to NSF from DU, HVT Center, February 2021.
34. M. KUMOSA, Annual Report to NSF from DU, HVT Center, February 2022.
35. M. KUMOSA, Annual Report to NSF from DU, HVT Center, February 2023.
36. M. KUMOSA, Annual Report to NSF from DU, HVT Center, February 2024.
37. M. KUMOSA, Final for Phase I to NSF from DU, HVT Center, October 2024, pending.

C. NSF Annual and Final Summary Reports from HVT Center

38. M. KUMOSA, Annual Summary Director's Report to the National Science Foundation Industry/University Cooperative Research Center for Novel High Voltage/Temperature Materials and Structures, March 1, 2016 - February 28, 2017, copy available.

39. M. KUMOSA, Annual Summary Director's Report to the National Science Foundation Industry/University Cooperative Research Center for Novel High Voltage/Temperature Materials and Structures, March 1, 2017- February 28, 2018, copy available.

40. M. KUMOSA, Annual Summary Director's Report to the National Science Foundation

Industry/University Cooperative Research Center for Novel High Voltage/Temperature Materials and Structures, March 1, 2018- February 28, 2019, copy available.

41. M. KUMOSA, Annual Summary Director's Report to the National Science Foundation Industry/University Cooperative Research Center for Novel High Voltage/Temperature Materials and Structures, March 1, 2019- February 28, 2020, copy available.

42. M. KUMOSA, Annual Summary Director's Report to the National Science Foundation Industry/University Cooperative Research Center for Novel High Voltage/Temperature Materials and Structures, March 1, 2020- February 28, 2021, copy available.

43. M. KUMOSA, Annual Summary Director's Report to the National Science Foundation Industry/University Cooperative Research Center for Novel High Voltage/Temperature Materials and Structures, March 1, 2021- February 28, 2022, copy available.

44. M. KUMOSA, Annual Summary Director's Report to the National Science Foundation Industry/University Cooperative Research Center for Novel High Voltage/Temperature Materials and Structures, March 1, 2022- February 28, 2023, copy available.

45. M. KUMOSA, Annual Summary Director's Report to the National Science Foundation Industry/University Cooperative Research Center for Novel High Voltage/Temperature Materials and Structures, March 1, 2023- February 28, 2024, copy available.

44. M. KUMOSA, Annual Summary Director's Report to the National Science Foundation Industry/University Cooperative Research Center for Novel High Voltage/Temperature Materials and Structures, March 1, 2024- September 30, pending.

45. M. KUMOSA, Final Summary for Phase I Director's Report to the National Science Foundation Industry/University Cooperative Research Center for Novel High Voltage/Temperature Materials and Structures, March 1, 2024- September 30, pending.

Maciej S. Kumosa - Biographical Sketch

Education

The Technical University of Wroclaw, from which Dr. Kumosa graduated, is one of the largest technical universities in Poland. At the time of his graduation in 1982, the University consisted of approximately 30 large research institutes, 20,000 undergraduate and MS graduate students, and approximately 1,000 graduate Ph.D. students in a variety of technical and scientific disciplines, with the exception of life sciences. Since 2002, the Technical University of Wroclaw has been ranked among the top 3 technical universities in Poland in national rankings.

Dr. Kumosa's Ph.D. program in Applied Mechanics and Materials Science was jointly sponsored by the Technical University of Wroclaw and the National Science Foundation (NSF) of the United States of America (Marie Curie Foundation, International Programs). His Polish academic advisor was Professor L. Golaski, whereas Professor K. Ono from the University of California, Los Angeles (UCLA) was his American advisor. As part of Dr. Kumosa's Ph.D. program, he was invited in 1981 by the NSF to visit UCLA and other research organizations in the USA. This was his first contact with the United States.

Employment History

After graduating in 1983, Dr. Kumosa was appointed an Assistant Professor of Applied Mechanics and Materials Science at the University of Wroclaw. In January 1984, due to mostly economic reasons, he left Poland and sought academic employment abroad. Initially, between January 1984 and December 1984, he worked as a Visiting Research Fellow at the University of Liverpool. Then, in January 1985, he moved to Cambridge, England, where he spent six fascinating years. In the Department of Materials Science and Metallurgy at the University of Cambridge, working with Professor D. Hull, FRS, Dr. Kumosa was exposed to state-of-the-art materials science research, particularly advanced composite research. The knowledge and experience he gained at Cambridge shaped his academic career in the years that followed.

In 1990, Dr. Kumosa left Cambridge and accepted an academic appointment at the Oregon Graduate Institute of Science & Technology (OGI) in Portland, Oregon. Between 1990 and 1996, he was an Associate Professor at OGI in two departments: initially in Materials Science and

Engineering, and then in Applied Physics and Electrical Engineering. At OGI, Dr. Kumosa built large research programs in high-voltage composite insulators (supported by DOE, EPRI, and several large US utilities) and high-temperature polymer-based composites for aerospace applications (funded by NSF, AFOSR, the State of Oregon, and others).

In 1996, due to family reasons, Dr. Kumosa left OGI and accepted an academic appointment in the Department of Engineering at the University of Denver (DU), where he was a tenured Professor of Mechanical Engineering between 1999 and 2024. In 2006, Dr. Kumosa became the John Evans Professor (DU's highest academic award for extraordinary research and scholarly work).

Research Centers and Academic Departments Built by M. Kumosa at OGI and DU

At DU, in 1996, jointly with Dr. Paul Predecki and Dr. Steve Carpenter, Dr. Kumosa created the Center for Advanced Materials and Structures. The Center was internationally recognized, attracting significant research funds from major US federal and private funding organizations.

In 2006, jointly with several (about 25) faculty members from the School of Natural Sciences and Mathematics (NSM) and the School of Engineering and Computer Science (SECS) Dr. Kumosa built a new interdisciplinary research center; the Center for Nanoscale Science and Engineering (the "Nano Center"). The Center operated until 2011/2012. The Center developed a graduate PhD program in Nanoscale Science and Engineering. It also attracted limited federal (NSF) and private (DU) educational and research funds. In 2011-12, Dr. Kumosa started replacing the "Nano Center" with a much larger and more successful I/UCRC Center (see below)

Between 2011 and 2014, Dr. M. Kumosa, jointly with his partners from the University of Illinois at Urbana-Champaign and Michigan Technological University (see below), built the National Science Foundation Industry/University Cooperative Research Center for Novel High Voltage/Temperature Materials and Structures (www.HVTCenter.org). The Center was awarded by NSF on March 15, 2014.

In addition to the research centers, Dr. Kumosa served as the first Chair of the Department of Mechanical and Materials Engineering (MME; www.mme.du.edu) from September 2007 to November 2009. The MME department was formed in 2007 after the split of the former Engineering department into the MME department and the Department of Electrical and Computer Engineering.

Brief History of HVT Center

The National Science Foundation awarded the HVT Center (www.HVT Center.org) to three Universities (the University of Denver, Michigan Technological University, and the University of Illinois at Urbana-Champaign) in March 2014. It expanded it in Jan 2017 by adding the University of Connecticut (see below). It was built primarily on M. Kumosa's research on HT-HV materials and technologies between 1990 and 2012-3 (see above). The Center combines both the HV and HT aspects of advanced materials and structures and was now rapidly expanded into other areas related to their application in extreme environments.

The Center was evaluated by its members for 2017. For the quality of its research, meetings, and management, the Center received 4.1/5, 4.2/5, and 4.2/5, respectively, all noticeably above the national averages. The evaluations for 2016 were very similar (for research 4.8/5).

As of October 2024, the Center graduated with 42 PhDs and 15 MS students. It has also produced 202 journal papers, numerous conference papers, and two patents.

Between March 2014 and October 2024, the HVT Center was funded by 21 large US corporations, federal agencies (DOE), and NSF (see the funding section of Dr. Kumosa's CV).

Most importantly, the entire HVT Center satisfied all NSF I/UCRC requirements and expectations and was ranked in good standing by NSF between 2015 and 2024. On September 30, 2024, the Center completed Phase I of its operation. The Center is presently considering moving to Phase II in a new location, without involving the University of Denver.

Academic Sites in Phase I (March 14, 2014, 0 September 30, 2024)

- University of Denver, lead site. Dr. M. Kumosa, overall Center Director
- Michigan Technological University (MTU); one of three original HVT sites
  Dr. Gregory Odegard, Professor and HVT Site Director (gmodegar@mtu.edu)
- University of Connecticut (UConn); joined in February 2017
  Dr. Yang Cao, Associate Professor and HVT Site Director (yang.cao@uconn.edu)
- University of Illinois at Urbana-Champaign (UIUC); one of three original sites
  Dr. Iwona Jasiuk, Professor and HVT Site Director (ijasiuk@illinois.edu)

Industries (21) supporting HVT between March 14, 2014, and September 30, 2024

ABB, Boeing, Bonneville Power Administration, BP, Department of Energy; Electricity Office, CTC Global, Composites Technology Development, Eversource, G&W, General Cable, General Electric, John Crane, Marmon Engineered Wire & Cable, New York Power Authority, Lockheed Martin Space Systems, Prysmian Group, Southwire, Tri-State Transmission and Distribution, USi, US Bureau of Reclamation, Western Area Power Administration.

Funding from March 15, 2014, to May 14, 2019;

- $3.8 M in industrial fees
- $1.65M in federal funding
- $1Min kind
- $10M-12M in various leveraged funds

Research Goals and Objectives in Phase I

The I/UCRC for Novel High Voltage/Temperature Materials and Structures ("HVT Center") works jointly with the electric utility, aerospace, nuclear, military, environmental, automotive, health, and other industries with needs for novel HV/T materials and structures.

The objectives of the Center are (1) Design of novel and evaluation of existing HV/T energy transmission/transfer multifunctional materials for next-generation composite conductors, insulators, underground cables, towers, and other electric power transmission structures; (2) Design and development of novel advanced high energy transfer materials for aerospace, oil/gas, automotive, and other industrial applications; (3) Failure prediction and prevention of HV/T materials and structures under in-service conditions through state-of-the-art multi-scale modeling and material performance evaluations; (4) Development of new failure monitoring techniques and material repair methods in HV/T materials under laboratory conditions and their subsequent transfer to in-service inspection and repair.

The HVT Center has a diverse and interdisciplinary educational, research, and business environment for (1) undergraduate and graduate students, including those from underrepresented groups, funded by the research projects of the Center; (2) faculty members from a variety of disciplines, including junior faculty starting their academic careers; (3) utility, aerospace and national lab engineers and designers developing various types of HV/T materials and structures; and (4) utility managers supervising HV transmission lines across the country.

The Center enhances the reputation of U.S. HV/T manufacturing around the world and, in particular, improves the level of confidence among the potential users of novel HV/T structures. The center targets long-term benefits to infrastructure, manufacturing, energy transport and efficiency of the electric grid, and the durability of other HV/T and high energy transfer structures.

HVT Research Projects in Phase I

Research Area 1. Multiscale Design and Development of Novel HVT Materials
- 1.2 Aluminum Alloys for High Conductivity and Strength (MTU)
- 1.3 Aging Resistant RTV Silicone Rubbers and their Nanocomposites (DU)
- 1.5 Development of Durable Icephobic Barriers (DU)
- 1.6 HVDC/MVDC Cabling: Electronic Structure of Polyolefin (UConn)
- 1.7 HVDC/MVDC Cabling – Space Charge Dynamics (UConn)

Research Area 2. Advanced Manufacturing of HVT Materials
- 2.2 High Temperature/Voltage Polymers and Nanocomposite (UIUC)
- 2.5 Titanium (Ti) Intermetallics, Ti Alloys and Superalloys for Extreme HT Aerospace, Automotive and other Applications (DU)

Research Area 3. Environmental Degradation of HVT Materials and Structures
- 3.4 In-Situ Sensing of Manufacturing and Aging of HVT Polymer Matrix Composites (DU)
- 3.5 Recycling Fiber Reinforced Polymer Matrix Composite Materials (DU)

Research Area 4. Damage Prevention of HVT Materials and Structures
- 4.2 Prevention of High Velocity Impact Damage to Substations (DU)
- 4.4 HVDC Grid Hardening against Geomagnetic Disturbance (UConn)
- 4.5 Discharge Resistant Materials for Circuit Breaker (UConn)

Research Area 5. Monitoring and Diagnosis of HVT Structures/Equipment
- 5.1 Applications of FBG Sensors in HVT Materials and Structures (DU)
- 5.5 Vibration of HVT Cable Structures (UIUC)
- 5.6 Photo-acoustic Based Dissolved Gas Analysis (UConn)

5.7 HT FBG Sensors for Temperature and Strain Sensing Applications (DU)
5.8 Remote Sensing of HVT Structures Using Hyperspectral Imaging (DU

Research Area 6. Major New Ventures

6.1 Modernization of the Large Power Transformer Tanks; approved by the Board in August 2019 (DU)