

# RAJESH SHARMA

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Associate Professor of Renewable Energy Technology  
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## **Education**

Ph.D.	Engineering Science and Systems	University of Arkansas at Little Rock, AR	2004
M.S.	Materials Science & Engineering	University of Florida, Gainesville, FL,	1999

## **Academic appointments**

- Associate Professor, Renewable Energy Technology, Arkansas State University, Jonesboro, AR, 08/2017- current
- Assistant Professor, Renewable Energy Technology, Arkansas State University, Jonesboro, AR, 06/2009- 06/2017
- Interim Director, Technology Program, Arkansas State University, Jonesboro, AR, 07/2010 – 08/2013
- Research Assistant Professor, Graduate Institute of Technology, University of Arkansas at Little Rock, 08/2006 – 06/2009
- Post-doctoral Research associate, Department of Applied Science/ Graduate Institute of Technology, University of Arkansas at Little Rock, 08/2004 – 08/2006.

## **Instructional experience**

- Trained in various learning management systems and distance learning technologies
- Completed online instruction training by Interactive Teaching & Technology Center at the Arkansas State University

## **Curricula development**

Developed and taught following cross-disciplinary courses

- Fundamentals and Application of Renewable Energy
- Advanced Renewable Energy Systems
- Energy Conservation and Efficiency
- Plasma Engineering (Graduate Course)
- Energy Analysis (Graduate Course)
- Materials Challenges in Renewable Energy (Graduate Course)

## **Research Experience**

### Renewable Energy and Nanotechnology

- Photo electrochemical hydrogen production.
- Electrochemical synthesis, fabrication, integration and characterization of nanostructured photo anodes.
- Development of Perovskite-phase ceramic membranes for high temperature oxygen ion transport for fuel cell applications.
- Synthesis and characterization of supported Au and Pd Catalysts.
- Development of advanced catalyst systems for CO remediation using plasma surface modification.

### Surface Engineering

- Designing and development of a fluidized bed atmospheric-pressure plasma reactor for surface modification of materials. This novel plasma reactor was used for modifying surface properties of sheet like substrates as well as particulate materials.
- Characterization of plasma-modified surfaces using various analytical techniques such as AFM, SEM, XPS, IR and Contact angle measurement.

### Space applications and other applied research

- Worked on a NASA sponsored research for development of an electrodynamic screen to remove dust particles from solar cells and astronaut suits on Mars and Moon surface.
- Characterization of electrostatic properties of Mars simulant dust. Development of biocompatible cardiovascular stents

### **Honors and awards**

- Finalist, Arkansas State University Faculty Award for Professional Service, 2015
- Eleanor Lane Faculty Professional Development Award, Arkansas State University, 2014
- Nominated for “You made a difference academic advising award”, Arkansas State University, 2012,2013
- Elected Senior member of IEEE, 2011
- James Melcher award by IEEE for outstanding paper, 2009 and 2010
- Elected Vice-president, Secretary, and Adjunct Secretary of IEEE-Industry Applications Society Electrostatic Processes Committee, 2011-2013, 2009-2011, and 2007-2009 respectively.
- Travel award to attend IEEE-IAS annual conference in Hong Kong, Office of Research and Sponsored Program, University of Arkansas at Little Rock, 2005.
- M. K. Testerman award for excellence in research, University of Arkansas at Little Rock, 2001.

### **Synergistic activities**

- Chair of the Organizing Committee for Arkansas Academy of Science Annual Meeting, Arkansas State University, Jonesboro, April 6-7, 2018
- Serving on the advisory board of Northeast Arkansas Career and Technical center, Jonesboro, AR, 2015-current
- Invited and served as remote reviewer for the Irish Research Council Laureate Awards Programme 2017/18 (IRCLA) for the following proposal.  
Project Title: Reliable and efficient photo-electrochemical water splitting for hydrogen fuel
- Liaison officer for the Arkansas Academy of science, 2016 - current
- Organizer, Fifth Annual Renewable Energy conference, Arkansas State University, Jonesboro, AR, October 14<sup>th</sup>, 2016.
- Technical Committee Program Review Chair, Electrostatics Processes Committee, IEEE-IAS (Institute of Electrical and Electronics Engineers – Industry Applications Society) Annual Meeting, Dallas, TX, October 18 - 22, 2015
- Served as Judge, Export Policy Trade Fair Simulation, College of Business, Arkansas State University, Jonesboro, AR, April 24, 2015.
- Technical Committee Program Review Chair, Electrostatics Processes Committee, IEEE-IAS Annual Meeting, Vancouver, BC, Canada, October 5-9, 2014
- Organizer, Fourth Annual Renewable Energy conference, Arkansas State University, Jonesboro, AR, September 19<sup>th</sup>, 2014
- Attended 2014 Arkansas Commercialization Retreat, Petit Jean, Arkansas, June 26-27, 2014
- Served as Judge, Create @ STATE: A Symposium of Research, Scholarship & Creativity on Thursday, April 10, 2014
- Served as Judge, Arkansas Soil and Water Education Conference, Arkansas State University, Jonesboro, AR, January 31<sup>st</sup>, 2014
- Moderator, Create @ STATE: A Symposium of Research, Scholarship & Creativity, April 11, 2013
- Organized Third Annual Renewable Energy Conference, Arkansas State University, Jonesboro, AR, November 5<sup>th</sup>, 2012
- Organized the conference “Renewable Energy in Arkansas: Opportunities for Economic Development,” Arkansas State University, Jonesboro, AR, April 18, 2011
- Organized the conference “Renewable Energy in Arkansas: Opportunities for Economic Development,” Arkansas State University, Jonesboro, AR, April 19, 2010
- Research was featured on over 500 websites including MSNBC, 2009.
- Organizer First IEEE/IAS/EPC-ESA joint meeting at Little Rock, 2003.
- Reviewer, NASA Postdoctoral Program, 2009
- Reviewer, Open Technology Program (OTP) of The Technology Foundation STW, Dutch funding agency for Academic Research, 2009

### ***Session chair and organizer in professional meetings***

- Session Organizer, “Electrostatic Measurement and Electrohydrodynamics,” IEEE-IAS Annual Meeting, Cincinnati, OH, October 3, 2017.
- Session Chair, “Contact Charging and Triboelectric Effects II,” 2017 Annual Meeting of the Electrostatics Society of

America, Ottawa, ON, Canada, June 13- 15, 2017

- Session chair, Session: “Electrical Charging and Discharging” IEEE-IAS Annual Meeting, Dallas, TX, October 18 - 22, 2015.
- Session Organizer, Session: “Electrodynamics” IEEE-IAS Annual Meeting, Dallas, TX, October 18 - 22, 2015.
- Session chair, Session: “Electrical Charging and Discharging” IEEE-IAS Annual Meeting, Vancouver, BC, Canada, October 5- 9, 2014.
- Session organizer, Session: “Electrostatic Separation” IEEE-IAS Annual Meeting, Vancouver, BC, Canada, October 5-9, 2014.
- Session chair, Session: “Nano- and Micro- Electrostatic Processes” IEEE-IAS Annual Meeting, Orlando, FL October 9-13, 2011.
- Session organizer, Session: “Nano- and Micro- Electrostatic Processes” IEEE-IAS Annual Meeting, Houston, TX October 4-6, 2010.
- Member, Technical Committee, Joint conference on Electrostatics, Boston, MA, June 16-18, 2009
- Session organizer, Session: “Material Properties and Measurement Techniques” IEEE-IAS Annual Meeting, Edmonton, Canada October 5-9, 2008.
- Session organizer, Session: “Electrical Discharges” at the IEEE-IAS Annual Meeting, New Orleans, September 23-26, 2007.
- Invited to Co-Chair the session “Advances in Photovoltaic as an Energy Source” at the 2007 AIChE (American Institute of Chemical Engineers) Spring National Meeting in Houston, April 22-26, 2007.
- Paper Review Manager, Session: “Charge Control” at the ESA/IEEE-IAS/IEJ/SFE Joint Conference on Electrostatics, University of California, Berkeley, CA June 2006
- Session Chair, “Corona and Plasma Discharge reactors” at the IEEE-IAS Annual Meeting, Hong Kong, October 2005

#### *Book Review*

- Engineering your Future – A comprehensive introduction to Engineering by William C. Oakes and Les L. Leone, Oxford University Press, 2017
- *Energy Resources: From Science to Society* by Drs. Wesley and Colin Reisser, Oxford University Press, 2016
- Renewable Energy Engineering, Cambridge University Press, 2014, 2015[second review]
- Modification of Polymer Properties, edited by Dr. Carlos Federico Jasso-Gastinel, Elsevier, 2014
- Renewable Energy for Agriculture, Harry Field and Scott Frazier, Springer, 2013
- Renewable Energy Engineering, Nick Jenkins, Cambridge University Press, 2013
- A Handbook of Renewable Energy Technology, World Scientific Publishing Company, Singapore, 2009

#### *Editorial Board*

- IEEE Transactions on Industry Applications (2007-present)
- Editorial Board, Journal of Physics Research and Applications (2018-current)
- Associate Editor, International Journal of Renewable Energy Technology (2009-2012)

Served as reviewer for the following journals

- IEEE Transactions on Industry Applications - Energy Systems Committee
- IEEE Transactions on Industry Applications - Electrostatic Processes Committee
- International Journal of Renewable Energy Technology
- Electrochemical and Solid State Letters
- Particulate Science and Technology: An International Journal
- Journal of Adhesion Science and Technology
- Physics Letters A
- Journal of Physics D: Applied Physics
- Applied Surface Science
- Surface and Coatings Technology
- Nanotechnology
- Carbon

- Electrochimica Acta
- Materials Research Bulletin
- Journal of Electrostatics

#### **Professional affiliations - Major offices in professional (academic) organizations**

- Committer Administrator, IEEE-IAS Electrostatics Processes Committee, 2015- current
- President, IEEE-Industry Applications Society Electrostatic Processes Committee, 2013-2015
- Vice-President, IEEE-Industry Applications Society Electrostatic Processes Committee, 2011-2013
- Secretary, IEEE-Industry Applications Society Electrostatic Processes Committee, 2009-2011
- Adjunct Secretary, IEEE-Industry Applications Society Electrostatic Processes Committee, 2007-2009

#### **Committee Service:**

- Arkansas State University first Fulbright Committee, 2014-current
- University Undergraduate Enrollment and Academic Policy committee 2013-14, 2015-current
- University Diversity and Affirmative Action Committee, 2014-current
- University Academic Calendar Committee 2013-15
- University Education and Technology Committee, 2010- 2011
- Internship Committee 2012-Current
- Self-assessment committee, College of Agriculture and Technology, Arkansas State University, 2010-2011
- Undergraduate Curriculum and Policies Committee, College of Agriculture and Technology, Arkansas State University, 2010-current
- Prior Learning Assessment committee, College of Agriculture and Technology, Arkansas State University, 2009-2010, Co-Chair, 2010 - 2011
- Careers Committee, College of Agriculture and Technology, Arkansas State University, 2009- 2010

#### **Patent, Publications and Presentations**

##### Selected Peer-reviewed Publications

1. **Rajesh Sharma**, Keith Arnoult, Kevin Hart, Gregory Phillips, Shane Knight, Michael Grappe, "Biomass (yard waste) Suspensions as Alternative Daily Cover Material for Landfills," *Journal of the Arkansas Academy of Science*, Vol. 70, 99. 216-220, 2017.
2. **Rajesh Sharma**, Keith Arnoult, Ali Shaikh, Sunil Kumar Ramasahayam, Saad Azam, Zachary Hicks, "Photo-electrochemical hydrogen production using novel heteroatom doped carbon under solar simulated radiation," *IEEE Transactions on Industry Applications*, Vol. 52, No. 1, pp. 378-383, 2016.
3. Maqsood Ali Mughal, Robert Engelken, **Rajesh Sharma**, "Progress in indium (III) sulfide (In<sub>2</sub>S<sub>3</sub>) buffer layer deposition techniques for CIS, CIGS, and CdTe-based thin film solar cells," *Solar Energy*, Vol. 120, pp. 131-146, October 2015. [**Review paper**]
4. Malay Mazumder, Mark Horenstein, Jeremy Stark, Girouard, Brooks Henderson, Ishihara Hidetaka, Alex Biris, **Rajesh Sharma**, Robert Sumner, and Omar Sadler, "Characterization of Electrodynamic Screen Performance for Dust Removal from Solar Panels and Solar Hydrogen Generators," *IEEE Transactions on Industry Applications*, Vol. 49, No. 4, pp. 1793-1800, 2013.
5. Franklin D. Hardcastle, Hidetaka Ishihara, **Rajesh Sharma** and Alexandru S. Biris, "Photoelectroactivity and Raman spectroscopy of anodized titania (TiO<sub>2</sub>) photoactive water-splitting catalysts as a function of oxygen-annealing temperature," *J. Mater. Chem.*, 21, 6337, 2011.
6. Hidetaka Ishihara, Jacob P Bock, **Rajesh Sharma**, Franklin Hardcastle, Ganesh K Kannarpady, Malay K Mazumder, "Electrochemical Synthesis of Titania Nanostructural Arrays and their Surface Modification for Enhanced Photoelectrochemical Hydrogen Production," *Chemical Physics Letters*, Volume 489, Issues 1-3, 2010.
7. Enkeleda Dervishi, Zhongrui Li, Viney Saini, **Rajesh Sharma**, Yang Xu, Malay K. Mazumder, Alexandru S. Biris, Steve Trigwell, Alexandru R. Biris, Dan Lupu, Divey Saini, "Multifunctional Coatings with Carbon Nanotubes for Electrostatic Charge Mitigation and with Controllable Surface Properties," *IEEE Transactions on Industry Applications*, Vol. 45, No. 5, pp. 1547-1552, 2009.

8. **Rajesh Sharma**, Jacob P. Bock, Alexandru S. Biris, Malay K. Mazumder, Prajna P. Das, Manoranjan Misra, Vishal K. Mahajan, "Evaluation of atmospheric-pressure plasma for improving photo electrochemical response of titania photoanodes," *IEEE Transactions on Industry Applications*, Vol. 45, No. 4, pp. 1524-1529, 2009.
9. Wisam J. Khudhayer, **Rajesh Sharma**, and Tansel Karabacak, "Hydrophobic Metallic Nanorods with Teflon Nanopatches," *Nanotechnology*, Vol. 20, 275302, 2009.
10. **R. Sharma**, P. P. Das, V. Mahajan, J. Bock, S. Trigwell, A. S. Biris, M. K. Mazumder, M. Misra, "Enhancement of Photoelectrochemical Conversion Efficiency of Nanotubular TiO<sub>2</sub> Photoanodes using Nitrogen Plasma Assisted Surface Modification," *Nanotechnology*, Vol. 20, 075704, 2009.

#### Patent

"Encased stent" Mark M. Mazumder, Jawahar L. Mehta, Malay K. Mazumder, Nawab Ali, Steven Trigwell, **Rajesh Sharma** and Samiran De, U.S. Patent 7,311,727 B2, 2007.

#### Book Chapters

1. M.K. Mazumder, **R. Sharma**, A. S. Biris, M. N. Horenstein, J. Zhang, H. Ishihara, J. W. Starks, S. Blumenthal and O. Sadder, "Electrostatic Removal of Particles and its applications to Self-Cleaning Solar Panels and Solar Concentrators," in *Developments in Surface Contamination and Cleaning: Methods for Removal of Particle Contaminants*, Volume 3, pp.149-200, chapter 5, Elsevier, 2011, ISBN: 978-1-4377-7885-4
2. M. K. Mazumder, A. S. Biris, C. E. Johnson, C. Y. Yurteri, R. A. Sims, **R. Sharma**, K. Pruessner, S. Trigwell and J. S. Clements, "Solar panel obscuration by dust and dust mitigation in the Martian atmosphere," in *Particles on Surfaces 9: Detection, Adhesion And Removal*, Brill, 2006, pp.1-29. ISBN 90 6764 435 8.
3. **R. Sharma**, S. Trigwell, M. K. Mazumder, and R. A. Sims, "Modification of Electrostatic Properties of Polymer powders using Atmospheric Plasma Reactor," in *Polymer Surface Modification: Relevance to Adhesion*, Volume 3, 2004; VSP, AH Zeist, The Netherlands, pp. 25-37. ISBN 90-6764-403-X.
4. H. El-Shall, S. A. Svoronos, N. A. Abdel-Khalek, S. Gupta, and **R. Sharma**, "Evaluations of Spargers for Column Flotation of Phosphates," in *Development on non-renewable resources: challenges and solutions*, 1999; United Engineering Foundation, New York, pp. 51-65. ISBN 0939204576.

#### Selected Presentations

1. **Rajesh Sharma**, "Hydrogen & Renewable Energy Systems: Challenges & Opportunities," *3<sup>rd</sup> International Conference of Science and Technology*, Bali, Indonesia, October 18-19, 2018. [**Invited Keynote Speaker**]
2. **Rajesh Sharma**, "Green Jobs Curriculum at Arkansas State University," *Presented to the House & Senate Joint Energy Legislative Committee meeting at the Arkansas Black Legislative Caucus 18<sup>th</sup> Annual Retreat*, University of Arkansas at Pine Bluff, September 27, 2018.
3. **Rajesh Sharma**, Samuel King, Mesut Yurukcu, and Tansel Karabacak, "Multijunction thin film electrodes for photoelectrolysis," *Electrostatic Society of America Annual Meeting*, Ottawa, ON, Canada, June 13, 2017.
4. **Rajesh Sharma**, Keith Arnoult, Kevin Hart, Gregory Phillips, Shane Knight, Michael Grappe, "Biomass suspension for landfills: A sustainable waste management approach," *Arkansas Academy of Science 100<sup>th</sup> Annual meeting*, Fayetteville, AR, April 1, 2016.
5. **Rajesh Sharma**, "Photo electrochemical characterization of titania photoanodes fabricated using varying anodization parameters," *IEEE Industry Applications Society 50<sup>th</sup> Annual Meeting*, Dallas, TX, October 19, 2015.
6. **Rajesh Sharma**, "Photo-electrochemical hydrogen production using novel carbon based material," *IEEE Industry Applications Society 49<sup>th</sup> Annual Meeting*, Vancouver, BC, Canada, October 14, 2014.
7. **R. Sharma**, "Materials Challenges in Photo electrochemical Hydrogen Production," *Department of Physics, University of Memphis*, Memphis, TN, March 19, 2014. (**Invited colloquium presentation**)
8. **Rajesh Sharma**, "Plasma surface modification of TiO<sub>2</sub> nanoparticles for Dye-Sensitized Solar Cell (DSSC) application," *IEEE Industry Applications Society 46<sup>th</sup> Annual Meeting*, Orlando, FL, October 11, 2011.
9. **Rajesh Sharma**, "Development of surface engineered nanostructured photoanodes for enhanced photo electrochemical processes," *presented at IEEE Industry Applications Society 45<sup>th</sup> Annual Meeting*, Houston, October 3-6, 2010.
10. **R. Sharma**, P.P. Das, M. Misra, V. Mahajan, J. Bock, S. Trigwell, A.S.Biris, and M. K. Mazumder, "Photo electrochemical performance of Plasma treated Titanium-di-oxide nanostructures," *Materials Research Society Fall Meeting*, Boston, MA, December 1, 2008.

### Grant proposals

- "Novel Heteroatom Doped Carbon Nanostructures for Use in Fuel Cells, Supercapacitors and Solar Light-Mediated Hydrogen Production" NASA EPSCoR Research Infrastructure Development (RID) Program, 2016-17, Funding requested: \$10,703, Status: **Funded**, Role: **PI** [External, Collaborative grant with UALR]
- "Novel Heteroatom Doped Carbon Nanostructures for Use in Fuel Cells, Supercapacitors and Solar Light-Mediated Hydrogen Production" NASA EPSCoR Research Infrastructure Development (RID) Program, 2015, Funding requested: \$10,703, Status: **Funded**, Role: **PI** [External, Collaborative grant with UALR]
- "Novel Heteroatom Doped Carbon Nanostructures for Use in Fuel Cells, Supercapacitors and SolarLight-Mediated Hydrogen Production" NASA EPSCoR Research Infrastructure Development (RID) Award, September 2014, Funding requested: \$10,371, Status: **Funded**, Role: **PI**
- "Development of multi-junction semiconductor photo anodes for enhanced Solar-to-Hydrogen conversion efficiency," Faculty Research Development Award, March 2014, Funding requested: \$5100, Status: **Funded**, Role: **PI**
- "Development of a waste biomass dispersion system" Submitted to Saline County Waste Management district, December 2013, Funding requested:\$13,600, Status: **Funded**, Role: **PI**
- "Novel metal-free doped carbon nanostructures and their use in solar light mediated energy generation and storage", 2012, Funding requested: \$645,000, Status: Selected as alternate proposal by Arkansas NASA EPSCoR committee. Role: **Co-PI**
- "An integrated approach for Hydrogen production and storage in complex hydrides of transitional elements and carbon-based nanostructured materials," Submitted to US Department of Energy, October 2006, Funding Requested: \$890,999, Status: **Funded**, Role: **Co-I**
- "Lunar Dust Hazard Mitigation," Submitted to Arkansas Space Grant Consortium, Funding Requested: \$5,000, August 2006, Status: **Funded**, Role: **Co-PI**
- "Development of an analyzer for size and charge characterization of nanoparticles for research and education," Submitted to National Science Foundation, 2005, Funding requested: \$251,028, Status: **Funded**, Role: **Co-PI**