Manoranjan Sahu, Ph.D.

RESEARCH AREAS

1. **Aerosol and air pollution research** (Indoor/Outdoor Aerosol Monitoring, Characterization and Modeling, Aerosol technology and advanced applications)
2. **Nanotechnology & Application to Environment and energy**: Nanomaterials synthesis, advanced characterization and application to solve various societal problems (waste water treatment, air contaminant and other areas of application)
3. **Climate Change**: CO_2 capture, GHG emission and nanomaterials application for CO_2 reduction to useful products
4. **Chemical Process Research and Development**: Process research and development, scale-up and technology transfer from lab scale to pilot scale to commercialization (solar energy, silicon materials, specialty polymers)

EDUCATION

Post-doctoral Fellow, Advanced Energy Technology Initiative, University of Illinois at Urbana-Champaign, IL, USA

Ph.D., Energy, Environmental, and Chemical Engineering, Washington University in St. Louis – MO, USA, 2011
Thesis: "*Aerosol Route Synthesis and Applications of Nanostructured Materials"*

M.S., Energy, Environmental and Chemical Engineering, Washington University in St. Louis – MO, USA, 2010

M.Tech. Environmental Science and Engineering, Indian Institute of Technology (IIT), Bombay, India, 2001
2001

Thesis: "*Treatment of Coke-oven Wastewaters*"

B.E., Civil Engineering, Indira Gandhi Institute of Technology (IGIT), Utkal University, Orissa, India, 1999

PROFESSIONAL EXPERIENCE

Senior Scientist, SABIC-USA, 2018-1019
R & D Scientist, *GCL Solar Materials-US*, 2017-2018
R & D Scientist, *MEMC Electronic Materials/SunEdison*, USA, 2013- 2017

Post-Doctoral Fellow, *University of Illinois at Urbana-Champaign, IL*, 2011- 2013,
Scientific Officer (C/D), *Bhabha Atomic Research Center, Mumbai,* India, 2001-2006,

AWARDS AND HONORS

- **Dissertation Award-First Place,** for original work that makes an unusually significant contribution, Air &Waste Management Association, 2012
  (The A&WMA Doctoral Dissertation Award acknowledge up to two exceptional dissertations per year based on original work that makes an unusually significant contribution.)

- **Highly cited paper award for 2011 & 2012** to my paper in Chemical Engineering Science journal
- **Best poster award-**, The Society of Toxicity Annual Meeting, Washington DC, USA, 2011
- Recipient of **McDonnell International Scholars Academy Fellowship**, Washington University in St. Louis, 2006-2011: (Fellowship awarded to 12 students across the world for that year at Washington University)
- **Energy and Environmental Research Group Corporate Fellow**, Washington University in St. Louis, 2006-2011
- Recipient of **Ed. Edgerley Scholarship**, Washington University in St. Louis, USA, 2006
- Certificate-Exemplifies the **Promise of a Future Global Leader** to Promote Global Connectedness and Social Responsibility, Washington University in St. Louis, 2011
- Student travel grant award, 29th AAAR conference, Portland, OR, 2010
- **NSF student travel grant**, 28th AAAR conference, Minneapolis, MN, 2009
- Scholarship for CEM Certification, University of Illinois at Urbana-Champaign, 2012
- Awarded Teaching and Research Assistantship, IIT, Bombay, 1999-2001
- **Graduated with Honors** in Engineering, Utkal University, Orissa
- Awarded **National Scholarship** from Government of Orissa, India, 1990-1992
- **Post-Doctoral Research** Position: Harvard University, MA,USA-2011-Declined
- **Dean's Distinguished Fellowship** award for graduate study-University of California, Riverside 2006-declined

PUBLICATIONS

1. **Sahu, M** and P. Biswas, *Single-step Processing of Copper-doped Titania Nanomaterials in a Flame Aerosol Reactor*, Nanoscale Research Letters, 2011: p 6:441.

2. **Sahu, M**, B. Wu, L. Zhu, C. Jacobson, W. N. Wang, Y. Goyal, K. Jones, Y. J. Tang, and P. Biswas, *Role of Dopant Concentration, Crystal Phase, and Particle Size on Microbial Inactivation of Cu-doped TiO_2 Nanoparticles,* Nanotechnology, 2011, 22 (415704):p 1-9.

3. **Sahu, M**, K. Suttiponparnit, S. Suvachittanont, T. Charinpanitku, and P. Biswas, *Characterization of Doped TiO_2 Nanoparticle Dispersions*, Chemical Engineering Science, 2011, 66 (15): p 3482-3490.

4. Wu, B, W. Zhuang, **M. Sahu**, P. Biswas, and Y. J. Tang, *Cu-doped TiO_2 Nanoparticles Enhance Survival of Shewanella Oneidensis MR-1 under Ultraviolet Light (UV) Exposure*, Science of the Total Environment, 2011,409: p 4635–4639.

5. Suttiponparnit, K, J. Jiang, **M. Sahu**, S. Suvachittanont, T. Charinpanitku, and P. Biswas, *Role of Surface Area, Primary Particle Size, and Crystal Phase on Titanium Dioxide Nanoparticle Dispersion Properties*, Nanoscale Research Letters, 2011, 6 (27): p 1-8.

6. **Sahu, M**, J. Peipert, V. Singhal, G. Yadama, and P. Biswas, *Evaluation of Mass and Surface Area Concentration of Particle Emissions And Development of Emissions Indices for Cookstoves in Rural India,* Environmental Science and Technology, 2011, 45 (6):p 2428-2434.

7. **Sahu, M**, S. Hu, P. Ryan, G. LeMasters, S. Grinshpun, J. Chow, and P. Biswas, *Chemical Compositions and Source Identification of $PM_{2.5}$ Aerosols for Estimation of a Diesel Source Surrogate,* Science of the Total Environment, 2011, 409 (13): p 2642-2651.

8. Kreyling, W. G, P. Biswas, M. E. Messing, N. Gibson, M. Geiser, A. Wenk, **M. Sahu**, K. Deppert, I. Cydzik, C. Wigge, O. Schmid, and M. Semmler-Behnke, *Generation and Characterization of Stable Highly*

Concentrated Titanium Dioxide Nanoparticle Aerosols for Rodent Inhalation Studies, Journal of Nanoparticle Research, 2011, 13 (2):p 511-524.

9. **Sahu, M** and P. Biswas, *Size Distributions of Aerosols in an Indoor Environment with Engineered Nanoparticle Synthesis Reactors Operating under Different Scenarios.* Journal of Nanoparticle Research, 2010, 12 (3): p 1055-1064

10. Wu, B, R. Huang, **M. Sahu**, X. Feng, P. Biswas, and Y. J. Tang, *Bacterial Responses to Cu-doped TiO_2 Nanoparticles,* Science of the Total Environment*,* 2010*,* 408 (7): p 1755-1758.

11. Zeng, H, A. Singh, S. Basak, K. U. Ulrich, **M. Sahu**, P. Biswas, J. C. Catalano, and D. E. Giammar, *Nanoscale Size Effects on Uranium (VI) Adsorption to Hematite.* Environmental Science and Technology, 2009, 43 (5): p 1373-1378.

12. **Sahu, M**, J. Park, and P. Biswas, *In Situ Charge Characterization of TiO_2 and Cu- TiO_2 Nanoparticles in a Flame Aerosol Reactor*, Journal of Nanoparticle Research, 2012,14 (678): p 1-11.

13. Han, X, N. Corson, P. Wade-Mercer, R. Gelein, J. Jiang, **M. Sahu**, P. Biswas, J. N. Finkelstein, A. Elder, and G. Oberdörster, *Assessing the Relevance of In vitro Studies in Nanotoxicology by Examining Correlations Between in vitro and in vivo Data*, Toxicology, 2012, 297: p:1-9.

14. Yadama, G, J. Peipert, **M. Sahu**, P. Biswas and V. Dyda, *Social, Economic, and Resource Predictors of Variability in Household Air Pollution from Cookstove Emissions,* PlOS One, 2012, 7 (10): p 1-8.

15. Seders, L. A, **M. Sahu**, P. Biswas, and J. B. Fein, *Experimental Study of TiO_2 Nanoparticle Adhesion to Silica and Fe(III) Oxide-coated Silica Surfaces.* Chemical Geology, 2012, 332-333: p148-156.

16. Suttiponparnit, K, V. Tiwari, **M. Sahu**, P. Biswas, S. Suvachittanont, and T. Charinpanitku, *Effect of Pt or Pd Doping on Stability of TiO_2 Nanoparticle Suspension in Water*, Journal of Industrial and Engineering Chemistry, 2013,19(1): p 150-156.

17. Leavey, A., J. X., M. Fang, **M. Sahu**, and P. Biswas.: "*Comparison of measured particle lung-deposited surface area concentrations by an aerotrak 9000 using size distribution measurements for a range of combustion aerosols"*, Aerosol Science and Technology, 2013, 47: p 966-978

PROFESSIONAL PRESENTATIONS/PROCEEDINGS

1. Lu, Y, M**. Sahu**, X. Ye, Q. Ye, J. Hirschi, and A. Jones *A Hot Carbonate Absorption Process with High Pressure Stripping to Reduce Energy Use for Post-Combustion CO_2 Capture*, SME Annual Meeting, USA 2013.

2. Lu, Y, **M. Sahu**, X, Q. Ye, X. Ye, K. O'Brien, S. Chen, J. Hirschi, and A. Jones, *Development of a Carbonate-Based Absorption Process for High Pressure CO_2 Recovery from Post-Combustion Flue Gases: Studies of CO_2 Absorption and Bicarbonate Crystallization*, Eleventh Annual Conference on Carbon Capture, Utilization & Sequestration, Pittsburgh, USA, 2012.

3. **Sahu, M**, Q Ye, and Y. Lu, *Development of a Novel Hot-Carbonate Process for Post-Combustion CO_2 Capture: Role of Organic Promoters in Enhanced Absorption and Bicarbonate Crystallization*, AIChE, Pittsburgh USA, 2012.

4. Ye, Q, **M.Sahu**, Y. Lu and X. Wang, *Development of a Novel Carbonate Absorption Process with Crystallization-Enabled High Pressure Stripping for Post-Combustion CO_2 Capture: Kinetic Study of Bicarbonate Salt Crystallization*, AIChE, Pittsburgh ,USA, 2012.

5. **Sahu, M** , Q. Ye, Y. Lu, and M. Abadi , *Organic Catalysts in Promoting CO_2 Absorption in a Hot-Carbonate Process Enabled with Crystallization for Post-combustion CO_2 Capture*, Post-Doctoral Symposium, University of Illinois at Urbana-Champaign, Champaign, 2011.

6. Corson, N, P. Mercer, R. Gelein, **M. Sahu**, P. Biswas, G. Oberdörster and A. Elder, *Effects of Copper Doped Titanium Dioxide Nanoparticles in Vivo: Role of Soluble Metal*, The Society of Toxicity Annual Meeting, Washington DC, USA, 2011.

7. **Sahu, M** and P. Biswas, *Single-step Processing of Copper-doped Titania Nanomaterials in a Flame Aerosol Reactor*, International Aerosol Conference, Finland, 2010.

8. **Sahu, M**, B. Wu, L. Zhu, W. N. Wang, Y. J. Tang, and P. Biswas, *Role of Nanoparticle Chemical Composition and Particle Size on Toxicity of Cu-doped TiO_2 Nanomaterials in Environmental Microorganism,* AAAR 29th Annual Conference, Portland, USA, 2010.

9. **Sahu, M**, K. Suttiponparnit, S. Suvachittanont, T. Charinpanitkul, and P. Biswas, *Characterization of Doped TiO_2 Nanoparticle Dispersion: The Effect of Dopants*, AAAR 29th Annual Conference, Portland, USA, 2010.

10. Park, J, **M. Sahu**, and P. Biswas, *Characterization of In-Situ Charge Distribution of TiO_2 and Cu-Doped-TiO_2 Nanoparticles in a Flame Aerosol Reactor*, AAAR 29th Annual Conference, Portland, USA, 2010.

11. Suttiponparnit, K., J. Jiang, **M. Sahu**, S. Suvachirranont, Charinpanitkul, T, and P. Biswas, *Effect of Crystalline Phase, Primary Particle Size and Particle Mass Concentration on Titania Nanoparticle Dispersions,* RGJ Seminar Series LXIII: Chemical Engineering: Theory and Applications , Kasetsart University, Thailand, 2010.

12. Wang, W.N L. Zhu, S. Torkamani, W.J. An, **M. Sahu**, J. Park, V. Shah, X. Wang, and P. Biswas, Nanoparticle Technology Research in Aerosol and Air Quality Research Laboratory, *Missouri NanoFrontiers Symposium 2010: Gateway to Economic Development*, Washington University in St. Louis, Missouri, USA, 2010

13. Wu, B, **M. Sahu**, C. Jacobson, P. Biswas, and Y. J. Tang, *Light-Dependent Antibacterial Properties of Cu-Doped TiO_2 Nanoparticles (NPs)*, AIChE, USA, 2010.

14. Seders, L. A, **M. Sahu**, P. Biswas, and J. B. Fein, *Experimental Study of TiO_2 Nanoparticle Adhesion to Silica and Fe(III) Oxide-coated Silica Surfaces*, Goldschmidt Conference, USA, 2010.

15. **Sahu, M**, B. Wu, Y. J. Tang, and P. Biswas, *Single-step Flame Aerosol Synthesis of Cu-doped TiO_2 Nanomaterials and Their Potential Toxicity*, AAAR 28th Annual Conference, Minnesota, USA, 2009.

16. Suttiponparnit, K, J. Jiang, **M. Sahu**, S. Suvachittanont, T. Charinpanitku, and P. Biswas, *Effect of Crystalline Phase, Primary Particle Size, and Particle Mass Concentration on Titania Nanoparticle Dispersions*, 6thAsian Aerosol Conference, Bangkok, Thailand, 2009.

17. Wu, B, R. Huang, **M. Sahu**, X. Feng, P. Biswas, and Y. J. Tang, *Assessment of Toxicity of Metal Oxide Nanoparticles to Microbial Species,* AIChE, USA, 2009.

18. Huang, R, B. Wu, **M. Sahu**, X. Feng, P. Wurm, H. Wynder, P. Biswas, and Y. J. Tang, *Enhanced Toxicity of Cu-doped TiO_2 Nanoparticles to Pathogenic and Environmental Microorganisms*, 1st Symposium on Nanotechnology for Public Health, Environment, and Energy, Washington University in St. Louis, 2009.

19. Zeng, H, A. Singh, S. Basak, **M. Sahu**, P. Biswas, J. C. Catalano, and D. E. Giammar, *Nanoscale Size Effects on Uranium(VI) Adsorption and Surface Mediated Reduction on Hematite Nanoparticles*, The 236rd ACS National Meeting. Philadelphia, USA, 2008.

20. **Sahu, M.** *Energy Poverty in Rural Areas; A Challenge for New Development*, Global Leadership Vision of McDonnell International Scholars Academy, Washington University in Saint Louis, USA, 2008.

21. **Sahu, M**, G. Yadama, J. Puppalla, and P. Biswas, *Personal Exposure Measurements from the Traditional Household and Commercial Scale Stoves in Rural Areas of Orissa, India*, AAAR 27th Annual Conference, Orlando, USA, 2008.

22. Peipert, J, **M. Sahu**, T. Severyn, E. Grimm, G. Yadama, P. Biswas, J. Puppala, R. Ravindranath, S. Pradhan, J. Topno, L. Nemali, V. Sethi, and R. S. Patil, *Adoption of Appropriate Household and Commercial Stove Technologies to Address Energy and Environmental Problems in Orissa and Andhra Pradesh, India,* Energy and Environment Conference, Hongkong, 2008.

23. **Sahu, M**, J. Peipert, T. Severyn, E. Grimm, J. Puppala, R. Ravindranath, S. Pradhan, J. Topno, L. Nemali, V. Sethi, R. S. Patil, G. Yadama, and P. Biswas, *Exposure Measurements to Cooking Technology Emissions and Household Ecology in Orissa, Andhra Pradesh, & Karnataka, India,* Energy and Environment Conference, Hongkong, 2008.

24. Kumar, A. V, J. Kayal, S. T. Manikandan, **M. Sahu**, S. Bhalke, R. Raghunath, B. Suseela, and R.M. Tripathi, *Elemental Composition and Source Apportionment of SPM, PM2.5-10, PM10, and PM2.5 in the Ambient Air of Anushaktinagar; A Residential Area in Mumbai, India,* 4th Asian Aerosol Conference, Mumbai, India, 2005.

25. **Sahu, M**, A. V. Kumar, R. M. Tripathi, S. Saundararajan, V. D. Puranik, and D. N. Sharma, *Software Package for Hazardous Risk Assessment of Toxic and Inflammable Storage Facilities*. In proceedings of XIII National Symposium on Environment, Shilong, India 377-382, 2004.

PEER REVIEWER FOR JOURNALS

- Langmuir
- Nanotechnology
- Catalysts
- Journal of Nanoparticle Research
- Applied Nanoscience
- International Journal of Nanoscience
- Advances in Chemical Engineering
- Science of the Total Environment
- Journal of Air and Waste Management Association