

## APPALA RAJU BADIREDDY

### (a) PROFESSIONAL PREPARATION

#### Institution and Location

Jawaharlal Nehru Technological University, India  
 Indian Institute of Technology Madras, India  
 University of Houston, Houston, Texas, USA  
 Duke University, Durham, NC, USA

#### Major

Chemical Engineering  
 Chemical Engineering  
 Environmental Engineering  
 Environmental Engineering

#### Degree & Year

B.Tech., 2001  
 M.Tech., 2003  
 Ph.D., 2009  
 Post-Doc., 2014

### (b) APPOINTMENTS

2014-Present **Assistant Professor**, Civil & Environmental Engineering, University of Vermont, Burlington, VT  
 2009-2014 **Post-Doctoral Associate**, Duke University, Durham, NC  
 2003-2009 **Research Assistant**, University of Houston, Houston, TX. *Research*: Water quality engineering, Fate and transport of contaminants, Membrane separation processes, Advanced oxidation processes, Resource recovery, and Environmental nanotechnology  
 2006-2008 **Visiting Research Assistant**, Environmental Molecular Science Laboratory, Pacific Northwest National Laboratory, Richland, WA  
 2003-2009 **Research Assistant and Graduate Teaching Assistant**, University of Houston, Houston, TX. *Research*: Physical and Chemical Processes in Environmental Engineering, Environmental Chemistry, Environmental Modeling, and Mass Transfer in Fluids

### (c) AWARDS

- Research article (DOI:10.1021/es204140s) won *Environmental Science and Technology's* Top Technology paper award for 2012



- Gordon Research Conference on Environmental Nanotechnology, May 29-June 3, 2011: Travel award
- Awarded the first prize in the Texas Water 2008 Water Environment Association of Texas student paper competition
- Graduate Leadership Scholarship, Dept. Civil & Environmental Engineering, University of Houston, 2007-2008
- Presidential Graduate Research Fellowship, University of Houston, 2003-2005

### RESEARCH HIGHLIGHTS

- National Science Foundation (NSF), Science360: Silver Nanoparticles in Water
- Research article (DOI: 10.1021/es204140s) highlighted in a perspective "Lighting Up Nanoparticles in Complex Samples" by Sarah Webb (DOI: 10.1021/es400922g)
- Research work highlighted in *Orion Magazine*, "Pandora's Boxes: Inside Nanotechnology's Little Universe of Big Unknowns" January/February 2013 issue
- Research work highlighted on the cover page of the "*Biotechnology and Bioengineering*" journal volume 99(3), 15 February, 2008:



- Meyer, J.N. *et al*, "Intracellular Uptake and Associated Toxicity of Silver Nanoparticles in *Caenorhabditis Elegans*", *Aquatic Toxicology*, (2010), 100, 140-150 was number 3 in the list of most downloaded articles in 2011 from the scientific journal, *Aquatic Toxicology*; <http://www.journals.elsevier.com/aquatic-toxicology/most-read-articles/>
- "How are nanomaterials affecting the environment-and us? With a new grant renewal, CEINT researchers seek answers"- Key Research findings highlighted;  
<http://www.pratt.duke.edu/news/15-million-grant-fund-further-study-nanotechnologies-environmental-impact>;  
<http://www.azonano.com/news.aspx?newsID=28756>  
<http://research.duke.edu/1100-words/26142>
- Stop That Slime!; <http://www.pnl.gov/science/highlights/highlight.asp?id=385>
- Engineering Researchers Develop Advanced Technique for Water Purification  
<http://www.egr.uh.edu/news/200802/engineering-researchers-develop-advanced-technique-water-purification>
- Membrane Filters Key to Future of Public Water Supply;  
[http://www.waterandwastewater.com/www\\_services/news\\_center/publish/article\\_001683.shtml](http://www.waterandwastewater.com/www_services/news_center/publish/article_001683.shtml)  
<http://www.physorg.com/news159541848.html>

#### REVIEWER FOR SCHOLARLY JOURNALS

Environmental Science and Technology, PLOS One, Water Research, Journal of Membrane Science, Separation and Purification Technology, Industrial and Engineering Chemistry Research, Environment International, Chemosphere, Desalination and Water Treatment, Nanotoxicology, Journal of Hazardous Materials, RSC Advances, SPIE

#### NATIONAL AND INTERNATIONAL COLLABORATIONS

- Center for Environmental Implications of NanoTechnology (CEINT), Duke University, Durham, NC, USA
- Environmental Molecular Science Laboratory, Pacific Northwest National Laboratory, Richland, WA, USA
- Centre Européen de Recherche et d'Enseignement des Géosciences de l'Environnement (CEREGE) in Aix-en-Provence, France
- Department of Environmental and Global Health, University of Florida, Gainesville, FL
- Civil & Environmental Engineering, Texas A&M University, College Station, TX
- Chemical Engineering, Clarkson University, Potsdam, NY

**NATIONAL MEETINGS:** Presiding Chairman at the ENVR 252<sup>nd</sup> American Chemical Society National Meeting & Exposition.

- Next Generation Techniques for Prevention & Precise Growth of Biofilms at the Interface of Nanomaterials & Electrochemistry (*Co-Chair Persons*: S. Argarwal & V. Gadhamshetty)
- Innovative Materials & Technologies for Environmental Sustainability (*Co-Chair Persons*: J.C. Crittenden, Q.Li, & W. Zhang)

**PATENT DISCLOSURE:** "Magnetic NanoBiocatalyst and NanoBiocatalytic Membrane", **BADIREDDY, A.R. (Inventor)**, and Lu, H., (Feb 2016).

## BOOK CHAPTER

**Badireddy, A.R.** and Chellam, S., (2014) “Antibacterial and Antifouling Properties of Lipophilic Bismuth Compounds and Nanoparticles”, in *Bismuth: Occurrence, Uses and Health & Environmental Effects*, Ed., Taylor, J.C., Advances in Chemistry Research, 21, Nova Science Publishers



## PEER-REVIEWED PUBLICATIONS

- Li, M., Bradley, J.C., **Badireddy, A.R.**, Lu, H., “Ultrafiltration Membranes Functionalized with Lipophilic Bismuth Dimercaptopropanol Nanoparticles: Anti-Fouling Behavior and Mechanisms”, *Chemical Engineering Journal*, (2017), 313, p293-300
- Baltus, R.E., **Badireddy, A.R.**, Delavari, A., Chellam, S., “Free Diffusivity of Icosahedral and Tailed Bacteriophages: Experiments, Modeling, and Implications for Virus Behavior in Media Filtration and Flocculation”, *Environmental Science and Technology*, (2017), 10.1021/acs.est.6b05323, [In press],
- Cogan, N.G., Li, J., **Badireddy, A.R.**, Chellam, S., “Optimal Backwashing in Dead-End Bacterial Microfiltration with Irreversible Attachment Mediated by Extracellular Polymeric Substances Production”, *Journal of Membrane Science*, (2016), 520, p337-344
- Hernandez-Delgadillo, R., **Badireddy, A.R.**, Martinez-Sanmiguel, J.J., Contreras-Cordero, J.F., Martinez-Gonzalez, G.I., Sánchez-Nájera, R.I., S. Chellam and C. Cabral-Romero, “Cytotoxic Effects of Lipophilic Bismuth Dimercaptopropanol Nanoparticles on Epithelial Cells”, *Journal of Nanoscience and Nanotechnology*, (2016), 16, p203-209 Hernandez-Delgadillo, R., **Badireddy, A.R.**, Zaragoza-Magaña, V., Sánchez-Nájera, R.I., S. Chellam and C. Cabral-Romero, “Effect of Lipophilic Bismuth Dimercaptopropanol Nanoparticles on Erythrocytes”, *Journal of Nanomaterials*, (2015), Article ID 264024, p1-9
- Gopalakrishnan, A., Lidiya, M.M., Chandran, J., Winglee, J., **Badireddy, A.R.**, Wiesner, M., Aravindakumar, C.T., Aravind, U., “Sustainable Polyelectrolyte Multilayer Surfaces: Possible Matrix for Salt/Dye Separation”, *ACS Applied Materials & Interfaces* (2015), 7, p3699-3707
- Sanpui, P., Zheng, X., Loeb, J., Bisesi Jr, J.H., Khan, I.A., Afrooz, A.R.M.N., Liu, K., **Badireddy, A.R.**, Wiesner, M.R., Ferguson, P.L., Saleh, N.B., Lednicky, J., Sabo-Attwood, T., “Single-Walled Carbon Nanotubes Increase Pandemic Influenza A H1N1 Virus Infectivity of Lung Epithelial Cells”, *Particle and Fiber Toxicology*, (2014), 11, p66
- Erdim, E, **Badireddy, A.R.**, Wiesner, M.R., “Characterizing Reactive Oxygen Generation and Bacterial Inactivation by a Zerovalent Iron-Fullerene Nano-Composite Device at Neutral pH Under UV-A Illumination”, *Journal of Hazardous Materials* (2014), 283, p80-88
- Badireddy, A.R.**, R. Hernandez-Delgadillo, R., Sánchez-Nájera, S. Chellam and C. Cabral-Romero, “Synthesis and Characterization of Lipophilic Bismuth Dimercaptopropanol Nanoparticles and their Effects on Oral Microorganisms Growth and Biofilm Formation”, *Journal of Nanoparticle Research*, (2014) 16 (6) article 2456
- Yang, X., Jiang, C., Hsu-Kim, H., **Badireddy, A.R.**, Dykstra, M., Wiesner, M.R., Hinton, D.E., and Meyer, J.N., “Silver Nanoparticle Behavior, Uptake, and Toxicity in *Caenorhabditis elegans*: Effects of Natural Organic Matter”, *Environmental Science and Technology* (2014), 48 (6), p3486-3495
- Badireddy, A.R.**, J.F. Budarz, S.M. Marinakos, S. Chellam, and M.R. Wiesner, “Formation of Silver Nanoparticles in Visible Light-Illuminated Waters: Mechanism and Possible Impacts on the Persistence of AgNPs and Bacterial Lysis”, *Environmental Engineering and Science (Special issue: Environmental Nanomaterials)*, (2014) 31 (7) p338-349

11. Chae, S.R., Hotze, E.M., **Badireddy, A.R.**, Lin, S., Kim, J.O., and Wiesner, M.R., "Environmental Implications and Applications of Carbon Nanomaterials in Water Treatment", *Water Science and Technology* (**2013**), 67 (11), p2582-2586
12. Levard, C., Mitra, S., Yang, T., Jew, A.D., **Badireddy, A.R.**, Lowry, G.V., Brown Jr, G.E., "Effect of Chloride on the Dissolution Rate of Silver Nanoparticles and Toxicity to *E. coli*", *Environmental Science and Technology* (**2013**), 47 (11) p5738-5745
13. Arnold, M.C., **Badireddy, A.R.**, Di Giulio, R.T., and Meyer, J.N., "Cerium Oxide Nanoparticles are More Toxic than Equimolar Bulk Cerium Oxide in *Caenorhabditis elegans*", *Archives of Environmental Contamination and Toxicology*, (**2013**), 1-10
14. **Badireddy, A.R.**, Marinakos, S., Chellam, S., and Wiesner, M.R., "Lipophilic Nano-Bismuth Inhibit Bacterial Growth, Attachment, and Impair Biofilm", *Surface Innovations* (**2013**), 1 (S13) p181-189
15. Wang, A., Marinakos, S., **Badireddy, A.R.**, Powers, C., Houck, K., "Characterization of Physicochemical Properties of Nanomaterials Immediate Environments in High-Throughput Screening of Nanomaterials Biological Activity", *WIRE Nanomedicine & Nanobiotechnology*, (**2013**), 5 (5), p430-448
16. Hendren, C.O., **Badireddy, A.R.**, Casman, E., and Wiesner, M.R., "Modeling Nanomaterial Fate in Wastewater Treatment: Monte Carlo Simulation of Silver Nanoparticles (Nano-Ag)", *Science of the Total Environment* (**2013**), 449, p418-425
17. **Badireddy, A.R.**, Liu, L., and Wiesner, M.R., "Detection, Characterization, and Abundance of Engineered Nanoparticles in Complex Waters by Hyperspectral Imagery With Enhanced Darkfield Microscopy," *Environmental Science and Technology* (**2012**), 46 (18), p10081-10088
18. **Badireddy, A.R.** ; Franer-Burdaz, J. ; Chellam, S., and Wiesner, M.R., " Bacteriophage Inactivation by UV-A Illuminated Fullerenes: Role of Nanoparticle-Virus Association and Biological Targets," *Environmental Science and Technology*, (**2012**) (**contributed equally**), 46 (11), p5963-5970
19. Kwok, K.W.H., Auffan, M., **Badireddy, A.R.**, Nelson, C.M., Wiesner, M.R., and Hinton, D.E., "Uptake of Silver Nanoparticles and Toxicity to Early Life Stages of Japanese Medaka (*Oryzias Latipes*): Effect of Coating Materials," *Aquatic Toxicology*, (**2012**), 120, p59-66
20. Lowry, G.V., Espinasee, B., **Badireddy, A.R.**, Reinsch, B., Bryant, L., Colman, B., Hsu-Kim, H., Matson, C., Richardson, C., and M.R. Wiesner, "Long-Term Transformation and Fate of Manufactured Ag NPs in a Simulated Large Scale Freshwater Emergent Wetland," *Environmental Science and Technology*, (**2012**) 46 (13), p7027-7036
21. **Badireddy, A.R.**, Chellam, S., "Bismuth Dimercaptopropanol (BisBAL) Inhibits Formation of Multispecies Wastewater Flocs", *Journal of Applied Microbiology*, (**2011**), 110 (6), p1426-1437
22. Powers, C.M., Slotkin, T.A., Seidler, F.J., **Badireddy, A.R.**, Padilla, S., "Silver Nanoparticles Alter Zebrafish Development and Larval Behavior: Distinct Roles for Particle size, Coating, and Composition", *Neurotoxicology and Teratology*, (**2011**), 33 (6) p708-714
23. Saathoff, J.G., Xia, X., Riviere, J.E., Inman, A.O., **Badireddy, A.R.**, Wiesner, M.R., Monteiro-Riviere, N.A., "Evaluation of Toxicity and Inflammation in Three Different Hydroxylated Fullerenes (C<sub>60</sub>(OH)<sub>x</sub>) in Human Cells," *Toxicologist CD- An Official Journal of the Society of Toxicology*, (**2011**), 1176, p.251
24. Powers, C.M., **Badireddy, A.R.**, Ryde, I.T., Seidler, F.J., Slotkin, T.A., "Silver Nanoparticles Compromise Neurodevelopment in PC12 Cells: Critical Contributions of Silver Ion, Particle size, Coating and Composition", *Environmental Health Perspectives*, (**2011**), 119 (1), p37-44
25. Meyer, J.N., Lord, C.A., Yang, X.Y., Turner, E.A., **Badireddy, A.R.**, Marinakos, S.M., Chilkoti, A., Wiesner, M.R., Auffan, M., "Intracellular Uptake and Associated Toxicity of Silver Nanoparticles in *Caenorhabditis Elegans*", *Aquatic Toxicology*, (**2010**), 100, p140-150
26. Chae, S.R. \*, **Badireddy, A.R. \***, Farner Budarz, J., Lin, S., Xiao, Y., Therezien, M., Wiesner, M.R., "Heterogenities in Fullerene Nanoparticle Aggregates Affecting Reactivity, Bioactivity, and Transport", *ACS Nano*, (**2010**), 4 (9), p5011-5018 (**\*Contributed equally**)
27. **Badireddy, A.R.**, Chellam, S., Gassman, P.L., Engelhard, M.H., Lea, A.S., and Rosso, K.M., "Role of Extracellular Polymeric Substances in Bioflocculation of Activated Sludge Microorganisms under Glucose-controlled Conditions." *Water Research*, (**2010**), 44 (15), p4505-4516
28. Hotze, E.M. \*, **Badireddy, A.R.\***, Chellam, S., and Wiesner, M.R., "Mechanisms of Bacteriophage Inactivation via Singlet Oxygen Generation in UV Illuminated Fullerol Suspensions", *Environmental Science and Technology*, (**2009**), 43(17), p6639-6645 (**\*Contributed equally**)

29. Baltus, R., **Badireddy, A.R.**, Xu, W., and Chellam, S., "Analysis of Configurational Effects on Hindered Convection of Nonspherical Bacteria and Viruses across Microfiltration Membranes," *Industrial & Engineering Chemistry Research*, (2009), 48, p2404–2413
30. **Badireddy, A.R.**, Korpól, B.R., Chellam, S., Gassman, P.L., Engelhard, M.H., Lea, A.S., and K. M. Rosso, K.M., "Spectroscopic Characterization of Extracellular Polymeric Substances from *Escherichia coli* and *Serratia marcescens*: Suppression using Sub-Inhibitory Concentrations of Bismuth Thiols", *Biomacromolecules*, (2008), 9 (11), p3079–3089
31. **Badireddy, A.R.**, Chellam, S., Yanina, S., Gassman, P.L., and Rosso, K.M., "Bismuth Dimercapto-propanol (BisBAL) Inhibits the Expression of Extracellular Polysaccharides and Proteins in *Brevundimonas diminuta*: Implications for Membrane Microfiltration," *Biotechnology and Bioengineering*, (2008), 99 (3), p634-643, (**highlighted as cover art in the journal issue**)
32. **Badireddy, A.R.**, E.M. Hotze, S. Chellam, P.J.J. Alvarez, and M.R. Wiesner, "Inactivation of Bacteriophages via Photosensitization of Fullerol Nanoparticles," *Environmental Science and Technology*, (2007), 41 (18), p662-6632

## PRESENTATIONS

- **Badireddy, A.R.**, "Effects of Surface Topography and Low-Frequency Electric Fields on Bioadhesion", Oral Presentation in ENVR Session at 252<sup>nd</sup> American Chemical Society National Meeting & Exposition, August 21-25, 2016, Philadelphia, PA.
- **Badireddy, A.R.**, Hotze, E.M., Chellam, S., Alvarez, P.J.J., and Wiesner, M.R., "Formation of Silver Nanoparticles in Visible Light-Illuminated Waters: Mechanism and Possible Impacts on the Persistence of AgNPs and Bacterial Lysis," Poster in "Fresh Ideas" Session at AEEP Research and Education Conference, June 13–16, 2015, Yale University, New Haven, CT.
- **Badireddy, A.R.**, Hotze, E.M., Chellam, S., Alvarez, P.J.J., and Wiesner, M.R., "Characterizing Reactive Oxygen Generation and Bacterial Inactivation by a Zerovalent Iron-Fullerene Nano-Composite Device at Neutral pH Under UV-A Illumination," Poster in Environmental Nanotechnology at Gordon Research Conference, June 21-26, 2015, West Dover, VT.
- **Badireddy, A.R.**, Franer-Burdaz, J., Chellam, S., and Wiesner, M.R., "Bacteriophage Inactivation by UV-A Illuminated Fullerenes: Role of Nanoparticle-Virus Association and Biological Targets," Poster in Environmental Sciences: Water, Gordon Research Conference, June 24-29, 2012, Holderness, NH.
- **Badireddy, A.R.** and Wiesner, M.R., "Detection and Analysis of Engineered Nanoparticles in Environmental Waters Using Hyperspectral Darkfield Microscopy," Poster in Environmental Nanotechnology at Gordon Research Conference, May 29-June 3, 2011, Waterville Valley, NH.
- **Badireddy, A.R.** and Wiesner, M.R., "Detection and Analysis of Engineered Nanoparticles in Environmental Waters Using Hyperspectral Dark-field Microscopy," ICEIN, May 9-11, 2011, Durham.
- **Badireddy, A.R.**, Soyer, E., and Wiesner, M.R., "Preparation and Characterization of Silver Nanoparticle Composite Ultrafiltration Membranes: Impact of Cleaning agents and Antibacterial Efficacy," Membrane Technology Conference and Exposition, March 28-31, 2011, Long Beach CA.
- Chellam, S., **Badireddy, A.R.**, Hotze, E.M., and Wiesner, M.R., "Virus Inactivation is Mediated by Reactive Oxygen Species in Photosensitized Fullerol Nanoparticle Suspensions," Session: Nanotechnology: Enabling Sustainable Solutions for Potable Water, Division of Environmental Chemistry, 239th ACS National Meeting & Exposition, March 21 – 25, 2010, San Francisco, CA.
- Powers, C.M., Ryde, I.T., **Badireddy, A.R.**, Seidler, F.J., and Slotkin, T.H., "Developmental Neurotoxicity of Silver Nanoparticles Modeled in PC12 Cells," Society of Toxicology, March 7-11, 2010, Salt Lake City, Utah.
- Baltus, R., Xu, W., **Badireddy, A.R.**, and S. Chellam. "Rejection of Rod-Shaped Bacteria From Porous Membranes: Comparison of Experiment to Model Predictions," Separations Division, AIChE Annual Meeting, November 8 – 13, 2009, Nashville, TN.
- **Badireddy, A.R.**, Chellam, S., Hotze, E.M., and Wiesner, M.R., "Virus Inactivation is Mediated by Reactive Oxygen Species in Photosensitized Fullerol Nanoparticle Suspensions," International Water Association conference on Particle Separations and Nanoparticles in Water, June 3 – 5, 2009, Durham, NC.
- **Badireddy, A.R.**, Hotze, E.M., Chellam, S., Alvarez, P.J.J., and Wiesner, M.R., "Inactivation of Bacteriophages via Photosensitization of Fullerol Nanoparticles," Poster in "Fresh Ideas" Session at AWWA Annual Conference and Exposition, June 8–12, 2008, Atlanta, GA.

- Baltus, R., W. Xu, **Badireddy, A.R.**, and Chellam, S., “Effect of Bacteria and Virus Shape on Rejection by Microfiltration Membranes: Comparison Of Experiment With Hindered Transport Theory,” Separations Division, AIChE Annual Meeting, November 4–9, 2007, Salt Lake City, UT.
- **Badireddy, A.R.**, Chellam, S., Yanina, S., Gassman, P.L., and Rosso, K.M., “Bismuth Dimercaptopropanol (BisBAL) Inhibits the Expression of Extracellular Polysaccharides and Proteins in *Brevundimonas diminuta*: Implications for Membrane Microfiltration”, North American Membrane Society, May 12 – 16, 2007.
- **Badireddy, A.R.**, Chellam, S., Yanina, S., Gassman, P.L., and Rosso, K.M., “Bismuth Dimercaptopropanol (BisBAL) Inhibits the Expression of Extracellular Polysaccharides and Proteins in *Brevundimonas diminuta*”, Student Paper for Texas Water 2007, WEAT and Texas Section AWWA Annual Conference April 10 – 13, Fort Worth, TX.
- **Badireddy, A.R.** and Chellam, S., “Diffusivity Measurements of Bacteriophages by Gradient Diffusion and Dynamic Light Scattering”, Session #66; Colloidal & Interfacial Phenomena in Aquatic Systems in AIChE Annual Meeting, November 12 – 17, 2006. San Francisco, CA.
- **Badireddy, A.R.** and Chellam, S., “Investigation of Virus Transport across Microfiltration membranes”, Student Paper for Texas Water 2005, WEAT and Texas Section AWWA Annual Conference April 5 – 8, 2005, Galveston, TX.