School of Chemical, Biological and Environmental Engineering

O R E G O N S T A T E U N I V E R S I T Y

College of Engineering
Mohammad F. Azizian
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Education:

Ph.D. Civil Engineering	Oregon State University	1993
M.S. Chemistry	University of Tehran	1983
B.S. Chemical Engineering	University of Tehran	1978

Academic Positions:
Teaching: School of Chemical, Biological and Environmental Engineering, OSU, 1997 – present. Aquatic Chemistry, Natural and Engineered Systems, ENVE 532; Aqueous Environmental Chemistry Lab, ENVE536

Research: Involved in the following research projects:

- Evaluation of A Novel Multiple Primary Substrate (MPS) Cometabolic Biosparging Technology for In Situ Bioremediation of 1,4-Dioxane and Chlorinated Solvents in Groundwater. The key objective of this project is to demonstrate that a novel multiple primary substrate (MPS) cometabolic biosparging technology can meet DoD needs for reliable, flexible, and cost-effective treatment of a groundwater with co-mingled 14-D and CVOCs.

- "Development of Slow-Release Compounds for the Aerobic Cometabolic Treatment of Complex Mixtures of COC Released from Low Permeability Zones." The overall aim of the project is to develop novel aerobic cometabolic processes based on Slow-Release Compounds (SRCs) to treat COC mixtures of interest to DoD. Our studies focus on a model isobutane utilizingstrain, *Rhodococcus rhodochrous* 21198, that we have shown can concurrently oxidize 14-D and diverse CAHs, including mixtures of 1,1-DCE and 1,1,1-TCA, when grown on isobutane as a primary substrate.

- Molecular Biomarkers for Detecting, Monitoring, and Quantifying Reductive Microbial Processes in Groundwater: Identification of biomarkers to assess groundwater contaminant degradative potential of a microbial population in order to enhance our ability to effectively manage bioremediation of contaminated groundwater.

- Anaerobic Continuous-flow column studies with bioaugmented Evanite culture and Hanford aquifer material to evaluate the sequential reductive dechlorination of tetrachloroethylene.

- Single-Well-Push-Pull Tests for Assessing the Feasibility for In-situ Aerobic Cometabolic Treatment for Chlorinated Aliphatic Hydrocarbons: The effectiveness of dissolved substrate addition to stimulate the indigenous toluene-utilizers was evaluated in standard monitoring wells at Fort Lewis, WA.

- Cometabolic Air Sparging of Chloroethenes (TCE, *cis*-DCE, and 1,1-DCE) and Dichloroethane (1,1-DCA) from groundwater. This study is an innovative method designed to remove CAH compounds in groundwater and to reduce off-gas CAH emission during air sparging. This study is being conducted at McClellan Air Force Base in California.

- Environmental impact of highway construction and repair materials on surface and groundwaters, National Cooperative Highway Research Program (NCHRP Project 25-9). A novel evaluation methodology incorporating a series of laboratory tests and a simulation model were developed as major products of this study.

Postdoctoral: Civil, Construction, and Environmental Engineering Dept., OSU, 1994 – 1997. Involved in the following research projects:

- Lead Sorption, Transport, and Remediation in Iron-Oxide-Coated sand: EPA-Western Region Hazardous Substance Research Center sponsored research grant.

- Development and characterization of a mixed oxidation state (ferrous-ferric) iron oxide for removal of adsorbable and electroactive metals in in-situ treatment in an interceptor trench: EPA-Western Region Hazardous Substance Research Center sponsored research grant.

- Simultaneous removal of the adsorbable and electroactive metals from contaminated soils and groundwater: EPA-Western Region Hazardous Substance Research Center sponsored research grant.

Laboratory Manager:
School of Chemical, Biological and Environmental Engineering, OSU, 1995 – present.

Murdock Biomedical Prototyping and Characterization Facility, established in 2021, including micro- and nano-fabrication, biosensors, and medical diagnostics. It is intended to promote interdisciplinary collaboration by providing unique experimental capabilities and co-locating device fabrication and characterization tools in one shared,#ntegrated facility1#

Expertise in operating and maintaining sophisticated analytical equipments such as HP 6890/5973 Gas Chromatograph/Mass Spectrometer (GC/MS), HP 6890 GC/Purge&Trap, HP 5890 Series II GC, ***micrOTOF-Q™ II LC-***MS and MS/MS (Bruker), Dionex RSLC-3400 Chromatography, Varian Liberty 150 Inductively Coupled Plasma Emission Spectrometry (ICP-ASE), Perkin-Elmer Elan DRC-e ICP-MS, Dionex DX500 Ion Chromatograph (IC), Dionex DX500 Liquid Chromatograph (HPLC), LSC2500 TR/AB, TOC, and UV/VIS spectrophotometer.

Publications:

Book Chapters:

1. **Azizian, M. F.** and Peter O. Nelson, "Lead Sorption, Chemical Enhanced Desorption, and Equilibrium Modeling in an Iron-Oxide-Coated Sand and Synthetic Groundwater System," Adsorption of Metals by Geomedia, Edited by Everett A. Jenne, Chapter 6, pp. 165-180, 1998.

2. **Azizian, M. F.,** Peter O. Nelson, Pugazhendhi Thayumanavan and Kenneth J. Williamson, 2005. Environmental Impacts of Portland Cement Concrete (PCC) With- and Without-Plasticizer from highway construction. In: Environmental Impact assessment of Recycled Hazardous Waste Materials on Surface and Groundwaters: Chemodynamics, Toxicology, Modeling and Information Systems. The Handbook of Environmental Chemistry, Water Pollution Series, Volume 5 (Aboul-Kassim TAT and Williamson KJ, eds.), Springer-Verlag, Berlin-Heidelberg, Handbook of Environmental Chemistry, pp. 45-60.

Journal Articles:

1. Azizian, M. F. Semprini, L. 2022. Aerobic Cometabolism of Chlorinated Solvents and 1,4-Dioxane in Continuous-Flow Columns Packed with Gellan-Gum Hydrogels Coencapsulated with ATCC Strain 21198 and TBOS or T2BOS as Slow-Release Compounds ACS ES&T Engineering**,** doi**:** 10.1021/acsestengg.2c00023

2. Mayer-Blackwell, K, M. F. Azizian, J. K. Green, Alfred M. Spormann, and L. Semprini. "Survival of Vinyl Chloride Respiring *Dehalococcoides mccartyi* Under Long-Term Electron Donor Limitation." *Environmental Science and Technology,* 51, 1635-1642 (2017).

3. Berggren, D.R.V., I.P.G. Marshall, M.F. Azizian, A.M. Spormann and L. Semprini. "Effects of Sulfate Reduction on Bacterial Community and Kinetic Parameters of a Dechlorinating Culture under Chemostat Growth Conditions. Environmental Science and Technology. 47, 1879-1886 (2013).

4. Behrens, S., M. F. Azizian, P.J. McMurdie, A. Sabalowsky, M. E. Dolan, L. Semprini, and A.M. Spormann. "Monitoring Abundance and Expression of 'Dehalococcoides' Species Chloroethene-Reductive Dehalogenases in a Tetrachloroethene-Dechlorinating Flow Column," *Appl. Envir. Microbiol*. 74: 5695-5703 (2008).

5. Azizian, M. F. and Semprini, L., 2017. Simultaneous anaerobic Transformation of Tetrachoroethene and Carbon Tetrachloride in a Continuous Flow Column. J. Contam. Hydrol. (190), 58–68.

6. Anne Taylor, Paige Molzahn**,** Clint Cheney, Monique LaJeunesse, Tanner Bushnell, **Mohammad F. Azizian**, and Lewis Semprini, 2018. "Immobilization of Methylosinus trichosporium OB3b for methanol production, Journal of Industrial Microbiology and Biotechnology. DOI. 10.1007/s10295-018-2010-z.

7. Kyle E. Vickstrom, **Mohammad F Azizian,** Lewis Semprini, 2017. Transformation of carbon tetrachloride and chloroform by trichloroethene respiring anaerobic mixed cultures and supernatant, Chemosphere.

8. Koshlan Mayer-Blackwell, **Azizian, M.F**., Jennifer K. Green, J. K., Alfred M. Spormann, and Lewis Semprini 2016. Survival of Vinyl Chloride Respiring *Dehalococcoides mccartyi* under Long-Term Electron Donor Limitation. Environ. Sci. Technol. *51* (3), pp 1635–1642.

9. Mayer-Blackwell, K., **Azizian, M.F**., Machak, C., Vitale, E., Carpani, G., Ferra, F.D., Semprini, L., Spormann, A.M., 2014. Nanoliter qPCR Platform for Highly Parallel, "Quantitative Assessment of Reductive Dehalogenase Genes and Populations of Dehalogenating Microorganisms in Complex Environments. Environ." Sci. Technol. (48), 9659–9667.
10. Marshall I. P.G., **Azizian, M. F**., Semprini, L., and Spormann, A. M. 2014. "Inferring community dynamics of organohalide-respiring bacteria in chemostats by covariance of *rdhA* gene abundance," FEMS Microbiology Ecology, Volume 87(2): 428–440.
11. **Azizian, M. F.,** Marshall, I. P. G., Behrens, S., Spormann, A.M., Semprini, L., 2010. Comparison of lactate, formate, and propionate as hydrogen donors for the reductive dehalogenation of trichloroethene in a continuous-flow column, *J. Contam. Hydrol.* 113, 77–92.
12. Behrens, S., **Azizian M. F.,** P.J. McMurdie, A. Sabalowsky, M. E. Dolan, L. Semprini, and A.M. Spormann. Monitoring Abundance and Expression of 'Dehalococcoides' Species Chloroethene-Reductive Dehalogenases in a Tetrachloroethene-Dechlorinating Flow Column. Appl. Envir. Microbiol. 2008 74: 5695-5703
13. **Azizian, M. F**, S. Behrens, A. Sabalowsky, M.E. Dolan, A.M. Spormann, and L. Semprini, (2008). Continuous-flow column study of reductive dehalogenation of PCE upon bioaugmentation with the Evanite enrichment culture. 2008. *Journal of Contaminant Hydrology* 100: 11–21.
14. **Azizian, M. F.,** Istok, J. D., L. Semprini, L., 2007. Evaluation of the in-situ aerobic cometabolism of chlorinated ethenes by toluene-utilizing microorganisms using push–pull tests. *Journal of Contaminant Hydrology*. 90, 105–124.
15. Marshall IP, Berggren DR, **Azizian M. F.,** Burow LC, Semprini L & Spormann AM (2012) The Hydrogenase Chip: a tiling oligonucleotide DNA microarray technique for characterizing hydrogen-producing and –consuming microbes in microbial communities. ISME J 6: 814–826.
16. Berggren D. R. V., Marshall I. P. G., **Azizian M. F.,** Spormann A. M., Semprini L. (2013). Effects of Sulfate Reduction on the Bacterial Community and Kinetic Parameters of a Dechlorinating Culture under Chemostat Growth Conditions. Environ Sci. & Technol 47:1879–1886.
17. Marshall, I. P. G., **Azizian, M. F**., Semprini, L., Spormann, A. M., 2013. Inferring community dynamics of organohalide-respiring bacteria in chemostats by covariance of *rdhA* gene abundance. *FEMS Microbio. Ecol.*, 1-13.
18. Marshall IPG, Berggren DRV, **Azizian M. F.**, Burow LC, Semprini L, Spormann AM. 2012. The Hydrogenase Chip: A Tiling Oligonucleotide DNA Microarray Technique for Characterizing Hydrogen Producing and Consuming Microbes in Microbial Communities ISME J. 6(4):814-26.
19. Sebastian Behrens, **Mohammad F. Azizian**, Paul J. McMurdie, Andrew Sabalowsky, Mark E. Dolan, Lew Semprini, and Alfred M. Spormann, 2008. Monitoring Abundance and Expression of "Dehalococcoides" Species Chloroethene-Reductive Dehalogenases in a Tetrachloroethene-Dechlorinating Flow

Column. Article in Applied and Environmental Microbiology 74(18):5695-703. DOI: 10.1128/AEM.00926-08.

20. **Azizian, M. F.,** M. E. Dolan, P. Ruiz-Haas, J. D. Ingle, and L. Semprini, 2007. "Effect of pre-reduction of aquifer material on PCE reductive dechlorination in a continuous-flow column study," *American Chemical Society*, Environmental Chemistry, Vol. 47 No.1, 560-565.

21. **Azizian, M. F.,** J. D. Istok, and L. Semprini, 2005. "Push-Pull test evaluation of the in situ aerobic cometabolism of chlorinated ethenes by toluene-utilizing microorganisms," *Water Science and Technology*, Vol. 52 No. 7 pp 34-40.

22. **Azizian, M. F.**, Jonathan Istok, and Lewis Semprini, 2004. "Evaluation of the in situ aerobic cometabolism of chlorinated ethenes by toluene-utilizing microorganisms using push-pull tests," *Environmental and West Management*, Advance Through the Environmental Science Program, Metal and DNAPL Contamination, Division of Environmental Chemistry, Vol. 44 No.1, 505-509.

23. **Azizian, M.F.,** Peter O. Nelson, Pugazhendhi Thayumanavan and Kenneth J. Williamson. 2003. Environmental impact of highway construction and repair materials on surface and ground waters: Case study: crumb rubber asphalt concrete, *Waste Management,* Vol. 23 No. 8, pp. 719-728. Abstract | Full Text + Links | PDF (512 K)

24. **Azizian, M.F.,** Peter O. Nelson, Pugazhendhi Thayumanavan, "Environmental impact of highway construction and repair materials on surface and ground waters: Case study ACZA treated timber," *American Chemical Society*, Vol. 42, No. 1, pp. 217-223, 2002.

25. **Azizian, M. F.,** Khemarath Osathaphan, K. and Peter O. Nelson, 2002, "Sorption and transport model for copper, chromium, and arsenic In an iron-oxide-coated sand, synthetic groundwater system," *American Chemical Society*, Vol. 42, No. 1, pp. 224-230.

26. **Azizian, M.F.,** Nelson, P.O. and Thayumanavan, P. Environmental Impact of Municipal-Solid-Waste-Incinerator-Bottom-Ash-Asphalt Concrete Leachate on Surface and Ground Waters, Beneficial Use of Recycled materials in Transportation Applications, Editor: T. Taylor Eighmy, pp. 161-174, 2001.

27. Nelson, P. O., **Azizian, M.F**. Thayumanavan, P., and Williamson, K.J., 2001. A Novel Methodology for Assessing Environmental Impacts of Recycled and Waste Materials Used in Highway Construction, Beneficial Use of Recycled materials in Transportation Applications, Editor: T. Taylor Eighmy, , pp. 135-147.

28. **Azizian, M.F.,** Peter O. Nelson, Pugazhendhi Thayumanavan, and Kenneth J. Williamson, 2001. "Environmental Impact of Crumb Rubber Asphalt Concrete Leachate Contaminants from Highway Construction and Repair Materials on Surface and Ground Waters," *American Chemical Society*, Vol. 41, No. 1, pp. 409-413.

29. Nelson, P.O., Williamson, K.J., **Azizian, M.F**., Thayumanavan, P., Huber, W.C., and Eldin, N.N., 2001. "Environmental Impact of Construction and Repair Materials on Surface and Ground Waters: Screening and Evaluation Methodology," In

Transportation Research Record, Transportation Research Board, National Research Council, No. 1743, Paper No. 01-3446, pp. 16-24, (2001).

30. Thayumanavan, P., Nelson, P.O., **Azizian, M.F.,** Williamson, K.J., and Lundy, J.R., "Environmental Impact of Construction and Repair Materials on Surface and Ground Waters: Detailed Evaluation of Waste Amended Highway Materials," In *Transportation Research Record*, Transportation Research Board, National Research Council, No. 1743, Paper No. 01-3446, pp. 25-32, (2001).
31. Nelson, P.O., Thayumanavan, P., Williamson, K.J. and **Azizian, M.F**., "A Novel Methodology for Assessing Environmental Impacts of Recycled and Waste Materials Used in Highway Construction, *First International Conference on Beneficial Use of Recycled Materials in Transportation Applications*, No. 1743, Paper No. 01-3444, pp. 16-24, 2001.
32. Khaodhiar, S., **Azizian, M.F.,** and Nelson, P.O., "Copper, Chromium, and Arsenic Adsorption and Equilibrium Modeling in an Iron-Oxide-Coated Sand, Synthetic Groundwater System," *Water, Air, and Soil Pollution*, Vol. *119*, pp 105-120, 2000.
33. Nelson, P. O., Huber, W. C., Eldin, N. N., Williamson, K. J., **Azizian, M. F**., Thayumanavan, P., Quigley, M.M., Hesse, E.T., Lundy, J.R., Frey, K.M. and Leahy, R.B., 2001. Environmental Impact of Construction and Repair Materials on Surface and Ground Waters, Volume I: Summary of Methodology, Laboratory Results and Model Development, NCHRP Report 448, Transportation Research Board, National Research Council, Washington, D.C.
34. **Azizian, M.F.,** and Nelson, P.O., 1998. "Lead Adsorption, Chemically-Enhanced Desorption, and Equilibrium Modeling in an Iron-Oxide-Coated Sand and Synthetic Groundwater System", *Adsorption of Metals by Geomedia*, E.A. Jenne, Ed., American Chemical Society Symposium Series, *chapter 6*, 165-180.
35. Adisorn Tovanaboot*r*, Lewis Semprini, Mark E. Dolan, **Mohammad Azizian** ,Victor S. Magar, Dennis DeBacker, Andrea Leeson, and Lt. David Kempisty, 2001. "Cometabolic Air Sparging Field Demonstration with Propane to Remediate Trichloroethylene and *cis*-Dichloroethylene," American Chemical Society, Environmental Chemistry Division, 221th ACS National Meeting, San Diego, Vol. *41*, No. 1, pp. 1082-1091.
36. Osathaphan, K., **Azizian, M.F**., and Nelson, P.O., 2001. "Chromated copper arsenate, or CCA Adsorption on an Iron-Oxide Adsorbent," American Chemical Society, Environmental Chemistry Division, Vol. 41, No. 1, pp. 436-440.
37. Lynch, M. R., McCall, S., Magar, V. S., Leeson, A., Dolan, M., Semprini, L., **Azizian, M.F.,** 2001. "Use of Cometabolic Air Sparging to Remediate Chloroethene-Contaminated Groundwater Aquifers." *In Situ and On-Site Bioremediation*, the Sixth International Symposium, Battelle, June 4-7.
38. **Azizian, M.F.,** K., Osathaphan, and Peter O. Nelson, "Simultaneous removal of Cu(II), Cr(VI), and As(V) metals from contaminated soils and groundwater. American Chemical Society, Environmental Chemistry Division, Vol. 40 No. 1, March 26-30th, 2000.

39. Peter O. Nelson, Pugazhendhi Thayumanavan, **Mohammad Azizian** and Kenneth J. Williamson, 2001. An Evaluation Methodology for Environmental Impact Assessment of Industrial Wastes Used as Highway Materials on Surface and Ground Waters: An Overview with respect to U.S. EPA's Environmental Risk Assessment Framework. In: Environmental Impact assessment of Recycled Hazardous Waste Materials on Surface and Groundwaters: Chemodynamics, Toxicology, Modeling and Information Systems. The Handbook of Environmental Chemistry, Water Pollution Series, Volume 5 (Aboul-Kassim TAT and Williamson KJ, eds.), Springer-Verlag, Berlin-Heidelberg.
40. **Azizian, M.F.,** Nelson, P.O., and Siddiqui, G., 1997. "Development, Characterization, and Performance Evaluation of Ferrous-Ferric Oxide Adsorbents for Metal Removal from Contaminated Groundwater," American Chemical Society, Environmental Chemistry Division, Vol. 37 No. 1, p 200.
41. Khaodhiar, S., **Azizian, M.F.,** and Nelson, P.O., 1998. "Equilibrium Modeling of Arsenic, Chromium, and Copper Adsorption on an Iron-Oxide-Coated Sand," American Chemical Society, Environmental Chemistry Division, 215th ACS National Meeting, Dallas, Vol. 38, No. 1, pp. 3-5.
42. **Azizian, M. F.,** and Nelson, P. O., 1993. "Hexavalent Chromium Adsorption Kinetics and Equilibrium in a Natural Soil," *Iranian Journal of Science and Technology*, Vol. 17, No.2 pp. 81-89.

Conference Presentations/Abstracts:

1. Semprini, Lewis, **Azizian, M. F.,** 2016, "Kinetic Studies of the Cometabolism of 14-Dioxane and Chlorinated Aliphatic Hyrdrocarbone Miture by Rhodocococcus Rhocochrous Grown on Isobutane." AGU Fall meeting San Francisco, CA.
2. **Azizian, M. F.,** Marshall, I., Behrens, S., A. Spromann, A., Semprini L., Evaluation in a continuous-flow column of different fermenting substrates for the reductive dehalogenation of trichloroethene, Groundwater Quality Management in a Rapidly Changing World (Proc. 7th International Groundwater Quality Conference held in Zurich, Switzerland, 13–18 June 2010). IAHS Publ 342, 2011.
3. **Azizian, M. F**., 2001. "Rubber in the road could be hazardous," Chemical and Engineering News, *Science and Technology*, April 23, p. 60.
4. Mustafa N., **Azizian M.,** Dolan M., Semprini L. (2008) Numerical Simulation of the Anaerobic Transformation of Chlorinated Aliphatic Hydrocarbons in a Continuous Flow Column. Subsurface Biosphere Initiative and IGERT Workshop, June 15-17, 2008 Newport, Oregon.
5. Semprini, Lewis**, Azizian, M. F**, 2015, "Chemostat Studies of TCE-Dehalogenating Anaerobic Consortia under Excess and Limited Electron Donor Addition." AGU Fall meeting San Francisco, CA.
6. Lewis Semprini and **M. Azizian**, Ian P. G. Marshall, and A. M. Spormann, 2009, "Comparison of Lactate, Formate, and Propionate as Substrates for TCE Reductive Dehalogenation in a Continuous-flow Column," Partners in Environmental Technology Technical Symposium, December 2-4, Washington D.C.
7. Mustafa N., **Azizian M.**, Semprini L. (2009) Experimental and Modeling of the Anaerobic Transformation of TCE to Ethene in a Continuous Stirred Tank Reactor (CSTR), Water Resources Graduate Program Workshop, January 28, 2009 Corvallis, OR.

8. Mustafa, N., **Azizian, M.F**., Dolan, M.E., and Semprini, L. 2007. Numerical Simulation of the Anaerobic Transformation of Tetrachloroethene to cis-Dichloroethene in a Continuous Flow Aquifer Column. EOS Transactions, *American Geophysical Union.* Vol. 88, no. 52, Suppl. Volume 1-2 B51B0369M.
9. **Azizian, M. F.,** Jonathan Istok, and Lewis Semprini, 2005. "In Situ Aerobic Cometabolism of Chlorinated Ethenes by Toluene-Utilizing Microorganisms Using Push-Pull Tests," The Joint International Symposia for Subsurface Microbiology (ISSM 2005) and Environmental Biogeochemistry (ISEB XVII), Jackson Hole, Wyoming - August 14-19.
10. Semprini, L., **Azizian, M. F.,** Istok, J. D., "Single-Well Push-Pull Tests for Evaluating In Situ TCE, cis-DCE, and trans-DCE Cometabolism by Toluene-Utilizing Microorganisms," Groundwater transport, Hydrology, AGU Fall Meeting, 2004.
11. **Azizian, M.F**. J.D. Istok, and L. Semprini, "Push-Pull test evaluation of the in situ aerobic cometabolism of chlorinated ethenes by toluene-utilizing microorganisms," International Conference Biofilms, Las Vegas, Nevada, 24-26 October 2004.
12. Semprini, Lewis, Kim, Young, **Azizian, Mohammad**, and ISTOK, Jonathan D., "Single-Well-Push-Pull Tests for Assessing the Feasibility for In-Situ Aerobic Cometabolic Treatment of Chlorinated Aliphatic Hydrocarbons," presented in the Geological Society of America, Transport and Remediation of Organic Compound in the Saturated Zone, Seattle Annual Meeting, November 2^{nd} – 5^{th} 2003.
13. **Azizian, M.F.,** Nelson, P.O. and Thayumanavan, P. Environmental Impact of Municipal-Solid-Waste-Incinerator-Bottom-Ash-Asphalt Concrete Leachate on Surface and Ground Waters, *First International Conference on Beneficial Use of Recycled Materials in Transportation Applications*, University of New Hampshire, November 13-15, 2001.
14. Tovanaboot*r,* A., Dolan, M. E., **Azizian, M.F.,** Semprini L., Magar, V. S., DeBacker, D., Leeson, A., and Kempisty, D., 2001. "Cometabolic Air Sparging Field Demonstration with Propane to Remediate Trichloroethylene and *cis*-Dichloroethylene." *In Situ and On-Site Bioremediation*, the Sixth International Symposium, Battelle, June 4-7.
15. Nelson, P. O., **Azizian, M.F**. Thayumanavan, P., and Williamson, K.J., "A Novel Methodology for Assessing Environmental Impacts of Recycled and Waste Materials Used in Highway Construction, Waste Management *First International Conference on Beneficial Use of Recycled Materials in Transportation Applications*, University of New Hampshire, November 13-15, 2001.
16. Timmins, B.; Dolan, M. E.; Tovannabootr, A.; **Azizian, M. F.**; Semprini, L.; Magar, V. S.; Leeson, A., 2001. "Comparison of Microcosm Tests and a Field Demonstration of Cometabolic Air Sparging With Propane for the Bioremediation of Trichloroethylene and cis-Dichloroethylene," American Geophysical Union, Fall Meeting 2001, abstract #B42B-0146.
17. **Azizian, M.F.,** Nelson, P.O., Thayumanavan, P., and Williamson, K.J. "Evaluation of environmental impact of Crumb Rubber-asphalt concrete leachate from highway construction and repair," Technologies for Contaminant Remediation Under Heterogeneous Subsurface Conditions, as part of the symposium Emerging Technologies: Waste Management in the 21st Century, American Chemical Society 219th National Meeting, March 26-30, 2000, San Francisco, CA.
18. **Azizian, M.F.,** Osathaphan, K., and Nelson, P.O., "Simultaneous removal of Cu(II), Cr(VI), and As(V) metals from contaminated soils and groundwater," American Chemical Society 219th National Meeting, Division of Environmental Chemistry, San Francisco, CA, March 26-30 2000.