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Engineering & Scientific Consulting

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Professional Profile

Dr. Ahn is environmental scientist with more than 15 years of experience investigating, analyzing, interpreting, and predicting behaviors of organic chemicals including PAHs, PCBs, flame retardants (PBDEs), petroleum fuels, dioxins, DDTs and other pesticides in complex natural environments and engineered systems. His work at Exponent has focused on applying in-depth knowledge of environmental chemistry, including chemical fate and transport, distribution and partitioning in environmental media, degradation, and bioavailability, which are crucial for accurate delineation of contamination, source identification and allocation, cost allocation, and evaluation and selection of remedial options.

Dr. Ahn has worked on projects related to oil spills, industrial chemical releases, former manufactured gas plants (MGPs), Superfund sites, landfills, fuel terminals, steel plants, and coal-fired power plants.

Dr. Ahn frequently uses technical tools that include chemical fingerprinting for environmental forensics, source identification and allocation using numerical models (e.g., EPA's Chemical Mass Balance) and statistical tools. He also utilizes emerging methods to measure low-level chemicals in sediment and water for assessing the potential exposure and toxicity of chemicals (e.g., passive samplers).

Dr. Ahn has been actively involved in fieldwork at sites for RI/FS studies and research projects. His field work responsibilities include planning, managing, conducting sampling of soil, groundwater, and sediment, and data analysis. He also has experience designing and conducting laboratory studies to support development of cost-effective alternatives for environmental problems.

Recently, Dr. Ahn expanded his capabilities to provide regulatory support for the registration of agrochemicals, biocides, and household chemical substances under K-BPR, K-REACH, and pesticide regulations. He has also evaluated regulatory compliance of food ingredients and additives in Korea. These require working closely with clients in different countries and government agency officers in Korea.

As a Korean native, he is fluent in English and Korean.

Academic Credentials & Professional Honors

Ph.D., Civil and Environmental Engineering, Stanford University, 2006

M.S., Civil and Environmental Engineering, Stanford University, 2001

M.S., Chemical Engineering, Yonsei University, South Korea, 1997

B.S., Chemical Engineering, Yonsei University, South Korea, 1995

The Ford Fund Fellowship, 2001-2003

Prior Experience

Postdoctoral Scholar, Stanford University, 2006

Professional Affiliations

Society of Environmental Toxicology and Chemistry (SETAC)

Languages

Korean

Patents

Superfund Sites

Portland Harbor: Conducted river sediment sampling to evaluate PAH and fuel impacts from fuel terminals. Provided technical support during RI and FS for determining driver contaminants, including PAHs, PCBs, and DDT. Applied EPA's CMB model for source contribution estimation.

Onondaga Lake: Supported the investigation of sources of sediment contamination. Used EPA's CMB model to estimate multiple source contributions of PAHs to lake sediment. Sources included petroleum fuel terminals, MGPs, and chemical manufacturing facilities.

Ashland, WI: Conducted multiple-lines-of-evidence approach forensic investigation using EPA's CMB and a suite of apportionment models and forensic tools to support cost allocation. The Superfund site consists of former lumberyard with wood treatment operations and a former MGP adjacent to a lake.

Lower Fox River, WI: Supported PCB fate and transport modeling. Examined, reviewed, and updated the physicochemical models, equations and parameters used in the modeling.

MGP Sites

Multiple projects: Conducted chemical fingerprinting analyses to evaluate the impacts of multiple former MGP facilities to contamination in soil and river sediment in metro urban area.

Conducted forensic investigation to support cost allocation for a site that included a former MGP and fuel terminal. Supported the historical reconstruction of the site and performed environmental forensics.

Fate and Transport of Contaminants

Multiple projects: Evaluated and estimated PAHs contributions to soil and sediment from various combustion sources, including coal tar sealants, coal ash, wood combustion, fuels, vehicle exhaust, urban runoff and more. Work included an extensive literature review, application of environmental forensic techniques, and modeling using EPA's CMB, a receptor model.

For a steel plant in Italy, supported investigation of dust and dioxin emissions and their controls from flue gas using carbon injection system.

Investigated dioxin emission from flue gas from a secondary copper smelter in US, and estimated soil concentrations through aerial deposition.

Conducted dioxin fingerprinting for sediment samples impacted by treated wastewater discharged from a pulp and paper mill.

Conducted fingerprinting of dioxin in stormwater samples for investigation of the source of dioxins.

Managed the assessment of potential VOC contamination of the groundwater at a landfill in eastern Washington State using historical reconstruction of the landfill operations and gas-transfer modeling.

Performed literature review and prepared comments on the synthesis of methyl mercury in a river estuary.

Analyzed hexavalent chromium concentrations in ambient air around a city to evaluate possible impacts from nearby cement plant. Extracted a large amount of data from California Air Resources Board database.

Regulatory Support in Korea - Agrochemicals, Biocides, Food items and ingredients

Assisted clients registering biocidal products under newly imposed regulation, K-BPR (consumer products and biocides law). Led communication with the government agency and the local representative of the client.

Helped multiple clients to submit applications to Korean Ministry of Food and Drug Safety (MFDS) for import tolerance of pesticides via Korean government's e-civil service system. Managed submissions, approval processes, and provided post-submission support. Provided timely and smooth communication with MFDS and clients.

Helped multiple clients with regulatory compliance issues in Korea for food ingredients and additives for import. This includes reviewing relevant regulations, consultation to MFDS officers in charge, and providing the clients deliverables.

Laboratory Oversight and Management

Conducted on-site oversight and audit of a laboratory in Asian region on behalf of a client. Reviewed laboratory's analytical methods and practices, and consulted with local staff to improve the quality of their analytical work.

Managed experiments for the Electric Power Research Institute (EPRI) and its utility members on the application of a passive sampler as a tool to evaluate toxicity of contaminated sediments at manufactured gas plant (MGP) sites.

Field Work

Planned, managed, and conducted groundwater sampling, sediment sampling, and soil sampling for RI/FS and research projects.

Publications

Book Chapter and Guidance Document

Shields WJ, Ahn S, Pietari J, Robrock K, Royer L. Atmospheric fate and behavior of POPs. Chapter 6. In: Environmental Forensics for Persistent Organic Pollutants. O'Sullivan W, Sandau C (eds), Chennai: Elsevier, pp. 199-290, 2019.

Burgess RM, Kane Driscoll SB, Burton GA, Ghosh U, Gschwend PM, Reible D, Ahn S, Thompson T. Laboratory, field, and analytical procedures for using passive sampling in the evaluation of contaminated sediments: user's manual. EPA/600/R-16/357, Feb 2017.

Peer-reviewed Journal Articles

Patterson, TJ, Kristofco, L, Tiwary, AK, Magaw, RI, Zemo, DA, O'Reilly, KT, Mohler, RE, Ahn, S, Sihota, N, Espino Devine, C. Human and Aquatic Toxicity Potential of Petroleum Biodegradation Metabolite Mixtures in Groundwater from Fuel Release Sites. Environmental Toxicology and Chemistry 2020. DOI: 10.1002/etc.4749

Mohler RE, Ahn S, O'Reilly KT, Zemo DA, Espino Devine C, Magaw R, Sihota N. Towards comprehensive analysis of oxygen containing organic compounds in groundwater at a crude oil spill site using GC×GC-TOFMS and Orbitrap ESI-MS. Chemosphere 2020, 244, 125504.

O'Reilly, KT, Mohler, RE, Zemo, DA, Ahn, S, Magaw, RI, Espino Devine, C. Oxygen-Containing Compounds Identified in Groundwater from Fuel Release Sites Using GCxGC-TOF-MS. Groundwater Monit R, 2019. 39: 32-40. doi:10.1111/gwmr.12350

O'Reilly KT, Ahn S. Comment on "Primary sources and toxicity of PAHs in Milwaukee-area streambed sediment". Environmental Chemistry and Toxicology 2017. DOI: 10.1002/etc.3825.

Zemo DA, O'Reilly KT, Mohler RE, Magaw RI, Espino Devine C, Ahn S., Tiwary AK. Life Cycle of Petroleum Biodegradation Metabolite Plumes, and Implications for Risk Management at Fuel Release Sites. Integrated Environmental Assessment and Management 2016, 3:714-727.

O'Reilly, KT, Mohler, RE, Zemo, DA, Ahn, S, Tiwary, AK, Magaw, RI, Espino Devine, C, Synowiec, KA. Identification of ester metabolites from petroleum hydrocarbon biodegradation in groundwater using GC×GC-TOFMS. Environmental Toxicology and Chemistry 2015, 34, (9), 1959-1961.

O'Reilly, KT, Ahn, S, Pietari, J, Boehm, PD. Use of receptor models to evaluate sources of PAHs in sediments. Polycyclic Aromatic Compounds 2015, 35:41-56

Zhuang, Y, Ahn, S, Seyfferth, AL, Masue-Slowey, Y, Fendorf, S, Luthy, RG. 2011. Dehalogenation of polybrominated diphenyl ethers and polychlorinated biphenyl by bimetallic, impregnated, and nanoscale zerovalent iron. Environmental science & technology, 45(11), pp.4896-4903.

Zhuang, Y, Ahn, S, Luthy, RG. Debromination of polybrominated diphenyl ethers by nanoscale zerovalent iron: pathways, kinetics, and reactivity. Environmental science & technology. 2010, 44, (21), 8236-42

Ahn S, Werner D, Luthy RG. Modeling PAH mass transfer in a slurry of contaminated soil or sediment amended with organic sorbents. Water Research 2008; 42:2931-2942.

Yoon TH, Benzerara K, Ahn S, Luthy RG, Tyliszczak T, Brown GE. Nanometer-scale chemical heterogeneities of black carbon materials and their impacts on PCB sorption properties: Soft x-ray spectromicroscopy study. Environmental Science and Technology 2006; 40:5923-5929.

Ahn S, Werner D, Karapanagioti HK, McGlothlin DR, Zare RN, Luthy RG. Phenanthrene and pyrene sorption and intraparticle diffusion in polyoxymethylene, coke, and activated carbon. Environmental Science and Technology 2005; 39:6516-6526.

Ahn S, Werner D, Luthy RG. Physicochemical characterization of coke-plant soil for the assessment of polycyclic aromatic hydrocarbon availability and the feasibility of phytoremediation. Environmental Toxicology and Chemistry 2005; 24:2185-2195.

Presentations

Kane Driscoll S, Ahn S, Schierz A, McGrath A, Clock J, Romer J. Use of Ex Situ Passive Samplers to Measure Freely Dissolved PAHs in Sediments at a Manufactured Gas Plant Site. 39th Annual Meeting of SETAC North America, Sacramento, CA, November 4-8, 2018.

Ahn S., Kane Driscoll SB, McGrath J, Clock J, Romer J, Schierz A., Measuring Freely Dissolved PAHs using Passive Sampler for Sediments at a Manufactured Gas Plant Site, The 11th Society of Environmental Toxicology and Chemistry - Asia Pacific; September 16-19, 2018.

Ahn S., O'Reilly K., Espino Devine C., Magaw R., Mohler R., Dawn Z., TPH metabolites in groundwater from fuel release sites - non-targeted analysis using GCxGC-TOFMS, The 11th Society of Environmental Toxicology and Chemistry - Asia Pacific; September 16-19, 2018.

Ahn S, O'Reilly K. Importance of Source Preparation and Selection Strategies in Chemical Mass Balance Modeling: Source Identification of PAHs in Urban Sediments. SETAC North America 37th Annual Meeting, Orlando, November 6-10, 2016

Ahn S, O'Reilly K, Boehm, P. Evaluation of Different Source Preparation and Selection Strategies in Chemical Mass Balance Modeling: Multiple Polycyclic Aromatic Hydrocarbon Sources to Urban Lake Sediments. National Environmental Monitoring Conference, Orange County, August 8-12, 2016.

Pietari J, O'Reilly K, Ahn S, Boehm, P. Tools for source apportionment: Receptor models and their applications. 31st Annual International Conference on Soils, Sediments, Water and Energy, Amherst, MA, October 20, 2015

Boehm, P, Pietari JMH, Ahn S. Application of ensemble environmental forensics to PAH source attribution. 8th International Conference on Remediation and Management of Contaminated Sediments. New Orleans, LA, January 12-15, 2015.

Ahn, S; O'Reilly. The influence of source selection on Chemical Mass Balance modeling results: Implications for source control policy. SETAC North America Annual Meeting, Vancouver, Canada, November 2014.

O'Reilly, K. T.; Ahn, S. Receptor Models for PAH Source Characterization: Opportunities and Limitations. SETAC North America Annual Meeting, Vancouver, Canada, November 2014.

Kane Driscoll S, Ahn S, Pietari J, Burgess R. Procedures for derivation of site-specific equilibrium partitioning sediment benchmarks for the protection of benthic organisms: nonionic organics. SETAC North America 32nd Annual Meeting, November 13-17, 2011.

Zhuang Y, Ahn S, Luthy RG. Debromination of polybrominated diphenyl ethers by nano-iron particles and carbon-supported nano-iron particles. 239th American Chemical Society National Meeting, San Francisco, CA, March 2010.

Zhuang Y, Ahn S, Luthy RG. PBDE debromintaion by nano-scale zerovalent iron (nZVI) and carbon supported nZVI. SETAC North America Annual Meeting, New Orleans, LA, November 2009.

Yoon TH, Benzerara K, Ahn S, Luthy RG, Tyliszczak T, Brown GE. Soft x-ray spectromicroscopy study of carbonaceous materials: Characterization of their chemical heterogeneities in sub-micrometer scale. 229th American Chemical Society National Meeting, San Diego, CA. March 2005.

Project Experience

Oil Spills

Deepwater Horizon: Conducted chemical fingerprinting of large sample data sets. Provided technical support to the biodegradation task force team. Analyzed water sample data to evaluate toxicity of oils and PAHs. Technical reviewer of associated publications.

Bemidji Crude-Oil Research Project: Planned, managed and performed annual groundwater sampling campaign over multiple years. In charge of data collection, management, and analysis. Researched metabolites of crude oil in groundwater: tentative identification and classification of the metabolites using GC×GC and high-resolution mass spectroscopy, to understand toxicity of the metabolites. Published journal articles and presented at various conferences.