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Professional Profile

Dr. Kim is an environmental chemist and toxicologist with expertise in per- and polyfluoroalkyl substances (PFAS) and emerging contaminants characterization, industrial wastewater treatment, in-situ contaminant remediation, and environmental risk assessment. He integrates environmental engineering, analytical chemistry, and toxicology to evaluate contaminant fate, transformation, and potential health implications in both engineered and natural systems.

He has supported investigations and remediation efforts at Superfund sites, military installations, landfills, semiconductor and plating facilities, pharmaceutical and personal care product manufacturing facilities, municipal wastewater treatment plants, and agricultural and fishery systems. His work includes resolving analytical artifacts; developing and validating advanced analytical methods; designing treatment strategies; evaluating contaminant fate, transformation, and risk; and strengthening the technical defensibility of environmental data under regulatory review.

Dr. Kim has extensive experience evaluating PFAS across diverse environmental matrices, including landfill leachate and sediments, military installations, biosolids, industrial effluents, polymer materials, and biological tissues. He developed advanced total oxidizable precursor (TOP) assays and non-target workflows to improve interpretation of PFAS precursor transformations and reduce analytical uncertainty, supporting technically rigorous site characterization and regulatory decision-making.

His remediation research includes the development of radical-chain-reaction-based in-situ chemical oxidation and reduction strategies for semi-volatile organic compounds (SVOCs) and volatile organic compounds (VOCs), including chlorinated solvents and polychlorinated biphenyls (PCBs) in contaminated sites and building materials. Also, he has contributed to Superfund-related investigations and technical refinements for federal sampling guidance. His doctoral research focused on the development and mechanistic evaluation of advanced oxidation processes to reduce toxicity in industrial wastewaters, while his master's research addressed taste-and-odor compounds and cyanotoxins in drinking water systems.

In addition, Dr. Kim has supported evaluations of environmental exposure and potential health implications of industrial discharges in collaboration with epidemiological research teams. He has investigated the environmental behavior and risk of biocides, heavy metals, and microplastics, including interactions in complex environmental systems that influence toxicity and risk outcomes. This interdisciplinary approach integrates mechanistic chemistry, exposure assessment, and risk evaluation to support objective, scientifically grounded environmental and public health decision-making.

Academic Credentials & Professional Honors

Ph.D., Environmental Health, Seoul National University, Korea, 2020

M.P.H., Environmental Health Sciences, Seoul National University, Korea, 2016

B.E., Environmental Engineering, Catholic University of Pusan, 2014

Excellence in Review Award, Environmental Science & Technology, American Chemical Society, 2026

K.C. Donelly Award, National Institute of Environmental Health Sciences, 2024

National Institute of Environmental Health Sciences Superfund Research Program Trainee, 2021-2026

Early Career Award, Korean Society of Environmental Health and Toxicology, 2021

Early Career Award, Korean Society of Environmental Engineers, Korea, 2020

Young Scientist Fellowship, Korea National Research Council of Science & Technology, 2020

Excellence in Environmental Technology Development Award, Ministry of Environment, Korea, 2020

Outstanding Environmental Policy Paper Award, Korea Environment Institute, 2018

Korea National Research Foundation Fellowship, 2017-2020

Prior Experience

Visiting Scientist, Berkeley National Lab, 2025-2026

Postdoctoral Research Fellow, UC Berkeley, 2021-2026

Research Fellow, Korea Institute of Toxicology, 2020-2021

Researcher, Institute of Health and Environment, Seoul National University, 2017

Professional Affiliations

American Chemical Society (ACS)

Society of Environmental Toxicology and Chemistry (SETAC)

Korean Society of Environmental Engineers (KSEE)

Korean Society of Environmental Health (KSEH)

Patents

Korean Patent 10-2073288: UV/Chlorine Water Treatment System with Replaceable Electrode Module in Oxidation Tank, January 2020 (Kim TK, Zoh KD, Kim T).

Korean Patent 10-1907485: Method of Wastewater Treatment Containing Free Cyanide and Heavy Metal–Cyanide Complexes, October 2018 (Kim TK, Zoh KD, Kim T, Choe WS).

Publications

Kim TK, Truong L, Tanguay RL, Sedlak DL. "Mineralization of Decachlorobiphenyl in Concrete Using Alcohol Washing Followed by UV Irradiation." Journal of Hazardous Materials 2026; In Press.

Salazar JS, Kim TK, Sedlak DL. "In Situ Chemical Oxidation of Nonionic Organic Contaminants: The Effect of Soil Organic Matter and Minerals on Stoichiometric Efficiency." Environmental Science & Technology 2025; 59(42):22940-22949.

Kim TK, Lee D, Walsh G, Lee C, Sedlak DL. "Unwanted Loss of Volatile Organic Compounds (VOCs) during In Situ Chemical Oxidation Sample Preservation: Mechanisms and Solutions." Journal of Hazardous Materials Letters 2024; 5:100102.

Cook EK, Olivares CI, Antell EH, Tsou K, Kim TK, Cuthbertson A, Higgins CP, Sedlak DL, Alvarez-Cohen L. "Sulfonamide Per-and Polyfluoroalkyl Substances Can Impact Microorganisms Used in Aromatic Hydrocarbon and Trichloroethene Bioremediation." Environmental Science & Technology 2024; 58(20):8792-8802.

Jang MH, Kim TK, Park JW, Kim TH, Hwang YS, Kim SO. "Elucidating Adsorption Mechanisms of Benzalkonium Chlorides (BACs) on Polypropylene and Polyethylene Terephthalate Microplastics (MPs): Effects of BACs Alkyl Chain Length and MPs Characteristics." Journal of Hazardous Materials 2024; 468:133765.

Kim TK, Sedlak DL. "Mineralization of a Fully Halogenated Organic Compound by Persulfate under Conditions Relevant to In Situ Reduction and Oxidation: Reduction of Hexachloroethane by Ethanol Addition Followed by Oxidation." Environmental Science & Technology 2023; 57(36):13691-13698.

Kim TK, Choe WS, Kim T, Chae SH, Hwang YS, Zoh KD. "Adsorption of Benzalkonium Chlorides onto Powdered Activated Carbon: Mechanisms and Detoxification." Environmental Engineering Research 2022; 27(6): 210496.

Kim TK, Lee D, Lee C, Hwang YS, Zoh KD. "Degradation of Tetramethylammonium Hydroxide (TMAH) during UV-LED/H2O2 Reaction: Degassing Effect, Radical Contribution, and Degradation Mechanism." Journal of Hazardous Materials 2022; 440:129781.

Cha Y, Kim TK, Lee J, Kim T, Hong AJ, Zoh KD. "Degradation of Iopromide during UV-LED/Chlorine Reaction: Effect of Wavelength, Radical Contribution, Transformation Products, and Toxicity." Journal of Hazardous Materials 2022; 437:129371.

Kim TK, Jang M, Hwang YS. "Adsorption of Benzalkonium Chlorides onto Polyethylene Microplastics: Mechanism and Toxicity Evaluation." Journal of Hazardous Materials 2022; 426:128076.

Kim TK, Kim T, Lee I, Choi K, Zoh KD. "Removal of Tetramethylammonium Hydroxide (TMAH) in Semiconductor Wastewater Using the Nano-Ozone/H2O2 Process." Journal of Hazardous Materials 2021; 409:123759.

Kim TK, Kim T, Cha Y, Zoh KD. "Energy-Efficient Erythromycin Degradation Using UV-LED (275 nm)/Chlorine Process: Radical Contribution, Transformation Products, and Toxicity Evaluation." Water Research 2020; 185:116159.

Kim MK, Kim T, Kim TK, Joo SW, Zoh KD. "Degradation Mechanism of Perfluorooctanoic Acid (PFOA) during Electrocoagulation Using Fe Electrode." Separation and Purification Technology 2020; 247:116911.

Kim TK, Kim T, Park H, Lee I, Jo A, Choi K, Zoh KD. "Degradation of Ciprofloxacin and Inactivation of Ciprofloxacin Resistant E. faecium during UV-LED (275 nm)/Chlorine Process." Chemical Engineering

Journal 2020; 394:124803.

Kim T, Kim TK, Zoh KD. "Removal Mechanism of Heavy Metal (Cu, Ni, Zn, and Cr) in the Presence of Cyanide during Electrocoagulation Using Fe and Al Electrodes." Journal of Water Process Engineering 2020; 33:101109.

Kim TK, Kim T, Jo A, Park S, Choi K, Zoh KD. "Degradation Mechanism of Cyanide in Water Using a UV-LED/H2O2/Cu2+ System." Chemosphere 2018; 208:441–449.

Kim TK, Kim T, Choe WS, Kim MK, Jung YJ, Zoh KD. "Removal of Heavy Metals in Electroplating Wastewater by Powdered Activated Carbon (PAC) and Sodium Diethyldithiocarbamate-Modified PAC." Environmental Engineering Research 2018; 23(3):301–308.

Moon BR, Kim TK, Kim MK, Choi J, Zoh KD. "Degradation Mechanisms of Microcystin-LR during UV-B Photolysis and UV/H2O2 Processes: Byproducts and Pathways." Chemosphere 2017; 185.

Kim TK, Moon BR, Kim T, Kim MK, Zoh KD. "Degradation Mechanisms of Geosmin and 2-MIB during UV Photolysis and UV/Chlorine Reactions." Chemosphere 2016; 162:157–164.

Presentations

Kim TK. Integrating Volatile PFAS Precursors into LC–MS/MS Monitoring Frameworks Using a Zero-Headspace Total Oxidizable Precursor Assay (Z-TOP), Invited Oral Presentation, 5th ICEPROM, Quy Nhon, Binh Dinh, Vietnam, 2026.

Kim TK. From Mechanisms to Solutions: Practical Strategies for Treating and Tracking Environmental Contaminants, Invited Oral Presentation, Department Seminar, Department of Civil and Environmental Engineering, Korea Advanced Institute of Science and Technology, Daejeon, Korea, 2026.

Kim TK., Sedlak DL. A Colorimetric TOP Assay Coupled with EPA Method 1633 for Standardized PFAS Precursor Oxidation and Total PFAS Analysis, Poster Presentation, Superfund Research Program Annual Meeting, College Station, TX, 2025.

Kim TK. Navigating the Complexities: Advanced Analytical Challenges for PFAS in Industrial Wastewater, Invited Oral Presentation, Department Seminar, Department of Civil and Environmental Engineering, University of Nevada Reno, Reno, NV, 2025.

Kim TK. Innovating for a Sustainable Future: Recent Progress in UC Berkeley Superfund Research Project, Invited Oral Presentation, Department Seminar, Department of Civil and Environmental Engineering, University of California, Berkeley, Berkeley, CA, 2024.

Kim TK, Sedlak, DL. Removal of Decachlorobiphenyl from Construction Waste Using Alcohol Flushing Followed by VUV/UV-C Dual Irradiation, Oral Presentation, Dr. Dionysios Dionysiou Memorial Session, Fall 2024 American Chemical Society Meeting, Denver, CO, 2024.

Kim TK., Sedlak DL. Unwanted VOCs Loss during the Sample Preservation at Superfund Remediation Sites: Mechanisms and Solutions, Poster Presentation, Superfund Research Program Annual Meeting, Albuquerque, NM, 2023.

Kim, TK, Sedlak, DL. Mineralization of a Fully Halogenated Organic Compound by Persulfate under Conditions Relevant to In Situ Reduction and Oxidation: Reduction of Hexachloroethane by Ethanol Addition Followed by Oxidation, Oral Presentation, Dr. William Cooper Honorary Session, Fall 2023 American Chemical Society Meeting, San Francisco, CA, 2023.

Kim TK, Zoh KD. Detoxification of Semiconductor Wastewater by Applying Nano-Ozone Bubble with H2O2, Oral Presentation, IWA-ASPIRE 2019, Busan, Korea, 2019.

Kim TK, Zoh KD. Energy-Efficient Hospital Wastewater Treatment to Control Residual Antibiotics, Oral Presentation, IWA-MICROPOL 2019, Seoul, Korea, 2019.

Project Experience

PFAS Analytical Method Development – Hazardous Waste Sites

Developed and validated analytical methods for PFAS to support treatment evaluation and site characterization under National Institute of Environmental Health Sciences Superfund Research Program (NIEHS SRP) and Department of War Strategic Environmental Research and Development Program (DoW SERDP) initiatives.

PFAS Analytical Artifact Resolution – Industrial Wastewaters

Initiated a technical investigation in collaboration with industry partners to identify and resolve the root cause of PFAS analytical artifacts in complex industrial wastewater matrices. Redesigned analytical workflows to improve detection accuracy and reduce uncertainty in regulatory reporting.

Federal Sampling Guideline Correction – VOCs

Identified and resolved a critical VOC sampling artifact affecting Superfund site investigations, improving analytical reliability and strengthening defensibility of regulatory data.

In-Situ Remediation Technology Development – SVOCs and VOCs

Designed and evaluated radical-chain-reaction-based in-situ chemical oxidation and reduction strategies for chlorinated solvents and PCBs in contaminated soil and building materials, including transformation product identification and comprehensive risk assessment.

Microplastics–Biocide Interaction Study

Initiated a government-funded project investigating the adsorption of quaternary ammonium compound-based biocides onto microplastics and assessing combined environmental behavior, mixture toxicity, and risk in aquatic systems during the COVID-19 Pandemic.

Advanced Oxidation Process Development – Industrial Wastewater

Designed and optimized UV-LED advanced oxidation and nano-bubble ozonation systems for detoxification of semiconductor, electroplating, and hospital wastewaters.

Nationwide Industrial Wastewater Monitoring – Korea

Conducted nationwide monitoring of hazardous pollutants in industrial wastewater across Korea, integrating toxicity testing and chemical concentration data to establish treatment priority rankings for regulatory and risk-based management.

Phthalate Leaching and Exposure Assessment

Conducted leaching studies on IV tubing and food-contact materials under Korean FDA funding to evaluate phthalate release, exposure pathways, and associated health risk implications.

Environmental Epidemiological Investigation – Industrial Emissions

Participated in an epidemiological assessment of cancer incidence near an asphalt manufacturing facility by analyzing SVOCs and VOCs in groundwater and soil to evaluate potential exposure pathways and health risk.

Algal Toxin and Taste-and-Odor Compound Monitoring and Treatment

Developed analytical methods for algal toxins and taste-and-odor compounds in drinking water systems and evaluated treatment performance in municipal water treatment plants. Investigated contaminant transformation and removal efficiency under advanced oxidation conditions to support drinking water safety and regulatory compliance.

Peer Reviews

Environmental Science & Technology (ES&T)

Journal of Hazardous Materials

Critical Reviews in Environmental Science and Technology

Science of the Total Environment

ACS ES&T Air