



## Water Resource Environmental Lab.

### Prof. Sang-Hyun Kim

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#### EDUCATION

- 1996 Ph.D. Purdue Univ. Civil & Environmental Engineering
- 1992 M.S. Kyungpook National Univ. Civil Engineering
- 1989 B.S. Kyungpook National Univ. Civil Engineering

#### CAREER

- 2008~present Professor, Pusan National University
- 1996~1997 Postdoctoral researcher, University of Illinois

#### RESEARCH FIELD

##### Water Resources & Water Quality

Hydrology is based on the water environment, addressing issues in the water cycle processes, quantitative and qualitative transfer process and redistribution in natural system. In the laboratory, there are various research topics such as mountain wetland, topographic analysis, a fundamental study for the identification of water circulation mechanisms, the development of a prediction model through statistical analysis for the generation of cyanobacteria, which is currently an hot issue in 4 rivers.

##### Hydraulics & Water Quality Modeling in Pipe System

Based on hydraulics analysis, the phenomenon of fluid flow in a pipe network, the simulation of pipe distribution in the water supply system, the experiment and model development of the chlorine attenuator in the pipe network, the analysis of the pipe network surge and the development of the pressure relief valve are carried out.

#### AWARDS

- 2017 Best Paper Award of the Korean Society of Disaster Prevention
- 2016 LINK Project R & BD Acceleration
- 2013 Korea Environmental Science Society Excellent Poster Award

#### SOCIETY SERVICE AND MEMBERSHIP

- 2018 WREM Technical Program Committee for WREM2018
- 2015~present Korean Society of Agricultural and Forest Meteorology, Editor-in-Chief
- 2013~2015 Korea Water Resources Association, Water and Sewage Division chairperson
- 2014 WDSA International Scientific Committee for WDSA 2014

#### PUBLICATIONS

Development of multiple leakage detection method for a reservoir pipeline valve system, *Water Resources Management*, 32(6), 2099–2112 (2018)

Pattern similarity based soil moisture analysis for three seasons on a steep hillslope, *Journal of Hydrology*, 551, 484–494 (2017)

Evaluation of chlorine decay models under transient conditions in a water distribution system, *Journal of Hydroinformatics*, 19(4), 522–537 (2017)



## Environmental Remediation Lab.

### Prof. Inseong Hwang

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#### EDUCATION

- 2000 Ph.D. Texas A&M Univ., USA Dept. of Civil Engineering
- 1991 M.S. Seoul National Univ. Dept. of Civil Engineering
- 1989 B.S. Seoul National Univ. Dept. of Civil Engineering

#### CAREER

- 2014~2017 Director, Institute of Environmental Technology and Industry in PNU
- 2013~2017 Chair, Busan Global Water Forum
- 2013~present Professor, Pusan National University

#### RESEARCH FIELD

##### Persulfate based in situ oxidation of organic contaminants

Contaminant removal using sulfate radical generated from persulfate activation by nanosized zero-valent iron, soil Fe minerals, and dissolved organic matters.

##### Development of solidifying/stabilizing/carbonating agents for treating soils contaminated with heavy metals

Development of supplementary cementitious material which can store carbon dioxide by accelerated carbonation and stabilize heavy metals in contaminated soil.

##### Electrochemical treatment of emerging pollutants

Removal of persistent organic pollutants and mitigation of halogenated byproducts formation by electrochemical sorption/oxidation/reduction using activated carbon based three-dimensional particle electrode.

#### AWARDS

- 2018 Best Paper Award, Journal of Soil and Groundwater Environment
- 2016 Best Paper Award, Journal of Soil and Groundwater Environment

#### SOCIETY SERVICE AND MEMBERSHIP

- 2017~present Director, Journal of Korean Society on Water Environment
- 2017~present Director, The Corrosion Science Society of Korea Education
- 2017~present Director, Korean Society of Ecology and Infrastructure Engineering
- 2016~present Director, Korean Society of Water and Wastewater

#### PUBLICATIONS

Activation of persulfate by Nanosized Zero-valent Iron (NZVI): Mechanisms and transformation products of NZVI, *Environmental Science & Technology*, 52, 3625–3633 (2018)

Reciprocal influences of dissolved organic matter and nanosized zero-valent iron in aqueous media, *Chemosphere*, 193, 936–942 (2018)

Effects of oxidants on in situ treatment of a DNAPL source by nanoscale zero-valent iron: A field study, *Water research*, 107, 57–65 (2016)



## Environmental Analysis and Monitoring Lab.

### Prof. Jeong-Eun Oh

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#### EDUCATION

- 2001 Ph.D. POSTECH Dept. of Environmental Engineering
- 1996 M.S. Seoul National Univ. Environmental Studies
- 1994 B.S. Ewha Womans Univ. Chemistry

#### CAREER

- 2004~present Professor, Pusan National University
- 2009~2010 Visiting scholar, USGS
- 2003~2004 Postdoctoral Researcher, US EPA
- 2002 Postdoctoral Researcher, Georgia Tech, USA

#### RESEARCH FIELD

**Development of Analytical Methods for Environmental Micropollutants** : Analysis of POPs (persistent organic pollutants), pesticides EDCs(endocrine disruptors) and Emerging compounds like PPCPs (pharmaceuticals and personal care products) and illicit drugs etc in environmental and human samples

**Occurrence and Fate of Micropollutants in the Environment** : Identification of major sources of micropollutants, investigation of occurrence and fate of micropollutants in the environment

**Target/Suspect/Nontarget Analysis** : Identification of unknown chemicals in environmental samples using LC-Q-TOF/MS and GC-Q-TOF/MS

**Monitoring of Micropollutants with Passive Sampling Techniques** : Development of environmental monitoring techniques using various passive samplers (ex ; SPMD, POSIS, LDPE etc)

**Human and Environmental Risk Assessment** : Evaluation of exposure pathways, human health and environmental risk assessment

#### AWARDS

- 2015 Research Award , The Korean Society for Environmental Analysis

#### SOCIETY SERVICE AND MEMBERSHIP

- 2018~present Environmental Engineering Research, SCIE Journal, Editorial Board Member
- 2014, 2018 STOTEN SCI journal, Special Issue, Guest Editor
- 2016~present Emerging Contaminants, International Journal, Editorial Board Member
- 2013~2016 Environmental Analysis, Domestic Journal, Editor-in-Chief

#### PUBLICATIONS

Tissue-specific distribution and bioaccumulation potential of organophosphate flame retardants in crucian carp, *Environmental Pollution*, 239, 161-168 (2018)

PFDEs and their structural analogues in marine environments: Fate and expected formation mechanisms compared with diverse environments, *Journal of Hazardous Materials*, 343, 116-124, (2018)

Evaluation of the current contamination status of PFASs and OPFRs in South Korean tap water associated with its origin, *Science of The Total Environment*, 634, 1505-1512 (2018)



## Lab. of Environmental Microbiology and Energy

### Prof. Taeho Lee

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#### EDUCATION

- 1999 Ph.D. Osaka Univ. Japan  
Environmental Engineering
- 1995 M.S. Pusan National Univ.  
Environmental Engineering
- 1993 B.S. Pusan National Univ.  
Environmental Engineering

#### CAREER

- 2018~present Chairman, Busan Global Water Forum
- 2017~present Director, Institute of Environment and Energy, PNU
- 2014~present Professor, Pusan National University

#### RESEARCH FIELD

##### Microbial fuel cell for wastewater treatment

Application of microbial fuel cell technology to treat wastewater and generate electricity simultaneously.

##### ANAMMOX process for nitrogen removal

Development of single-stage ANAMMOX processes to remove nitrogen compounds from different types of wastewater.

##### DNA based microalgae monitoring

Development of molecular monitoring method to detect harmful microalgae in algal blooms.

##### Microalgae based biorefinery

Production of value-added compounds from microalgae (Euglena) by using recycled resources.

#### AWARDS

- 2018 Academic Research Award, Korea Society of Environmental Engineers
- 2017 Outstanding Contribution Award, Busan City

#### SOCIETY SERVICE AND MEMBERSHIP

- 2018~present Vice-president, Korean Society of Environmental Engineers
- 2017~present Chairman of Korean organizing committee, Asia Society of Microbial Ecology Meeting
- 2016~present Board member, International Society for Microbial Electrochemistry and Technology (ISMET)
- 2016 Conference chairman, Asia-Pacific ISMET conference

#### PUBLICATIONS

Characterization of diversified Sb(V)-reducing bacterial communities by various organic or inorganic electron donors, *Bioresource Technology*, 250, 239–246 (2018)

Comparison of trophic modes to maximize biomass and lipid productivity of microactinium inermum NLP-F014, *Biotechnology and Bioengineering*, 23(2), 238–245 (2018)

Sidestream Deammonification, *Korean Society of Water Environment*, 34(1), 109–120 (2018)

Response of microbial community structure to pre-acclimation strategies in microbial fuel cells for domestic wastewater treatment, *Bioresource Technology*, 233, 176–183 (2017)



## Lab. of Particle & Sustainable Technology

### Prof. Kuk Cho

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#### EDUCATION

- 2005 Sc.D. Washington Univ. in St. Louis  
Environmental Engineering
- 2002 M.S. Univ. of Florida  
Environmental Engineering
- 1996 B.S. Korea Univ.  
Environmental Engineering

#### CAREER

- 2011~present Professor, Pusan National University
- 2010~2011 Professor, University of Science and Technology
- 2006~2011 Senior researcher, Korea Institute of Geoscience and Mineral Resources
- 2005~2006 Research associate, University of Maryland

#### RESEARCH FIELD

##### Investigation and Prevention of Health risk of fine Particles

Fine particles, such as PM<sub>2.5</sub>, PM<sub>10</sub>, are a serious environmental problem. We analyze the relationship between diseases and particle characteristics including particle size and composition, provide the individuated risk information using information and communication technology, and develop the removal technology of fine particles.

##### Removal of Radionuclides

Using fine particles, we study the removal technologies of radionuclides from water and air. The fine particle with a functional group or structure (nanofiber, nanocage, etc.) can selectively remove radionuclides. There will be many demands of this technology because many nuclear power plants worldwide are running and are scheduled to be dismantled soon.

#### AWARDS

- 2015 Best presentation, Korean Association for Particle and Aerosol Research
- 2014 Best presentation, Korean Society of Environmental Engineers

#### SOCIETY SERVICE AND MEMBERSHIP

- 2017 Panelist for fine dust, Busan MBC TV
- 2015~2018 Technical advisor, Korea Environment Corporation
- 2014~2016 Editorial board, Korean Association for Particle and Aerosol Research
- 2011~present Member, Korean Radioactive Waste Society

#### PUBLICATIONS

Selective adsorption of cesium from an aqueous solution by a montmorillonite–prussian blue hybrid. *Chemical Engineering Journal*, 349, 595–602 (2018)

Capture of ultrafine particles using a film–type electret filter with a unipolar charger. *Aerosol and Air Quality Research*, 17(2), 626–635 (2017)

Role of chemical hardness in the adsorption of hexavalent chromium species onto metal oxide nanoparticles. *Chemical Engineering Journal*, 273, 401–405 (2015)



## Photon Energy Upconversion Lab.

### Prof. Jae-Hyuk Kim

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#### EDUCATION

- 2009 Ph.D. Seoul National Univ.  
Dept. of Chemical and  
Biological Engineering
- 2002 B.S. Seoul National Univ.  
Chemical Engineering

#### CAREER

- 2018~present Associate professor,  
School of Chemical and  
Environmental Engineering
- 2014~2018 Assistant professor,  
School of Chemical and  
Environmental Engineering
- 2013~2014 Postdoctoral associate,  
Yale University
- 2010~2013 Postdoctoral researcher,  
Georgia Tech

#### RESEARCH FIELD

Our research group is currently focusing on exploring the unconventional photochemical phenomenon, called upconversion(UC). Upconversion refers to a process that achieves photon-frequency amplification or anti-Stokes shift via sequential absorption of two or more photons with lower energy and subsequent emission of one higher energy photon. Among various UC mechanisms, triplet-triplet annihilation upconversion (TTA-UC) has gathered increasing attention by boasting the advantage of a high quantum yield at noncoherent, low excitation intensity close to sunlight.

**Fabrication of polymeric TTA-UC materials** includes the development of solid-state (i) UC soft materials with high efficiency/stability and (ii) 3D-printable UC architectures.

**Synthesis of new micro/nano-systems for TTA-UC** includes the fabrication of (i) various nanohybrid structures and (ii) microfluidic emulsion for high performance aqueous-phase photon upconversion.

**Application TTA-UC to energy, environmental and biomedical engineering** refers to achieving the enhancement of the efficiency of solar-based technologies such as solar cells and photocatalysis, as well as exploring unconventional UC-based applications such as anti-counterfeiting, anti-Stokes emission-based bio-imaging and drug photo-release by integrating our as-developed high efficiency TTA-UC materials.

#### AWARDS

- 2014 Outstanding Young Researcher Award, Korean Society of Environmental Engineers
- 2015 Young Researcher Award, Korean Society of Industrial and Engineering Chemistry

#### SOCIETY SERVICE AND MEMBERSHIP

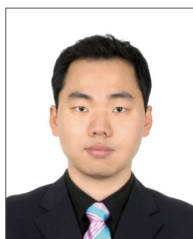
- 2015~present Director, Water & Future City Institute
- 2016~present Member, Korean Institute of Chemical Engineers, Department of Energy and Environment

#### PUBLICATIONS

Flexible and micropatternable triplet-triplet annihilation upconversion thin films for photonic device integration and anticounterfeiting applications, *ACS Applied Materials & Interfaces*, 10(10), 8985-8992 (2018)

Synergetic effect of graphene oxide nanosheets embedded in the active and support layers on the performance of thin-film composite membranes, *Journal of Membrane Science*, 525, 99-106 (2017)

Triplet-triplet annihilation upconversion in CdS-decorated SiO<sub>2</sub> nanocapsules for sub-bandgap photocatalysis, *ACS Applied Materials & Interfaces*, 7(1), 318-325 (2015)



## Nanoparticle/Aerosol Research Lab.

### Prof. Changhyuk Kim

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#### EDUCATION

- 2016 Ph.D. Univ. of Minnesota,  
Mechanical Engineering
- 2007 M.S. Seoul National Univ., Mechanical  
and Aerospace Engineering
- 2005 B.S. Seoul National Univ., Mechanical  
and Aerospace Engineering

#### CAREER

- 2018~present Assistant Professor, Pusan  
National University
- 2016~2018 Postdoctoral Scholar,  
Caltech, USA
- 2010~2011 Researcher, IAMD, Seoul  
National University
- 2007~2010 Researcher, Samsung SDI,  
Co. R&D Center

#### RESEARCH FIELD

**Technology for detecting/reducing air pollutants (PM<sub>2.5</sub> and SO<sub>x</sub>/NO<sub>x</sub>/VOCs) :** Air pollutants including PM<sub>2.5</sub> and its gaseous precursors (SO<sub>x</sub>/NO<sub>x</sub>/VOCs) have detrimental effects on the human health, environment, and semiconductor industry. We develop materials, instruments and integrated systems to 1) determining physicochemical properties (size, composition, concentration, etc.) of air pollutants, such as aerosols and gaseous chemicals, and 2) reduce their concentration in the air for achieving better quality of the air.

**Nucleation and growth mechanism of secondary aerosols :** Secondary particles formed from gaseous precursors through complicate physical/chemical processes consist of ~60% of PM<sub>2.5</sub>. We investigate the mechanism for transforming gaseous precursors into secondary aerosols to understand their characteristics and deploy the knowledge for developing technologies to detect/reducing air pollutants.

**Applying nanoparticle/aerosol technology to develop nano-energy/bio devices :** Nanoparticles are attractive due to their unique properties, which are not found in bulk materials. We develop energy-efficient and health-beneficial devices by employing nanoparticles and aerosol technology.

#### AWARDS

- 2012 Best Poster Award, 31st American Association for Aerosol Research (AAAR) Conference, USA
- 2014 Best Poster Award, 33rd American Association for Aerosol Research (AAAR) Conference, USA
- 2015 American Filtration Society (AFS) Fellowship, USA
- 2018 Outstanding Reviewer, Carbon, American Carbon Society, USA

#### SOCIETY SERVICE AND MEMBERSHIP

- 2005~present Member, Korean Society of Mechanical Engineers (KSME)
- 2011~present Member, Korean Society of Environmental Engineers (KSEE)
- 2018 Lecturer, KAPAR 2nd Aerosol Short Course

#### PUBLICATIONS

Rapid growth of organic aerosol nanoparticles over a wide tropospheric temperature range, *Proceedings of the National Academy of Sciences*, 115(37), 9122–9127 (2018)

The effect of filtered nanoparticles on gas filtration efficiency of granular activated carbons, *Carbon*, 121, 63–71 (2017)

Removal of airborne sub-3nm particles using fibrous filters and granular activated carbons, *Carbon*, 104, 125–132 (2016)





## Water Treatment and Reuse Lab.

### Prof. Sanghyun Jeong

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Homepage : <https://sites.google.com/view/pnuwaterlab>

#### EDUCATION

- 2013 Ph.D. Univ. of Technology Sydney,  
Environmental Engineering
- 2009 M.S. Univ. of Sci. & Tech., Construction  
Environment Engineering
- 2005 B.S. Hong-ik Univ., Chemical  
Engineering

#### CAREER

- 2019~present Assistant Professor, Pusan  
National University
- 2017~2019 Research Professor,  
Sungkyunkwan University
- 2015~2017 Post-doc, WDRC, King  
Abdullah University of  
Science and Technology,  
Saudi Arabia
- 2007~2010 Research Associate,  
CTWW, Univ. of Technology  
Sydney, Australia

#### RESEARCH FIELD

**Advanced Water Treatment for Smart Cycling and Supply of Multiple Water Resources** : Future water city should have an efficient and sustainable cycle of resources and energy from various water resources including wastewater and seawater. We develop processes to 1) apply them to produce energy efficient demand responded water resources, and 2) recover nutrients, valuable materials and energy from the wastewater and seawater with simultaneous extraction water to use them in the future smart city.

**Membrane Fouling Monitoring and Control for Water Treatment** : Fouling is a significant challenge of membrane-based water treatment. We investigate the fouling mechanism using advanced monitoring and characterization techniques to control the fouling on the membranes used in various processes and applications.

**Development of Eco-friendly Industrial Wastewater Treatment for Reuse** : Water resources are limited and there have been an increasing need for zero emissions and reuse in industrial field. We develop eco-friendly industrial wastewater treatment for reuse, further to increase the productivity and economical benefit.

#### AWARDS

- 2016 Best Poster Award, 1st International Conference on Bioresource Technology for Bioenergy, Bioproducts & Environmental Sustainability, Sitges, Spain
- 2017 Best Award, World water challenge at Korean International Water Week, Gyeongju, South Korea
- 2017 Best oral presentation award of Ministry of Land, Infrastructure and Transport, International Desalination Workshop, Busan, South Korea

#### SOCIETY SERVICE AND MEMBERSHIP

- 2006~present Member, Korean Society of Environmental Engineering (KSEE)
- 2010~present Member, International Water Association (IWA), International Desalination Association (IDA)
- 2015~2017 Young Leaders Program Committee (YLPC), International Desalination Association (IDA)
- 2017~present Member, The Membrane Society of Korea (MSK), Korean Society of Civil Engineers (KSCE), The Korean Society of Industrial and Engineering Chemistry (KSIEC)

#### PUBLICATIONS (Recent 5 Years)

Chemical-free scale inhibition method for seawater reverse osmosis membrane process: Air micro-nano bubbles, *Desalination*, 461, 1–9 (2019)

Fouling development in direct contact membrane distillation: Non-invasive monitoring and destructive analysis, *Water Research*, 132, 34–41 (2018)

New concept of pump-less forward osmosis (FO) and low-pressure membrane (LPM) process, *Scientific Reports*, 7(1), 14569 (2017)





## Environmental Intelligence Lab.

Prof. JongCheol Pyo

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### EDUCATION

**2020 Ph.D.** Ulsan National Institute of Science and Technology, Urban and Environmental Engineering

**2015 B.S.** Ulsan National Institute of Science and Technology, Chemical engineering

### CAREER

**2022~present** Professor, Pusan National University

**2021~2022** Senior researcher, Center for environmental data strategy, Korea Environment Institute

**2020~2021** Postdoctoral researcher, Urban and Environmental Engineering, Ulsan National Institute of Science and Technology

### RESEARCH FIELD

#### Research on artificial intelligence technology development for water environment

We conduct research to comprehensively evaluate the health of aquatic ecosystems by predicting freshwater water quality and flow and classifying waterside vegetation through the development of deep learning integrated models and big data such as remote sensing data, GIS data, time series data, and modeling data.

#### Research on Artificial intelligence technology demonstration

Using digital twin technology, real-time environmental domains are implemented as virtual domains, and real-time water quality change and flood prediction studies are conducted through convergence with deep learning models. Based on this, we conduct research on the development of technology demonstration that can preemptively prepare for future environmental phenomena by analyzing the aquatic environment and disaster scenarios according to rapid climate change.

#### Advancement of environmental data-driven research

Automated processing of big data produced in multi-media (air, soil, groundwater) environments and deep learning model advancement research with explainable artificial intelligence (XAI) technology are researched on improving air pollution, soil pollution, and groundwater level prediction performance.

### Projects

**2021 - 2026** Sejong Science Fellowship, National Research Foundation of Korea, Development of integrated water environment management technology using remote sensing and artificial intelligence

### Conference

Korean Society of Environmental Engineering(KSEE)  
Advancing Earth and space science (AGU)  
European Geosciences Union (EGU)  
GeoAI

### Publications

34 SCI papers have been published (2017-2022)

A convolutional neural network regression for quantifying cyanobacteria using hyperspectral imagery, Remote Sensing of Environment, 2019

Using convolutional neural network for predicting cyanobacteria concentrations in river water, Water Research, 2020

Cyanobacteria cell prediction using interpretable deep learning model with observed, numerical, and sensing data assemblage, Water Research, 2021