

Hyun-Shik Chang, Ph.D.

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Education

PhD, Civil and Environmental Engineering, Mar. 2007

University of Washington, Seattle, WA

- Research Advisor : Dr. Gregory V. Korshin and Dr. John F. Ferguson
- Dissertation : Determination of Oxidation Mechanism of Ethylenediaminetetraacetate (EDTA)-Metal Complexes by Alkaline Permanganate and Structures of *In Situ* Formed Manganese Oxide Containing Heavy Metals

M.S.E., Civil and Environmental Engineering, Dec. 2001

University of Washington, Seattle, WA

- Research Advisor : Dr. Gregory V. Korshin and Dr. Mark M. Benjamin
- Thesis : Effects of Various Reaction Parameters on the Chlorination of Lake Washington Water : Studies Using the Method of Differential Absorbance

M.S.E., Environmental Engineering, Feb. 1998

Inha University, Incheon, Korea (R.O.K.)

- Research Advisor : Dr. Jaeho Bae
- Thesis : Effects of Temperature and Hydraulic Retention Time (HRT) on the Removal of Ammonia Nitrogen from Leachate in a Nitrification Reactor

B.S., Environmental Engineering, Feb. 1996

Inha University, Incheon, Korea (R.O.K.)

Research Experience

Geochemistry

Post Doctorate Research Associate, Pacific Northwest National Laboratory, 2009 – 2010

- Modeling of geochemical and transfer reactions for the contaminants released from the weathered sediments in Hanford Site using CrunchFlow.
- Design and conduct assorted saturated and unsaturated column experiments to study mineral transformation caused by contaminated caustic solutions.
- Development of stabilization method of Tc(VII) using various iron oxide minerals.
- Investigation of microscopic solid structure using advanced spectroscopic technique including SEM, XRD, XAFS, etc.
- Test of the glass material containing secondary waste from Hanford site radioactive waste treatment plant using various extraction techniques.

Research Assistant, University of Washington, 2000 – 2007

- Investigation of the behavior of manganese species and the breakdown pathways of EDTA-Metal complexes in pretreatment process of the tank waste at Hanford site.
- Characterization of the morphology and structure of produced manganese oxides containing decomplexed heavy metals with SEM, SAA, XRD, XAFS at Brookhaven National Laboratory (BNL).

Summer Internship, Pacific Northwest National Laboratory (PNNL), 2004

- Study of the adsorption of Uranyl on Gibbsite at various pHs and ionic strengths in the absence of carbonate using TRLIFS under cryogenic conditions.
- Determination of the contribution of several distinct emission components using Evolving Factor Analysis (EFA) approach.

Water chemistry

Invited Professor, Kyungpook National University, South Korea, 2007 – 2008

- Development of an analytical method for Bisphenol-A (BPA) as an Endocrine Disrupting Compound (EDC) using Solid Phase Micro Extraction (SPME) and GC-MS.
- Investigation of the effect of Natural Organic Matter (NOM) on the analysis of BPA.

Research Assistant, University of Washington, 2000 – 2007

- Investigation of the NOM effect on the formation of Disinfection-By-Products (DBPs) during chlorination of natural water using 12 different water sources across the U.S.
- Development of a mechanistic model based on the changes of spectroscopic property of NOM.

Researcher, Inha University, South Korea, 1998 – 1999

- Examination of the pollutant loading from point and non-point source around Incheon coastal area.
- Investigation of the treatment options for livestock wastewater.
- Management of the water quality for Shiwha Lake project.

Research Assistant, Inha University, South Korea, 1996 – 1998

- Study of the removal of ammonia nitrogen ($\text{NH}_3\text{-N}$) from landfill leachate using biological nitrification and denitrification.
- Development of optimal landfill systems using lab-scale lysimeters.

Industrial Experience

Field Engineer, GeoEn Tech., Ltd., South Korea, 1999

- Operation and management of biological anaerobic-aerobic reactors for the treatment of leachate from food waste composting facility.

Teaching Experience

Invited Professor, Kyungpook National University, South Korea, 2007 – 2008

- Advanced water treatment processes, renewable energy and the effects on environment for senior.
- Structural mechanics for junior and senior.
- Creative engineering for sophomore.

Teaching Assistant, University of Washington, 2006

- TA in undergraduate class (CEE 350. Introduction to Environmental Engineering: Air and Water).

Laboratory Teaching Assistant, University of Washington, 2002

- TA in graduate school class (CEE 599. Advanced Environmental Analyses Laboratory).

Professional Registration

American Chemical Society (ACS) member, 2007 – present.

American Water Works Association (AWWA) member, 2006 – 2008.

Licensed EIT (Engineer-In-Training), state of Washington, 2004.

Publications

Journal

- **Chang, H.**; Um, W.; Rod, K. Modeling of Release Mechanisms of Strontium and Cesium from Contaminated Hanford Sediment under Unsaturated Column Conditions. *Environmental Science and Technology*, **2010**, in preparation.
- **Chang, H.S.**; Choo, K.H.; Lee, B., Choi, S.J. The methods of identification, analysis, and removal of endocrine disrupting compounds (EDCs) in water. *J. Hazardous Material*, **2009**, 172(1), 1-12.
- Korshin, G.V.; **Chang, H.S.** Chapter 12. Spectroscopic studies of the roles of distinct chromophores in NOM chlorination. Occurrence, Formation, Health Effects and Control of Disinfection By-Products in Drinking Water, **2008**. T. Karanfil, S.W. Krasner, P. Westerhoff, Y. Xie, Eds. ACS Symposium Series, American Chemical Society.
- Roccaro, P.; **Chang, H.S.**; Vagliasindia, F.G.A.; Korshin, G.V. Differential absorbance study of effects of temperature on chlorine consumption and formation of disinfection byproducts in chlorinated water. *Water Research*, **2008**, 42(8-9), 1879-1888.
- Korshin, G.V.; Benjamin, M.M.; **Chang, H.S.**; Gallard, H. Examination of NOM chlorination reactions by conventional and stop-flow differential absorbance spectroscopy. *Environmental Science and Technology*, **2007**, 41(8), 2776-2781.
- Korshin, G.V.; **Chang, H.S.**; Frenkel, A.I.; Ferguson, J.F. Structural study of the incorporation of heavy metals into solid phase formed during the oxidation of EDTA by permanganate at high pH. *Environmental Science and Technology*, **2007**, 41(7), 2560-2565.
- **Chang, H.S.**; Korshin, G.V.; Ferguson, J.F. Investigation of mechanisms of oxidation of EDTA and NTA by permanganate at high pH. *Environmental Science and Technology*, **2006**, 40(16), 5089-5094.

- **Chang, H.S.;** Korshin, G.V.; Wang, Z.M.; Zachara, J.M. Adsorption of uranyl on gibbsite: A time-resolved laser-induced fluorescence spectroscopy study. *Environmental Science and Technology*, **2006**, 40(4), 1244-1249.
- Korshin, G.V.; **Chang, H.S.;** Wang, Z.M.; Zachara, J.M. Speciation of uranyl adsorbed on gibbsite: A time-resolved laser-induced fluorescence spectroscopic study. *Geochimica et Cosmochimica Acta*, **2005**, 69(10), A619-A619.
- Bae, J.H.; Kim, S.K.; **Chang, H.S.** Treatment of Landfill Leachates: Ammonia Removal via Nitrification and Denitrification and Further COD Reduction via Fenton's Treatment Followed by Activated Sludge. *Water Science & Technology*, **1997**, 366(12), 341-348.

Project Report

- Um, W.; Truex, M.J.; Valenta, M.M.; Iovin, C.; Kutnyakov, I.V.; **Chang, H.;** Clayton, R.E.; Serne, R.J.; Ward, A.L.; Brown, C.F.; Geiszler, K.N.; Clayton, E.T.; Baum, S.R.; Smith, D.M. *Characterization of Sediments from the Soil Desiccation Pilot Test (SDPT) Site in the BC Cribs and Trenches Area*. **2009**, PNNL-18800, Pacific Northwest National Laboratory, Richland, WA.
- Benjamin, M.M.; Korshin, G.V.; **Chang, H.** Modeling DBP Formation Kinetics: Mechanistic and Spectroscopic Approaches. 2005, AwwaRF Report 91000F.

Presentations

- **Chang, H.,** Um, W., Rod, K. "Release Mechanisms of Strontium and Cesium from Contaminated Hanford Sediment under Saturated and Unsaturated Column Conditions", *MIGRATION '09*, Sep. 2009, Kennewick, WA
- **Chang, H.S.,** Korshin, G.V., Benjamin, M.M. "In-Depth Study of Effects of Reaction Parameters on the Formation of Disinfection By-Products in Chlorinated Lake Washington Water Using the Method of Differential Absorbance", *PNWS-AWWA 2002 annual conference*, May. 2002, Eugene, OR.
- **Chang, H.S.,** Korshin, G.V., Benjamin, M.M. "A Kinetic Model for Formation of Chlorinated Disinfection Byproducts", *Water Quality Technology Conference*, Nov. 2002, Seattle, WA.
- **Chang, H.S.,** Korshin, G.V., and Benjamin, M.M., "Development of a Detailed Mechanistic Kinetic Model for Formation of Disinfection By-products during Chlorination", *PNWS-AWWA 2002 annual conference*, May. 2004, Bellevue, WA.