

## **CHUL PARK**

Assistant Professor

Department of Civil and Environmental Engineering

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## **EDUCATION**

Ph.D. Civil Engineering, 2007, Virginia Tech, Blacksburg, VA

M.S. Environmental Engineering, 2002, Virginia Tech, Blacksburg, VA

B.S. Environmental Engineering, 2000, Yeungnam University, Korea

## **PROFESSIONAL EXPERIENCE**

- Assistant Professor, Department of Civil and Environmental Engineering, University of Massachusetts, September 2007 - present
- Research Assistant, Virginia Tech, 2001 – 2006
- Study Abroad Scholar Civil Engineering, 1998-99, Washington St. Univ., Pullman, WA

## **RESEARCH INTERESTS**

- Activated sludge, biofilm, and MBR wastewater treatment processes
- Anaerobic digestion
- Renewable bioenergy: hydrogen and methane
- Reduction of excess sludge generation
- Role of metals and extracellular polymeric substances in bacterial aggregation
- Metaproteomics and metagenomics
- Characterization of effluent organic nitrogen and effect on receiving water eutrophication

## **TEACHING**

- CEE 370 Environmental Engineering Principles
- CEE 575 Hazardous Waste Management
- CEE 671 Biological Processes in Environmental Engineering

## **REGISTRATION**

- Engineer in Training, Virginia, 2008

## **PATENT**

- Effect of cations on activated sludge characteristics, No.20040149661, August 5, 2004

## **HONORS & AWARDS**

- Finalist, University Research & Entrepreneurship Symposium, Cambridge, MA 2009
- Finalist, CVIP Technology Development Awards, University of Massachusetts, 2009
- Graduate Research & Development Program Award, Virginia Tech, 2006
- Sussman Fellowship, Edna Bailey Sussman Foundation, 2004
- Paul E. Torgersen Research Excellence Award, Virginia Tech, 2003
- International Exchange Program Scholarship, Yeungnam University, 1998
- Best Academic Performance, Environmental Engineering, Yeungnam University, 1997

## **REFEREED JOURNAL PUBLICATIONS**

- Chon, D.H., Rome, M., Kim, H.S., and Park, C. (under review) Investigating the mechanism of sludge reduction in activated sludge with an anaerobic side-stream reactor. *Water Science and Technology*.
- Park, C., Fang, Y., Murthy, S.N., and Novak, J.T. (under review) Effects of floc aluminum on activated sludge characteristics and removal of 17- $\alpha$ -ethinylestradiol in wastewater treatment systems. *Water Research*.
- Kim, J., Park, C., and Novak, J.T. (under review) Combination of coagulating agents (alum and cationic polymer) for sludge dewatering and odors. *Korean Society of Civil Engineers Journal of Civil Engineering*.
- Baek, K.H., Park, C., Oh, H.M., Yoon, B.D., and Kim, H.S. (In revision) Diversity and abundance of ammonia-oxidizing bacteria in activated sludge treating different types of wastewater. *Journal of Microbiology and Biotechnology*.
- Ostendorf, D., Park, C., Rotaru, C., and Pereira, M. (In press) A case study of steady oxygen concentration gradients in a groundwater plume from a highway infiltration basin. *ASCE Journal of Environmental Engineering*.
- Park, C. and Novak, J.T. (2009) Characterization of lectins and bacterial adhesins in activated sludge flocs. *Water Environment Research*, **81**, 755-764.
- Park, C. and Helm, R.F. (2008) Application of metaproteomic analysis for studying extracellular polymeric substances (EPS) in activated sludge flocs and their fate in sludge digestion. *Water Science and Technology*, **57**, 2009-2015.
- Park, C., Helm, R.F., and Novak, J.T. (2008) Investigating the fate of activated sludge exocellular proteins in sludge digestion using sodium dodecyl sulfate polyacrylamide gel electrophoresis (SDS-PAGE). *Water Environment Research*, **80**, 2219-2227.
- Park, C., Novak, J.T., Helm, R.F., Ahn, Y., and Esen, A. (2008) Evaluation of the extracellular proteins in full-scale activated sludges. *Water Research*, **42**, 3879-3889.
- Novak, J.T., Park, C., Higgins, M.J., Chen, Y.-C., Morton, R., Gary, D., Forbes, R., and Erdal, Z. (2007). Impacts of the MicroSludge™ process on odor causing compounds in anaerobically digested biosolids. *Water Practice*, **1**.
- Park, C. and Novak, J.T. (2007) Characterization of activated sludge exocellular polymers using several cation-associated extraction methods. *Water Research*, **41**, 1679-1688.
- Park, C., Muller, C.D., Abu-Orf, M.M., and Novak, J.T. (2006). The effect of wastewater cations on activated sludge characteristics: effects of aluminum and iron in floc. *Water Environment Research*, **78**, 31-40.
- Park, C., Abu-Orf, M.M., and Novak, J.T. (2006). The digestibility of waste activated sludges. *Water Environment Research*, **78**, 59-68.
- Novak, J.T., Park, C., and Abu-Orf, M.M. (2005). "Conditioning and dewatering of digested waste activated sludges"-Closure. *Journal of Residuals Science and Technology*, **2**, 110-112.
- Novak, J.T. and Park, C. (2004). Chemical conditioning of sludge. *Water Science and Technology*, **49**, 73-80.
- Novak, J.T., Park, C., and Abu-Orf, M.M. (2004). Conditioning and dewatering of digested waste activated sludges. *Journal of Residuals Science and Technology*, **1**, 45-51.
- Abu-Orf, M.M., Muller, C.D., Park, C., and Novak, J.T. (2004). Innovative technologies to reduce water content of dewatered municipal residuals. *Journal of Residuals Science and Technology*, **1**, 83-91.

## **INVITED JOURNAL ARTICLES**

- Park, C. and Novak, J.T. Characterization of lectins and bacterial adhesins in activated sludge flocs. *Water Environment Research. Special WER thematic issue on biological treatment*; see Park and Novak (2009) under Refereed Journal Publications
- Park, C., Helm, R.F., and Novak, J.T. Investigating the fate of activated sludge exocellular proteins in sludge digestion using sodium dodecyl sulfate polyacrylamide gel electrophoresis (SDS-PAGE). *Water Environment Research. Special WER thematic issue on Bacterial Aggregation and Flocculation in 2008*; see Park et al. (2008) under Refereed Journal Publications

## **CONFERENCE PROCEEDINGS**

- Park, C., Nüsslein, K., Teague, P, and Wang, M. (2009) Effects of Feeding patterns on activated sludge characteristics and its digestibility in anaerobic digestion. *Oral presentation and conference proceeding, Water Environment Federation 82<sup>nd</sup> Annual Technical Exhibition and Conference (WEFTEC 2009), Orlando, FL.*
- Westgate, P. and Park, C. (2009) Evaluation of effluent proteins: Toward characterizing effluent organic nitrogen. Poster presentation and conference proceedings, *Water Environment Federation 82<sup>nd</sup> Annual Technical Exhibition and Conference (WEFTEC 2009), Orlando, FL.*
- Park, C., Nüsslein, K., Zhang, C., Teague, P, and Wang, M. (2009) Effects of Feeding Conditions on Activated Sludge Characteristics and Anaerobic Digestion. *Oral presentation and conference proceeding, Water Environment Federation 23rd Annual Residuals Biosolids Management Conference, Portland, OR.*
- Park, C. and Novak, J.T. (2008) Characterization of Lectins and Bacterial Adhesins in Activated Sludge Flocs. *Oral presentation and conference proceeding, Water Environment Federation 81<sup>th</sup> Annual Technical Exhibition and Conference (WEFTEC 2008), Chicago, IL.*
- Park, C. and Helm, R.F. (2008) Application of metaproteomic analysis for studying extracellular polymeric substances (EPS) in activated sludge flocs and their fate in sludge digestion. *Oral presentation and conference proceeding, International Water Association (IWA) Water Congress, Vienna, Austria.*
- Park, C. and Novak, J.T. (2007) Investigating the fate of activated sludge exocellular proteins in sludge digestion using sodium dodecyl sulfate polyacrylamide gel electrophoresis (SDS-PAGE). *Oral presentation and conference proceeding, Water Environment Federation 80<sup>th</sup> Annual Technical Exhibition and Conference (WEFTEC 2007), San Diego, CA.*
- Novak, J.T., Park, C., Higgins, M.J., Chen, Y.-C., Morton, R., Gary, D., Forbes, R., and Erdal, Z. (2007). WERF Odor study phase III: Impacts of the microsludge process on odor causing compounds. *Oral presentation and conference proceeding, Water Environment Federation 21<sup>st</sup> Annual Residuals Biosolids Management Conference, Denver, CO.*
- Muller, C.D., Park, C., Verma, N., and Novak, J.T. (2007). The Influence of Anaerobic Digestion on Centrifugally Dewatered Biosolids Odors. *Oral presentation and conference proceeding, Water Environment Federation 21<sup>st</sup> Annual Residuals Biosolids Management Conference, Denver, CO.*
- Verma, N., Park, C., Novak, J.T., Erdal, Z., Forbes, B., and Morton, R. (2006). Effects of anaerobic digester sludge age on odors from dewatered biosolids. *Oral presentation and conference proceeding, Water Environment Federation 79<sup>th</sup> Annual Technical Exhibition and Conference (WEFTEC 2006), Dallas, TX.*

- Park, C., Abu-Orf, M.M., and Novak, J.T. (2006). Investigation of extracellular polymeric substances in activated sludge flocs; their structural links with key floc cations and fates in sludge digestion. *Oral presentation and conference proceeding, International Water Association (IWA) Specialized Conference-Sustainable sludge management: state of the art, challenges and perspectives, Moscow, Russia.*
- Park, C., Abu-Orf, M.M., and Novak, J.T. (2005). Activated sludge extracellular polymeric substances extracted by different cation-targeted extraction methods: their key roles in floc structure and sludge digestibility. *Poster presentation and conference proceeding, International Water Association (IWA) 3<sup>rd</sup> Leading Edge Conference on Water and Wastewater Treatment Technology, Sapporo, Japan.*
- Park, C. and Novak, J.T. (2005). Characterization of floc structure using different extraction methods. *Oral presentation and conference proceeding, Water Environment Federation 19<sup>th</sup> Annual Residuals Biosolids Management Conference, Nashville, TN.*
- Park, C., Abu-Orf, M.M., and Novak, J.T. (2004). Analysis of floc structure and predicting sludge digestibility using different cation-associated EPS extraction methods. *Oral presentation and conference proceeding, Water Environment Federation 77<sup>th</sup> Annual Technical Exhibition and Conference (WEFTEC 2004), New Orleans, LA.*
- Abu-Orf, M.M., Laquidara, M., Muller, C.D., Park, C., and Novak, J.T. (2004). Adjusting floc cations to improve effluent quality: the case of aluminum addition at Sioux City wastewater treatment facility. *Oral presentation and conference proceeding, Water Environment Federation 77<sup>th</sup> Annual Technical Exhibition and Conference (WEFTEC 2004), New Orleans, LA.*
- Holbrook, R.D., Wagner, M., Mahoney, C., Wight, S., Park, C., and Novak, J.T. (2004). Investigating the structure of activated sludge flocs: morphologic and compositional characterization of surface and bulk components. *Oral presentation and conference proceeding, Water Environment Federation 77<sup>th</sup> Annual Technical Exhibition and Conference (WEFTEC 2004), New Orleans, LA.*
- Novak, J.T. and Park, C. (2003). Chemical conditioning of sludge. *Oral presentation and conference proceeding, International Water Association (IWA)-International Conference on Wastewater Sludge as a Resource - Biosolids 2003, Trondheim, Norway.*
- Park, C., Abu-Orf, M.M., and Novak, J.T. (2003). Predicting the digestibility of waste activated sludges using cation analysis. *Oral presentation and conference proceeding, Water Environment Federation 76<sup>th</sup> Annual Technical Exhibition and Conference (WEFTEC 2003), Los Angeles, CA.*

### **CONFERENCE ABSTRACTS & PRESENTATIONS**

- Westgate, P. and Park, C. (2009) Characterizing the proteins in domestic wastewater effluent discharged to the Connecticut River using proteomics technology. *Oral presentation, 2009 Sixth Annual Massachusetts Water Resources Research Conference: Integrating Water Resources Management at UMass Amherst.*
- Teague, P., Zhang, C., and Park, C. (2008) Effect of Reactor Configuration on Activated Sludge Characteristics and Subsequent Anaerobic Digestion. *Poster presentation, 2008 REU Poster Session at UMass Amherst.*
- Park, C. (2008) Impact of Wastewater Metals on Bioflocculation of Activated Sludge and Its Effect on Wastewater Effluent Quality. *Oral presentation, 2008 Fifth Annual Massachusetts Water Resources Research Conference: Integrating Water Resources Management at UMass Amherst.*

## **INVITED PRESENTATIONS**

- Assessing the Role of Activated Sludge Microbial Physiology in Sludge Treatment, Korea Institute of Science and Technology, Jul 2009
- Assessing the Role of Activated Sludge Microbial Physiology in Sludge Treatment, Seongkyunkwan University, Jul 2009
- Assessing the Role of Activated Sludge Microbial Physiology in Sludge Treatment, Samsung Engineering, Jul 2009
- Novel and better H<sub>2</sub> yielding wastewater treatment technology, University Research Entrepreneur Symposium, Cambridge, MA, Mar 2009
- Flocs, metals, extracellular polymers, and metaproteomics in biological wastewater engineering, Graduate Program Seminar at Department of Microbiology, University of Massachusetts Amherst, Oct 2007
- Exocellular polymers and cations: their impact on activated sludge flocs and a vision for the future of wastewater treatment, Graduate Program Seminar at Department of Civil and Environmental Engineering, University of Massachusetts Amherst, Sep 2007
- The impact of metals on activated sludge characteristics and sludge digestibility, Graduate Program Seminar at Department of Civil and Environmental Engineering, Virginia Tech, Sep 2004
- Cations and Activated sludge floc structure, Department of Civil and Environmental Engineering, Korea University, Jul 2004
- The role of cations in bioflocculation of activated sludge, Paul E. Torgersen Research Excellence Award Ceremony, Virginia Tech, Sep 2003

## **GRANT ACTIVITY**

- A sustainable process to capture and store CO<sub>2</sub> to increase production of renewable bioenergy, UMass Amherst Subcontract (Co-PI, Sarina Ergas) to Biowater Technology to Norwegian Research Council, 7/09 ~ 6/12, \$274,000, NRC funded; Final negotiation for subcontract
- Natural Attenuation of Ethylene Dibromide (1,2-Dibromoethane [EDB]) at MMR, The Air Force Center for Engineering and the Environment, PI (Co-PI, Sarina Ergas and Klaus Nüsslein), 7/09 ~ 6/10, \$183,111.
- Assessing the transport and fate of effluent organic nitrogen in the Connecticut River and Long Island Sound using mass-mapping proteomics technology, Matching fund to U.S Geological Survey's Water Resources Annual Institute Program from the Massachusetts Water Resources Research Center, Springfield Water and Sewer Commission, PI, 4/09 ~ 3/10, \$30,000.
- Assessing the transport and fate of effluent organic nitrogen in the Connecticut River and Long Island Sound using mass-mapping proteomics technology, U.S Geological Survey's Water Resources Annual Institute Program from the Massachusetts Water Resources Research Center, PI, 4/09 ~ 3/10, \$30,000.
- Phenotypic characteristics of activated sludge generated under different feeding conditions and implications for wastewater treatment performance and sludge treatment, Faculty Research Grant/Healey Endowment Grant, University of Massachusetts, PI, 9/08 ~ 8/09, \$30,000.
- Characterization of wastewater effluent from Western Massachusetts publicly owned treatment works using metaproteomic analysis, U.S Geological Survey's Water Resources Annual Institute Program from the Massachusetts Water Resources Research Center. Graduate student project, PI (Graduate student: Pamela Westgate), 4/07 ~ 3/09,

\$5,000.

### **COMMITTEE**

- New England Water Environment Association Residuals Management Committee, February 2008 – present

### **STUDENT RESEARCH SUPERVISED**

#### **Committee Chair**

- Philip Teague, Effect of sludge physiology on enhanced anaerobic digestion, MS candidate, Sep 2009 – present
- Donke Yu, Evaluation of the fate of effluent organic nitrogen and proteins in the receiving water, MS candidate, Sep 2009 - present
- Robert McKeever, Bioremediation of EDB at MMR, MS candidate, Sep 2009 – present
- Diane Sheppard, Bioremediation of EDB at MMR, MS candidate, Sep 2009 – present
- Meng Wang, Effect of reactor configuration on activated sludge physiology, PhD candidate, Sep 2008 – present
- Dong-Hyun Chon, Mechanism of biological solids reduction processes, PhD candidate, Sep 2008 – present
- Pamela Westgate, Characterization of Proteins in Effluents from Three Wastewater Treatment Plants that Discharge to the Connecticut River, MS Environmental Engineering, Aug 2009

#### **Committee Member**

- Marina Pereira (Committee Chair: Dr. Dave Ostendorf), Vertical Dispersion and Oxygen Demand of Deicing Agent Contaminants from an Infiltration Basin in Plymouth, MS Environmental Engineering, March 2008
- Ryan Siegel (Committee Chair: Dr. Sarina Ergas), Bioretention Systems for Control of Non-Point Sources of Nitrogen, MS Environmental Engineering, June 2008

#### **Summer Research Experience for Undergraduates (REU)**

- Philip Teague, Impact of different feeding patterns on activated sludge characteristics and anaerobic digestion, University of Massachusetts Amherst Summer 2008

#### **Undergraduate Research Assistants**

- Meghan Krupka, University of Massachusetts Amherst Summer 2009 - present
- McNamara Rome, University of Massachusetts Amherst Spring 2009 - present
- Philip Teague, University of Massachusetts Amherst Fall 2007 – Summer 2009
- Chengyan Zhang, University of Massachusetts Amherst Fall 2007 – Summer 2008

### **JOURNAL REVIEWER**

- Bioresource Technology
- Environmental Engineering and Science
- Environmental Science and Technology
- Journal of Applied Microbiology
- Water Environment Research
- Water Practice
- Water Research

### **AFFILIATIONS**

- Association of Environmental Engineering and Science Professors

- International Water Association
- New England Water Environment Association
- Water Environment Federation