Bo Hyung Ryoo

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RESEARCH FOCUS

Inorganic/Physical Chemistry, Solid-State Materials, Nanoscience, Experiment *and* Theory.

EDUCATION

University of Pittsburgh, Department of Chemistry Pittsburgh, PA
M.S. Inorganic Chemistry *Aug. 2016 - Oct. 2019*
Research Advisor: Jill E. Millstone GPA:3.85

"Influence of Phosphine and Halide Ligands on the Properties of Undecagold Nanoclusters"

University of Pittsburgh, Department of Chemistry Pittsburgh, PA
Bachelor of Science in Chemistry *Aug. 2012 - Apr. 2016*
Minor: Physics

Saint Joseph High School Bridgeport, CT
High School Graduate *Sept. 2010 - Jun. 2012*

RESEARCH EXPERIENCE

SionTech Co. Ltd. Daejeon, S. Korea
Senior Researcher · Technical Research Personnel *Sep. 2019 - Sep. 2022*

- Designed improved capacitative deionization (CDI) cells for commercial/industrial water purification
- Developed new methods on large-scale chemical depolymerization of polyesters for plastic-recycling

University of Pittsburgh Pittsburgh, PA
Graduate Student Researcher under Dr. Jill Millstone *Apr. 2016 - Oct. 2019*

- Synthesized and analyzed atomically precise gold nanoclusters and understand their physical properties with the use of density functional theory (DFT)

University of Pittsburgh Pittsburgh, PA

Undergraduate Student Researcher for Dr. Jill Millstone *Sept. 2013 - Apr. 2016*

- Synthesized and analyzed gold nanoparticles (< 5nm) along with the use of DFT

Carnegie Mellon University Pittsburgh, PA

Undergraduate Student Researcher for Dr. David Yaron *Apr. 2014 - Oct. 2014*

- Modelled small metal-containing molecules with hotbit density functional tight binding theory (DFTB) calculation on atomic simulation environment (ASE) for faster and accurate geometry optimization

Korean Advanced Institute of Science and Technology Daejeon, S. Korea

High School Student Shadowing Under Dr. Yun-Ho Lee *May. 2011 - Oct. 2011*

- Designed metal and ligands for industrial energy efficient catalysts

PUBLISHED

9. Ryoo, B-H.; Lee, K-H.; Kang, K-S.; Kang, S-W.; Kim, Y-H.; Do, S-A. (Siontech Co, Ltd). Chemical Recycling Method of Polyester-based Polymer Waste. *KR. Patent* KR1020210087149, Jul. 2, 2021. *patent filed*

8. Kang, K-S.; Lee, K-H.; Do, S-A.; Kang, S-W.; Ryoo, B-H. (Siontech Co, Ltd). Recovery Method for Bis-hydroxyethyl Terephthalate from Polyethylene Terephthalate. *KR. Patent* KR10202100871497, Apr. 8, 2021. *patent filed*

7. Kang, K-S.; Lee, K-H.; Lee, H-I.; Ryoo, B-H.; Park, N-S.; Lee, K-H. (Siontech Co, Ltd). Energy-saving Ion Adsorption/Desorption Water Purification Apparatus and Energy-saving Water Purification Method. *US. Patent* US20220119288A1, Apr. 21, 2022. *patent pending*

6. Lee, K-H.; Ryoo, B-H.; Do, S-A.; Kang, K-S. (Siontech Co, Ltd). Capacitive Desalination Cell Performance Inspection Device. *KR. Patent* KR1020220067738, May. 25, 2022.

5. Kim, M-Y.; Kang, K-S.; Lee, K-H.; Ryoo, B-H. (Siontech Co, Ltd). Capacitive Deionization Electrode and Manufacturing Method Thereof. *KR. Patent* KR102327637B1, Nov. 11, 2021.

4. Kang, K-S.; Lee, K-H.; Park, N-S.; Yoo, H-W.; Ryoo, B-H. (Siontech Co., Ltd., Kyung Dong Navien Co., Ltd.). Deionization Electrode, Apparatus and Method for Deionization Electrode, Electrode Module and Deionization Module. *US. Patent* US2021221711A1, Jul. 22, 2021. *patent pending*

3. Kang, K-S.; Lee, K-H.; Ryoo, B-H. (Siontech Co., Ltd.). Apparatus and Method for Removing Boron Contained in Radioactive Waste Liquid. *KR. Patent* KR102346894B1, Jan. 4, 2022.

2. S.E. Crawford, B-H. Ryoo, N.L. Tolman, P.J. Straney, J. E. Millstone, "Controlling Gold Nanoparticle Shape Using Household Antioxidants: A Spectroscopy Study" *in preparation*

1. S.E. Crawford, C.M. Andolina, D.C. Kaseman, B-H. Ryoo, A.M. Smith, K.A. Johnston, J. E. Millstone, "Efficient Energy Transfer from Near-Infrared Emitting Gold Nanoparticles to Pendant Ytterbium(III)", *J Am Chem Soc.* **139(49)**, 17767-17770 (2017).

TECHNIQUES

Characterization

- X-ray Diffractometry **(XRD)**
- UV-visible spectroscopy **(UV-Vis)**
- Photoluminescence Spectroscopy
- Transmission Electron Microscope **(TEM)**
- Fourier Transform Infrared Spectroscopy **(FTIR)**
- Raman Spectroscopy **(Raman)**
- Electron Paramagnetic Resonance Spectroscopy **(EPR)**
- High Performance Liquid Chromatography **(HPLC)**

Wet Lab Techniques

- Metal nanomaterial syntheses
- Inert atmosphere techniques and syntheses
- Crystallization
- Pilot scale productions and engineerings

Computer Languages and Computational Chemistry

- Python
- Javascript

- Graphic design
  - Blender
  - Gimp
- Atomic Simulation Environment calculators (python based)
  - hotbit (DFTB)
  - GPAW (DFT)
  - ORCA (DFT)
- Other calculators
  - CP2K (DFT)
  - TURBOMOLE (DFT)

TEACHING EXPERIENCE

Teaching Assistance
@ University of Pittsburgh, Chemistry Dept.:

CHEM1430: Physical Chemistry Laboratory	Fall 2016 - Spring 2019
CHEM0110: General Chemistry I	Fall 2017
Laboratory Manuals for Honors General Chemistry	Summer 2017
CHEM0250: General Chemistry for Engineers I	Fall 2016

Undergraduate Teaching Assistance
@ University of Pittsburgh, Mathematics Dept.:

MATH0020: College Algebra	Spring 2015 - Spring 2016
Math tutor	Spring 2015 - Spring 2016

@ University of Pittsburgh, Chemistry Dept.:

Organic Chemistry I & II	Spring 2015 - Fall 2015
STEM-ulate Learning	Fall. 2014
General Chemistry	Fall 2013 - Spring 2014

FELLOWSHIPS

- Art & Science Tuition Scholarship — *Fall 2017 - Spring 2018*
  University of Pittsburgh
- Summer Research Fellowship — *Summer 2016*
  University of Pittsburgh

ONLINE COURSE CERTIFICATES

- Quantum Technology: Computing MicroMasters — *Purdue University*
- Differential Equation Xseries — *Massachusetts Institute of Technology*
- Machine Learning — *Coursera: Stanford University*
- Intellectual Property Law — *Coursera: University of Pennsylvania*

LANGUAGES

Korean	Fluent
English	Fluent
Russian	Early Intermediate

CIVIL STATUS

Military Service **Served** (Sep 2019 - Sep 2022)