



# Bo Hyung Ryoo

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## RESEARCH FOCUS

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

## EDUCATION

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**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

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

- Designed improved capacitive 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**

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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. *patent pending*
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

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## 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

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### *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

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

## ONLINE COURSE CERTIFICATES

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- Quantum Technology: Computing MicroMasters *Purdue University*
- Google IT Automation with Python Professional Certificate *Coursera: Google*
- Machine Learning *Coursera: Stanford University*
- Intellectual Property Law *Coursera: University of Pennsylvania*

## LANGUAGES

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Korean	Fluent
English	Fluent
Russian	Early Intermediate

## CIVIL STATUS

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Military Service   **Currently serving** (Sep 2019 - Sep 2022)