



# 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 Apr. 2016 - Aug. 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

## RESEARCH EXPERIENCE

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

- Designed and improved capacitive deionization (CDI) cells for commercial/industrial water purification
- Developed and tested new methods on large-scale chemical depolymerization of polyesters for plastic-recycling
- Filed and reviewed company's intellectual properties for patent transactions and managements

**University of Pittsburgh** Pittsburgh, PA  
*Graduate Student Researcher under Prof. Jill Millstone* Apr. 2016 - Aug. 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 Prof. Jill Millstone* Sept. 2013 - Apr. 2016

- Synthesized small gold nanoparticles (< 5nm) protected with various thiolated ligands and studied their properties using diverse analytical techniques

**Carnegie Mellon University** Pittsburgh, PA  
*Undergraduate Student Researcher for Prof. 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 Prof. Yun-Ho Lee* May 2011 - Jul. 2011

- Shadowed graduate students and learned about synthetic approaches on efficient inorganic catalysts for energy-related industrial applications

## PATENTS AND PUBLICATIONS

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8. 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 pending*
7. 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, Oct. 17, 2021. *patent pending*
6. 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* [granted in KR]
5. Lee, K-H.; Ryoo, B-H.; Do, S-A.; Kang, K-S. (Siontech Co, Ltd). Capacitive Desalination Cell Performance Inspection Device. *KR. Patent* KR1020220067738, Nov. 1, 2022.
4. 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.
3. 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* [granted in KR]
2. 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.
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).

## POSTER PRESENTATIONS

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6. Pittsburgh Quantum Institute Apr. 2018  
*Pittsburgh, PA*  
Understanding the Influence of Heavy Atoms in Photoluminescence of Noble Metal Nanoparticles
5. Pittsburgh Conference on Analytical Chemistry and Applied Spectroscopy Feb. 2018  
*Orlando, FL*  
Understanding the Influence of Heavy Atoms in Photoluminescence of Noble Metal Nanoparticles
4. University of Pittsburgh Recruitment Week Mar. 2017  
*Pittsburgh, PA*  
Nanoparticle Characterization and Surface Chemistry
3. University of Pittsburgh Recruitment Week Mar. 2016  
*Pittsburgh, PA*  
Nanoparticle Characterization and Surface Chemistry
2. University of Pittsburgh Undergraduate Poster Session Nov. 2014  
*Pittsburgh, PA*  
HPLC analysis on cholesterol in dairy products
1. University of Pittsburgh Undergraduate Poster Session Mar. 2013  
*Pittsburgh, PA*  
HPLC analysis on caffeine in commercial soda

## FELLOWSHIPS AND AWARDS

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- Art & Science Tuition Scholarship  
*University of Pittsburgh*
- Summer Research Fellowship  
*University of Pittsburgh*

*Fall 2017 - Spring 2018*

*Summer 2016*

## 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
- Crystallography
- Pilot scale productions and engineerings

### Computer Languages and Computational Chemistry

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

## TEACHING EXPERIENCE

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### *Teaching Assistance*

*@ University of Pittsburgh, Chemistry Dept.:*

CHEM1430: Physical Chemistry Laboratory  
CHEM0110: General Chemistry I  
Laboratory Manuals for Honors General Chemistry  
CHEM0250: General Chemistry for Engineers I

Fall 2016 - Spring 2019

Fall 2017

Summer 2017

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

## **ONLINE COURSE CERTIFICATES**

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- Quantum Technology: Computing MicroMasters
- Differential Equation Xseries
- Machine Learning
- Intellectual Property Law

*Purdue University*

*Massachusetts Institute of Technology*

*Coursera: Stanford University*

*Coursera: University of Pennsylvania*

## **LANGUAGES**

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Korean	Fluent
English	Fluent
Russian	Early Intermediate

## **CIVIL STATUS**

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