



Bo Hyung Ryoo

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RESEARCH FOCUS

Masters in Chemistry, Inorganic Nanomaterial Experiment *and* Theory.

EDUCATION

University of Pittsburgh, Chemistry Department

Master in Chemistry, Inorganic Chemistry

Research Advisor: Jill E. Millstone

Pittsburgh, PA

Aug. 2016 - Oct. 2019

GPA:3.85

“Influence of Phosphine and Halide Ligands on the Properties of Undecagold Nanoclusters”

University of Pittsburgh, Chemistry Department

Bachelor of Art and Science in Chemistry

Minor: Physics

Pittsburgh, PA

Aug. 2012 - Apr. 2016

Saint Joseph High School

High School Graduate

Bridgeport, CT

Sept. 2010 - Jun. 2012

RESEARCH EXPERIENCE

SionTech Co. Ltd.

Senior Researcher (Technical Research Personnel)

The research focuses on designing improved capacitative deionization (CDI) cells for commercial/industrial water purification and developing new methods on large-scale chemical depolymerization of polyesters for plastic-recycling.

Daejeon, South Korea

Sep 2019 - present

ChemRep

Computer Scientist

The research involves writing and open-sourcing complete python library used to execute machine learning (ML) algorithm for molecular representation

May 2019 - present

University of Pittsburgh

Graduate Student Researcher

Pittsburgh, PA

Apr. 2016 - Oct. 2019

The research involves synthesizing and analyzing atomically precise gold nanoclusters along with the use of density functional theory (DFT)

University of Pittsburgh

Pittsburgh, PA

Undergraduate Student Researcher for Dr. Jill Millstone

Sept. 2013 - Apr. 2016

The research involves synthesizing and analyzing gold nanoparticles along with the use of DFT

Carnegie Mellon University

Pittsburgh, PA

Undergraduate Student Researcher for Dr. David Yaron

Apr. 2014 - Oct. 2014

The research involved hotbit density dunctional 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

The research involved the synthesis and design of catalytic metal complexes for industrial energy efficiency

PUBLISHED

10. 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* WO 10-2021-0086334, Jul. 2, 2021. *patent pending*
9. 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* WO 10-2021-00871497, Apr. 8, 2021. *patent pending*
8. 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* NO 17,186,985, Feb. 26, 2021. *patent pending*
7. Lee, K-H.; Ryoo, B-H.; Do, S-A.; Kang, K-S. (Siontech Co, Ltd). Capacitive Desalination Cell Performance Inspection Device. *KR. Patent* WO 10-2020-0154282, Nov. 18, 2020. *patent pending*
6. Kim, M-Y.; Kang, K-S.; Lee, K-H.; Ryoo, B-H. (Siontech Co, Ltd). Capacitive Deionization Electrode and Manufacturing Method Thereof. *KR. Patent* WO 10-2020-0040781, Apr. 3, 2020. *patent pending*
5. 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* NO US2021221711A1, Jan. 21, 2020. *patent pending*
4. 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* WO 10-2020-0004027, Jan. 13, 2020. *patent pending*
3. Ryoo, B-H., “Influence of Phosphine and Halide Ligands on the Properties of Undecagold Nanoclusters”, *M.S. Thesis, The University of Pittsburgh,*, Pittsburgh, PA, (2019).
2. B-H. Ryoo, S.E. Crawford, 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**)
Bruker Apex II diffractometer
- UV-visible spectroscopy (**UV-Vis**)
Cary 5000 spectrophotometer
- Photoluminescence Spectroscopy
Horiba Jobin-Yvon NanoLog spectrometer
- Transmission Electron Microscope (**TEM**)
FEI Morgani 268 Transmission Electron Microscope
JEOL JEM2100F Transmission Electron Microscope
Hitachi 9500 Transmission Electron Microscope
- Fourier Transform Infrared Spectroscopy (**FTIR**)
Bruker Vertex-70LS FTIR and Hyperion 2000 FTIR Microscope
- Raman Spectroscopy (**Raman**)
Renishaw inVia Raman microscope
- Electron Paramagnetic Resonance Spectroscopy (**EPR**)
Bruker EMXNano Spectrometer
- Inductively Coupled Plasma Optical Emission Spectrometry (**ICP-OES**)
ThermoFisher ICAP 6300 Spectrometer

Wet Lab Techniques

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

Computer Languages and Computational Chemistry

- Python
- Javascript
- React-Native
- Model and graphic design
 - pyplot
 - Visual Molecular Dynamics
 - Blender
 - Gimp
- Atomic Simulation Environment calculators (python based)

- hotbit (DFTB)
- GPAW (DFT)
- ORCA (DFT)
- Other calculators
 - CP2K (DFT)
 - TURBOMOLE (DFT)

TEACHING EXPERIENCE

@ 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

@ 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

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

ONLINE CERTIFICATES

- Google IT Automation with Python Professional Certificate *Coursera: Google*
- Machine Learning *Coursera: Stanford University*
- Leading People and Teams Specialization *Coursera: University of Michigan*

LANGUAGE EFFICIENCY

Korean	Fluent
English	Fluent
Russian	Early Intermediate

CIVIL STATUS

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

OUTREACH

- **Faculty Advisor**
Sigma Alpha Epsilon, Chi-Omega Chapter
Apr. 2018 - Apr. 2019
Pittsburgh, PA
- **Student Affiliates of the American Chemical Society**
University of Pittsburgh
Sep. 2014 - Apr. 2016
Pittsburgh, PA
- **Carnegie Chemistry Carnival**
Mellon Institute
Oct. 2014
Pittsburgh, PA