

# SHIN HUM CHO

## Address

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Austin TX 78712

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**Twitter:** @ShinHumCho



## EDUCATION

### B.S.

**KAIST (Korea Advanced Institute of Science and Technology)**

Chemical & Biomolecular Engineering (2009 ~ 2015)

Chemistry (2009 ~ 2015)

Graduation with Honors: Cum Laude

### Ph.D Candidate

**University of Texas at Austin**

McKetta Department of Chemical Engineering (2015 ~ Present)

Fulbright Student Program

Advisor: Dr. Delia J. Milliron

## RESEARCH EXPERIENCE

### • University of Texas at Austin, Milliron Research Group (nanocrystal.che.utexas.edu)

Graduate Research Assistant · Austin, Texas

Oct 2015 - Present

Advisor: Professor Delia J. Milliron

- *Nanocrystal Synthesis*
- Synthetic development in n-type doped metal oxide nanocrystals. Infrared (IR) range localized surface plasmon resonance (LSPR) active NC, including shape control and spectral tunability.
- Research in plasmon-exciton interaction between infrared photoluminescent quantum dots and LSPR active nanocrystals, with COMSOL near-field simulations.

### • Harvard-MIT Health Sciences & Technology, Wellman Center for Photomedicine

Student Research Intern · Boston, Massachusetts

Jun 2014 - Aug 2014

Advisor: Professor Seemantini Nadkarni

- *Laser Optics*
- Summer 2014 Biomedical Optics Program Student Intern; Optical thromboelastography (OTEG) research; Laser speckle rheology imaging device for noninvasive detection of thrombosis.
- Blood coagulation parameter extraction through MATLAB in blood sample subjected to rivaroxaban factor X inhibitor and argatroban compounds.

### • KAIST Electronic Nanomaterial & Devices Laboratory (dclee.kaist.ac.kr)

Undergraduate Researcher · Daejeon, Korea

Jul 2013 - Aug 2015

Advisor: Professor Doh Chang Lee

- *Nanotechnology*
- Independent undergraduate research program; design stable and energy efficient electronic materials for display devices.
- Inorganic nanomaterials research for design and synthesis of oxidation stable quantum dots for QLED displays; Bandgap engineered core-shell CdSe/ZnS/ZnO nanocrystal synthesis.
- CdSe/CdS dot-in-rod nanoparticle synthesis.

• **Korea Institute of Science and Technology (KIST)**

Natural Medicine Center Research Assistant · Gangneung, South Korea

Nov 2012 – Feb 2013

Advisor: Dr. Jungyeob Ham

- *Organic Chemistry*
- Marine Chemomics Laboratory; natural cancer drug synthesis.
- Total synthesis of Justicidine B bioactive natural organic compounds through Suzuki-Miyaura reaction; Synthesizing aryl-fluoroborate compound chemical library for compound modification

## PUBLICATIONS

### Articles:

- SH Cho, K Roccapiore, JA Hachtel, CK Dass, S Ghosh, J Choi, J Noh, L Reimnitz, K Kim, S Heo, K Xie, BA Korgel, X Li, J Hendrickson, JC Idrobo, and DJ Milliron, **Spectrally Tunable Infrared Plasmonic F:Sn:In<sub>2</sub>O<sub>3</sub> Nanocrystal Cubes**, *J. Chem. Phys.*, **2019**, Invited
- S Ghosh, HC Lu, SH Cho, T Maruvada, MC Price, and DJ Milliron, **Colloidal ReO<sub>3</sub> Nanocrystals: Extra Red-Electron Instigating a Plasmonic Response**, *J. Am. Chem. Soc.*, **2019**, 141 (41), 16331-16343
- SH Cho, S Ghosh, ZJ Berkson, JA Hachtel, J Shi, X Zhao, LC Reimnitz, CJ Dahlman, Y Ho, A Yang, Y Liu, JC Idrobo, BF Chmelka, and DJ Milliron, **Syntheses of Colloidal F:In<sub>2</sub>O<sub>3</sub> Cubes: Fluorine-Induced Faceting and Infrared Plasmonic Response**, *Chem. Mater.*, **2019**, 31 (7), 2661–2676
- TD Siegler, LC Reimnitz, M Suri, SH Cho, A Bergerud, M Abney, DJ Milliron, and BA Korgel, **Deliquescent Chromism of Nickel (II) Iodide Thin Films**, *Langmuir*, **2019**, 35 (6), 2146–2152
- TD Siegler, DW Houck, SH Cho, DJ Milliron, and BA Korgel, **Bismuth Enhances the Stability of CH<sub>3</sub>NH<sub>3</sub>PbI<sub>3</sub> (MAPI) Perovskite under High Humidity**, *J. Phys. Chem. C*, **2019**, 123 (1), 963–970
- BH Kim, CM Staller, SH Cho, S Heo, CE Garrison, J Kim, and DJ Milliron, **High Mobility in Nanocrystal-Based Transparent Conducting Oxide Thin Films**, *ACS Nano*, **2018**, 12 (4), 3200–3208
- A Agrawal, SH Cho, O Zandi, S Ghosh, RW Johns, and DJ Milliron, **Localized Surface Plasmon Resonance in Semiconductor Nanocrystals**, *Chem. Rev.*, **2018**, 118 (6), 3121–3207

### Oral Presentations:

- SH Cho, S Ghosh, ZJ Berkson, JA Hachtel, J Shi, X Zhao, LC Reimnitz, CJ Dahlman, Y Ho, A Yang, Y Liu, JC Idrobo, BF Chmelka, and DJ Milliron, **Syntheses of colloidal F:In<sub>2</sub>O<sub>3</sub> cubes: Fluorine-induced faceting and infrared plasmonic response**, ACS Fall National Meeting & Exposition, San Diego, 2019

### Poster Presentations:

- SH Cho, S Ghosh, ZJ Berkson, JA Hachtel, J Shi, X Zhao, LC Reimnitz, CJ Dahlman, Y Ho, A Yang, Y Liu, JC Idrobo, BF Chmelka, and DJ Milliron, **Infrared Plasmonic Response and Fluorine-Induced Faceting in Colloidal F:In<sub>2</sub>O<sub>3</sub> Nanocubes**, Oak Ridge National Laboratory CNMS User Meeting, 2019
- SH Cho, D Tshikudi, M Tripathi, S Nadkarni, **Optical Thromboelastography for Monitoring Anticoagulant Dosing**, Harvard-MIT HST Summer Institute for Biomedical Optics Program, 2014
- SH Cho, S Lee, **Ultra-stable CdSe/ZnS/ZnO Core Shell Quantum Dots for Next-Generation QD-LED Display Devices**, KAIST Undergraduate Research Participation Program, 2014

## TECHNICAL SKILLS

### Experimental Skills:

- *Nanocrystal Synthesis*: LSPR n-type doped metal oxide nanocrystal (NC) synthesis (Sn:In<sub>2</sub>O<sub>3</sub>, Ce:In<sub>2</sub>O<sub>3</sub>, F:In<sub>2</sub>O<sub>3</sub>, In:CdO), Excitonic quantum dot (QD) synthesis (CdSe, PbS, PbSe), CdSe/ZnS core shell QD, Alloyed CdSeS core shell QD, CdSe/CdS dot-in-rod, InP cadmium free QD, Hot-injection, Heat-up, Continuous injection colloidal synthesis, Ligand stripping, SERS active Ag nanoparticle
- *VLSI Microfabrication*: Lithography, Dopant predeposition and drive, Gate oxide growth, Wet etching,

MOSFET I-V C-V measurement

- *Organic Chemistry*: Natural compound total synthesis (Justicidine B), Aryl-fluoroborate compound, Palladium catalyzed Suzuki cross coupling reaction, Grubbs catalyst metathesis
- *Computational Chemistry*: Ligand bound surface energy computation (VASP)
- *Process Engineering*: Process flow diagram design of tert-butanol production process with AspenPlus
- *Biochemistry*: Drug compound testing in red blood cells (Argatroban, Rivaroxaban)

#### **Instrument Skills:**

- *Instruments*: SEM, HRTEM, SAED, XRD, EDX, XPS, NMR, TOF-SIMS, AFM, DLS, UV-Vis-NIR, FTIR, Raman Spectroscopy, PL Spectroscopy, Ultrafast Laser Spectroscopy (TCSPC), ALD, Spin-coating, Spray-coating, Two-phase Assembly, HPLC, TLC, Column Chromatography, Cyclic Voltammetry, Hall Measurement, Photolithography, Glovebox
- *Programs*: MATLAB, COMSOL, Python, NumPy, C, Java, R, SQL, HTML CSS, Excel, Adobe Illustrator, Origin, CrystalMaker, VESTA, AspenPlus, NionSwift, SPICE, Verilog

### **A W A R D S**

- **Oak Ridge National Laboratory CNMS User Meeting, 2019 Poster Award, Bronze**, *Infrared Plasmonic Response and Fluorine-Induced Faceting in Colloidal F:In<sub>2</sub>O<sub>3</sub> Nanocubes*
- **Dean's List (KAIST Department of Chemical and Biomolecular Engineering)**, KAIST College of Engineering, Spring 2014
- **KAIST Undergraduate Research Project 2013, Award of Excellence**, *Ultra-stable CdSe/ZnS/ZnO Core Shell Quantum Dots for Next-Generation QD-LED Display Devices*
- **American Institute of Chemical Engineers, KAIST-AIChE Student Chapter President**, Academic Year 2014-2015
- **Korea Foundation for the Advancement of Science and Creativity (KOFAC)**, 2013 Life of a Scientist Exhibition Award
- **ICISTS-KAIST 2009, Best Team Project Award**, Nano Clinic Workshop
- **KAIST Freshmen Design 2009, Poster Award**, *Design of Emergency Shelter for Earthquake in Indonesia*
- **KAIST Department of Humanities and Social Sciences Best Paper Award 2013**, *How Anonymous (Dangerously) Saved Wall Street Hacktivism, and a Path to Safer Internet Social Movement*, Second Prize

### **P A S T E N R O L L E D C O U R S E S**

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| <ul style="list-style-type: none"> <li>• <b>Chemistry:</b> <ul style="list-style-type: none"> <li>Physical Chemistry I, II,</li> <li>Molecular Spectroscopy</li> <li>Quantum Chemistry</li> <li>Advanced Quantum Mechanics</li> <li>Physical Organic Chemistry</li> <li>Organic Chemistry I, II</li> <li>Organic Synthesis</li> <li>Inorganic Chemistry I</li> <li>Advanced Inorganic Chemistry</li> <li>Analytical Chemistry</li> <li>Biochemistry</li> <li>Molecular Biology</li> <li>Chemistry Major Lab</li> </ul> </li> <li>• <b>Chemical Engineering:</b> <ul style="list-style-type: none"> <li>Chemical and Biomolecular Engineering Analysis</li> <li>Thermodynamic and Energy Systems</li> </ul> </li> </ul> | <ul style="list-style-type: none"> <li>Reaction Engineering</li> <li>Heat and Molecular Transfer</li> <li>Fluid Mechanics</li> <li>Nanochemical Technology</li> <li>Nanobiotechnology</li> <li>Chemical and Biomolecular Engineering Laboratory</li> <li>Molecular Engineering Laboratory</li> <li>Macromolecular Engineering</li> <li>Materials Science and Engineering</li> <li>Process Simulation and Control</li> <li>Introduction to Programming</li> <li>Communications for Design</li> <li>• <b>Graduate Courses:</b> <ul style="list-style-type: none"> <li>Materials Physics</li> <li>Electromagnetic Theory</li> <li>Ultra Large Scale Integration</li> <li>Electrochemistry</li> </ul> </li> </ul> |
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Inorganic Reactions and Structure  
X-Ray Diffraction Theory

Fluid Flow and Heat Transfer  
Energy Technology and Policy

## FUNDINGS & SCHOLARSHIPS

- **Fulbright Scholarship**, Fulbright Foreign Student Program (2015~2016)
- **University of Texas at Austin Graduate Dean's Prestigious Fellowship** (2015 Fall ~ 2016 Summer)
- **Thomas H. and Dorothy M. Timmins Endowed Graduate Fellowship** (2015 Fall, 2019 Fall)
- **Korea Student Aid Foundation, National Scholarship** Recipient (Feb. 2009 ~ Nov. 2014)
- **KAIST Undergraduate Research Continuous Fund** (Feb. ~ Dec. 2014)
- **KAIST Undergraduate Research Project 2013** (Jun. ~ Nov. 2013)
- **Harvard-MIT HST, Wellman Center for Photomedicine Intern Support Fund** (Jun. ~ Aug. 2014)

## CONFERENCES

- **AAAS Annual Meeting**, 2018, Austin, Texas
- **Harvard-MIT HST Summer Institute for Biomedical Optics Poster Presentation**, 2014, Boston
- **Quantum Dots: Promises and Challenges**, 2013, Daejeon, South Korea
- **9<sup>th</sup> World Congress of Chemical Engineering**, 2013, Seoul, South Korea
- **KAIST Undergraduate Research Participation (URP) Program**, Research Presenter
- **KAIST / Oxford University / UC Irvine 2013 MOU**, Student Press Reporter/Interviewer
- **ICISTS-KAIST 2012**, Age of Integration: Beyond the Borders of Knowledge
- **ICISTS-KAIST 2010**, Sustainable Energy, Organization Committee
- **Korea Student Aid Foundation, 2010 Mentor Program**, Mentee for KAIST President Nam Pyo Suh
- **ICISTS-KAIST 2009**, Nano Clinic Workshop
- **International Presidential Forum 2009**, Challenges to Global Research Universities, Student Press
- **Harvard Project for Asian and International Relations 2009**, Understanding Security Issues in East Asia

## COLLABORATORS

### • Collaborators

*Oak Ridge National Laboratory* – Dr. Jordan A. Hachtel, Dr. Kevin M. Roccapriore, Dr. Juan-Carlos Idrobo

*University of California Santa Barbara* – Dr. Zachariah J. Berkson, Dr. Bradley F. Chmelka

*Air Force Research Laboratory* – Dr. Chandriker Dass, Dr. Josh Hendrickson

*Lawrence Berkeley National Laboratory* – Dr. Ankit Agrawal

*Pennsylvania State University* – Dr. Evan L. Runnerstrom, Dr. John-Paul Maria

*City College of New York* – Dr. Lauren O'Donnell, Dr. Robert J. Messinger

*University of Texas at Austin* – Dr. Brian A. Korgel, Timothy D. Siegler, Jungchul Noh, Dr. Yuanyue Liu, Jianjian Zhi, Xunhua Zhao, Dr. Xiaoqin (Elaine) Li, Junho Choi, Dr. Sandeep Ghosh, Dr. Molly Jhong, Dr. Gary K. Ong, Dr. Sungyeon Heo, Dr. Byung Hyo Kim, Dr. Corey Staller, Dr. Clayton Dahlman, Lauren Reimnitz, Kihoon Kim, Camila A. Saez Cabezas

### • Undergraduate Mentorship

Karen Xie (2019) – UT Austin Chemical Engineering

Naveen Chokkar (2017) – UT Austin Chemical Engineering

Allison Foster (2017) – Austin Community College (Current Status: UT Austin Chemical Engineering)

Anni Yang (2016 - 2018) – UT Austin Chemical Engineering (Current Status: Schlumberger)

Yujing Ho (2016 - 2018) - UT Austin Chemical Engineering (Current Status: Baker Engineering)

## PROFESSIONAL SOCIETY

- **American Chemical Society**

ACS Member, #31564406 · Central Texas

Jun 2019

- **American Alpine Club**

Student Member, #89904

Jan 2019

Alpine, Mixed Climb, Top Rope, Lead Climb. Ice Axe, Crampon experienced. Climbs: Mt Whitney CA, Mt Elbert CO, Mt Hood OR, Mt St Helens WA, Guadalupe Peak TX, Borah Peak ID, Wheeler Peak NM, Mica Mountain AZ.

- **Texas Board of Professional Engineers**

Engineer in Training, #60497 (FE, PE Exam Passed) · Austin, Texas

Sep 2017

- **Gemological Institute of America (GIA)**

Applied Jewelry Professional · Austin, Texas

June 2016

- **UT Austin Korean Student Association, Chemical Engineering (UTKSA-ChE)**

President · Austin, Texas

Sep 2015 – Jan 2017

- **AIChE Student Chapter**

President, Founding Member · Daejeon, Korea

Feb 2014 – July 2015

Advisor: Professor Doh Chang Lee

Founding member and President for AIChE (American Institute of Chemical Engineers) Student Chapter in KAIST. Engagement in International Sister Chapter with Massachusetts Institute of Technology (MIT). Projects include directing students competing in annual AIChE Chem-E-Car Competition.

- **The KAIST Herald**

Senior Staff Reporter · Daejeon, Korea

Feb 2009 – Jun 2015

Official English newspaper of Korea Advanced Institute of Science and Technology; Reporter for Interviews, News, and Science & Technology Section; Exclusive interviews and coverage: 2002 Nobel Chemistry Prize Laureate Kurt Wüthrich, 2005 Nobel Chemistry Prize Laureate Robert H. Grubbs, Oxford University Vice Chancellor Andrew Hamilton.

- **ICISTS-KAIST (Sustainable Energy Workshop)**

Coordination & Planning · Daejeon, Korea

Feb 2010 – Sep 2010

Student-run international conference organizer for experts and delegates to discuss technological and socio-economic aspects on sustainable energy technology. Invited speakers from Seoul National University, UC Davis, National Fusion Research Institute, and United Nations Development Programme for in-depth discussions on smart grids, appropriate technology, and nuclear fusion.

## MILITARY SERVICE

- **ROK Army**

Sergeant Operations Staff · 23<sup>rd</sup> Division 1607 Battalion · Gangneung, Korea

Feb 2011 – Nov 2012

Regional military reserve forces management; Local municipal administration; Regional defense operation; ROKA Level 2 Security Clearance.

## LANGUAGE SKILLS

- GRE : Verbal 157/170, Quantitative 170/170, Analytical Writing 3.5/6.0
- TOEFL : 116/120 (Reading 30, Listening 30, Speaking 28, Writing 28)
- TOEIC : 990/990
- Native: English and Korean