Woo Je Chang, Ph.D.

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EDUCATION

Northwestern University, McCormick School of Engineering — *Evanston, Illinois*
Doctor of Philosophy in Materials Science and Engineering — *June 2022*
Advisor: Emily A. Weiss
Committee Members: Mark C. Hersam, James M. Rondinelli, Mecouri Kanatzidis

Seoul National University — *Seoul, South Korea*
Master in Bioengineering — *February 2016*
Advisor: Ki Tae Nam

Seoul National University — *Seoul, South Korea*
Bachelor of Materials Science and Engineering/Cum Laude — *February 2014*

Professional Experience

University of Texas at Austin, McKetta Department of Chemical Engineering — *Austin, Texas*
Post-Doctoral Researcher — *August 2022 -*
Advisor: Delia J. Milliron

Tokyo Institute of Technology, Earth Life Science Institute — *Tokyo, Japan*
Visiting Researcher — August 2016 - *February 2017*
Advisor: Shawn E. McGlynn

RESEARCH INTEREST

Semiconducting Nanocrystal Synthesis and Doping, Time-Resolved Spectroscopic Analysis, Nanocrystal Structure Investigation, Quantum Information, Exciton-Photon Coupling, Solar Energy Conversion

RESEARCH EXPERIENCE

Research Assistant

Weiss Research Lab, Northwestern University — *September 2017 – June 2022*

- Investigated doping chemistry of semiconducting nanocrystals potentially applicable optical devices
- Applied a lithium-ion battery system to modify the optical response of nanocrystals
- Collaborated with a team of researchers from different departments and national laboratories to analyze the structural-optical relationship between semiconducting nanocrystals and their optical cavity coupling
- Mentored two graduate students, guiding in experimental design, scientific writing, and presentations

Earth Life Science Institute, Tokyo Institute of Technology — *August 2016 - February 2017*

- Designed a microfluidic channel for mimicking hydrothermal vent

Nam Research Lab, Seoul National a University — *March 2014 - February 2016*

- Optimized a halide perovskite photocatalyst stable under an aqueous solution
- Constructed a solar to hydrogen conversion system with the highest energy efficiency

PUBLICATIONS

Publications

1) **Chang, W.J.;** Irgen-Gioro, S.; Vong, A.F.; Kim, H.; Mara, M.W.; Chen, L.X.; Weiss, E.A. "Enhancement of Emission from Lanthanide Dopants in Perovskite Nanocrystals through a Temperature-Dependent Phase Transformation of the Perovskite Lattice.", *J. Phys. Chem. C., under revision*
2) Choo, P.; Arenas-Esteban, D.; Jung, I.; **Chang, W.J**.; Weiss, E.A.; Bals, S.; Odom, T.W. Investigating Reaction Intermediates During the Seedless Growth of Gold Nanostars using Electron Tomography, *ACS Nano*, *16*, 4408-4414 (2022)
3) **Chang, W.J.**; Irgen-Gioro, S.; Padgaonkar, S.; Lopez-Arteaga, R.; Weiss, E.A. "Photoredox-Mediated Sensitization of Lanthanide Dopants by Perovskite Nanocrystals.", *J. Phys. Chem. C.* 125, 25634-25642 (2021)
4) Irgen-Gioro, S.; Yang, M.; Padgaonkar, S.; **Chang, W.J.**; Zhang, Z.; Nagasing, B.; Jiang, Y.; Weiss, E.A. "Charge and Energy Transfer in the Context of Colloidal Nanocrystals." *Chem. Phys. Rev*. 1, 011305 (2020)
5) **Chang, W.J.**; Park, K.-Y.; Zhou, Y.; Wolverton, C.; Hersam, M.C.; Weiss, E.A. "n-Doping of Quantum Dots by Lithium Ion Intercalation." *ACS. Appl. Mater. Interf.* 12, 36523-36529 (2020)
6) Lee, B.-H.; Park, S.; Kim, M.; Sinha, A. K.; Lee, S. C.; Jung, E.; **Chang, W.J.;** Lee, K.-S.; Kim, J.H.; Cho, S.-P.; Kim, H.; Nam, K.T.; Hyeon, T. "Reversible and Cooperative Photoactivation of Single-Atom Cu/TiO_2 Photocatalysts." *Nat. Mater*. 18, 620-626 (2019)
7) **Chang, W.J.;** Lee, K.-H.; Ha, J.-I.; Nam, K.T. "Hydrogen Production via Water Electrolysis: The Benefits of a Solar Cell-Powered Process." *IEEE Electric. Mag*. 6, 19-25 (2018)
8) Lee, J.; Yun, J.; Kwon, S. R.; **Chang, W.J.;** Nam, K.T.; Chung, T.D. "Reverse Electrodialysis-Assisted Solar Water Splitting." *Sci. Rep*. 7, 1-9 (2017)
9) Kale, V.S.; Sim, U.; Yang, J.; Jin, K.; Chae, S.I.; **Chang, W.J.;** Sinha, A. K.; Ha, H.; Hwang, C.-C.; An, J.; Kong, H.-K.; Lee, Z.; Nam, K.T.; Hyeon, T. "Sulfur‐Modified Graphitic Carbon Nitride Nanostructures as an Efficient Electrocatalyst for Water Oxidation." *Small* 13, 1603893 (2017)
10) **Chang, W.J.;** Lee, K.-H.; Ha, H.; Jin, K.; Kim, G.; Hwang, S.-T.; Lee, H.-M.; Ahn, S.-W.; Yoon, W.; Seo, H.; Hong, J.S.; Go, Y.K.; Ha, J.-I..; Nam, K.T. "Design Principle and Loss Engineering for Photovoltaic–Electrolysis Cell System." *ACS Omega* 2, 1009-1018, (2017)
11) Park, S.†; **Chang, W.J.†;** (co-1st author), Lee, C.W.; Park, S.B.; Ahn, H.-Y.; Nam, K.T. "Photocatalytic Hydrogen Generation from Hydriodic Acid using Methylammonium Lead Iodide in Dynamic Equilibrium with Aqueous Solution." *Nat. Energy* 2, 1-8 (2016) – **selected as a cover**
12) Kim, Y.; Shin, D.; **Chang, W.J.;** Jang, H.L.; Lee, C.W.; Lee, H.E.; Nam, K.T. "Hybrid Z‐Scheme Using Photosystem I and $BiVO_4$ for Hydrogen Production." *Adv. Funct. Mater*. 25, 2369-2377 (2015)

In prep

13) **Chang, W. J.**; Zeng, H.; Liu, P.; Terry-Weatherly, C.; Provazza, J.; Tempelaar, R.; Stern, N. P.; Weiss, E. A. "Anisotropic Emission from CdSe Nanoplatelets Based Optical Cavity.', *in prep*
14) **Chang, W. J.**; Kim, S.; West, C. T.; Hersam, M. C.; Weiss, E. A. "Lithiation Controlled Emission Behavior from CuS Nanoplatelets.', *in prep*

PATENTS AND PRESENTATIONS

Patents

- Nam, K.T.; Ha, J.-I.; **Chang, W.J.**; Lee, K.-H.; Real-Time Optimized Solar Energy-Carbon Dioxide Reduction System", Patent No: PCT/KR2018/005793

Selected Presentations

- "Polariton Emission Pathway from CdSe Nanoplatelets Based Optical Cavity." American Chemical Society Spring, Oral Presentation, March 22nd, 2022
- "Charge Transfer-Mediated Sensitization of Lanthanide Dopants by Perovskite Quantum Dots." SPIE Nanoscience + Engineering, Oral Presentation, August 4th, 2021
- "n-doping of Quantum Dots by Lithium Ion Intercalation." Materials Research Society Spring Meeting, Oral Presentation, November 28th, 2020
- "Methylammonium Lead Iodide Photocatalyst in Aqueous Solution for Hydrogen Evolution." Materials Research Society Spring Meeting, Poster Presentation, March 31st, 2016

- "Flow Electrolyzer for Efficient Water Splitting." International Conference of Photochemistry, Oral Presentation, June 30th, 2015

LEADERSHIP AND COMMUNITY ENGAGEMENT

Materials Science Umbrella Society, Northwestern University *Evanston, Illinois*
President/Board Member *Winter 2019 – June 2022*

- President of the Materials Research Society at Northwestern University
- Hold career development events every month for over 150 materials science and engineering graduate students at Northwestern

Korean Student Association, Northwestern University *Evanston, Illinois*
President Fall *2020 – Summer 2021*

- Raised $2K to fund networking events and seminars for over 200 Korean graduate students and postdocs at Northwestern
- Interacted with companies and Korean-American Scientists and Engineers Association to accommodate the events

AWARDS AND HONORS

- Kwanjeong Educational Foundation Scholarship, 2017 – 2022 ($30,000 support per each year)
- KSEA-KUSCO Graduate Scholarship, 2021
- SNU Alumni Association in Chicago Area Scholarship, 2018
- Merit-based Scholarship from Seoul National University, 2011 – 2014

TEACHING

Teaching Assistant
Physics of Materials (Mat_Sci 351), Northwestern University *Winter 2021*

- Supported online-based lab sessions with portable oscilloscopes

Materials Science Principle (Mat_Sci 301), Northwestern University *Spring 2019*

- Instructed lab sessions of 25 students based on the self-designed laboratory section
- Advised students during the recitation sessions, providing feedback on their exams and assignments

SKILLS

Technical skills:

- **Spectroscopy:** Transient Absorption, Time Correlated Single Photon Counting, Degree of Circular Polarization, Raman Spectroscopy, Infrared Spectroscopy, Spectro-electrochemistry
- **Synthetic Techniques:** Semiconducting Nanocrystal Synthesis, Metal Nanocrystal Synthesis
- **Materials and Device Analysis:** X-ray Photoelectron Spectroscopy, X-ray Diffraction, Total Scattering Analysis, Cyclic Voltammetry, Battery Cycler, Solar Simulator
- **Microscopy**: Scanning Electron Microscopy, Transmission Electron Microscopy, Atomic Force Microscopy, Optical Microscopy

Software: Matlab (for data fitting and analysis), Origin, GSAS (X-ray analysis tool)

Languages: Korean (Native), English (Fluent), Japanese (Intermediate)