

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, Mercouri G. 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

The University of Texas at Austin, McKetta Department of Chemical Engineering *Austin, Texas*
Post-Doctoral Fellow *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, Light Matter Interaction, Solar Energy Conversion

RESEARCH EXPERIENCE

Milliron Research Lab, The University of Texas at Austin *August 2022 -*

- Understanding vibration-plasmon coupling between ligand molecules and plasmonic nanocrystals
- Cooperating with coworkers outside of the university to analyze near field optical response of closely packed nanocrystals superlattice

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

- Investigated doping chemistry of semiconducting nanocrystals potentially applicable for 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*

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.**; 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.”, *submitting soon*
- 2) Kim, K.; Sherman, Z. M.; Cleri, A.; **Chang, W. J.**; Maria, J.-P.; Truskett, T. M.; Milliron, D. J. “Hierarchically Doped Nanocrystal Metamaterials”, preprint. 10.26434/chemrxiv-2023-1ht31, *submitted*
- 3) Zeng, H.; Liu, P.; Eckdahl, C.; Pérez-Sánchez, J.; **Chang, W. J.**; Weiss, E. A.; Kalow, J.; Yuen-Zhou, J.; Stern, N. P. “Control of Photoswitching Kinetics with Strong Light-Matter Coupling in a Cavity.”, *ChemRxiv*, preprint. 10.26434/chemrxiv-2023-m1pj0, *submitted*
- 4) **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* 126, 15247–15253 (2022)
- 5) 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)
- 6) **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)
- 7) 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)
- 8) **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)
- 9) 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/TiO₂ Photocatalysts.” *Nat. Mater.* 18, 620–626 (2019)
- 10) **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)
- 11) 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)
- 12) 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)
- 13) **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)
- 14) 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**
- 15) 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 BiVO₄ for Hydrogen Production.” *Adv. Funct. Mater.* 25, 2369–2377 (2015)

In prep

- 16) “Resonant Coupling between Plasmons and Molecular Vibrations for Tilting Physical Properties of Target Molecules.”
- 17) “Perfect Absorber Generated By Metal Oxide Nanocrystals.”

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 (3 out of 10)

- “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

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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

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

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

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, Small-angle X-ray Scattering, Cyclic Voltammetry, Battery Cyclers, 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), Illustrator