

Woo Je Chang, Ph.D.

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Google scholar: <https://scholar.google.com/citations?user=GVrwKdMAAAAJ&hl=en>

EDUCATION

Northwestern University, McCormick School of Engineering *Evanston, Illinois*
Doctor of Philosophy in Materials Science and Engineering *September 2017 - 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 *March 2014 - February 2016*
Advisor: Ki Tae Nam

Seoul National University *Seoul, South Korea*
Bachelor of Materials Science and Engineering/Cum Laude *March 2010 - February 2014*

Sejong Science High School *Seoul, South Korea*
Graduated within 2 years *March 2008 - February 2010*

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*

RESEARCH INTEREST

Semiconducting Nanocrystal Synthesis and Doping, Time-Resolved Spectroscopy, Nanocrystal Structure Investigation, Quantum Information, Light Matter Interaction, Solar Energy Conversion, Electrocatalysis

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 from the electrical engineering department to design photonic devices.
- Guiding two undergraduate students to synthesize and analyze optical properties of nanocrystals.

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

- Investigated doping chemistry of semiconducting nanocrystals potentially applicable for quantum information transduction.
- 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

1st author

- 1) **Chang, W.J.**†; Zeng, H.†; Terry-Weatherly, C.†; Provazza, J.; Liu, P.; Weiss, E.A.; Stern, N.P.; Tempelaar, R. Dark State Concentration Dependent Emission and Dynamics of CdSe Nanoplatelet Exciton-Polaritons. *ChemArxiv*, 2024, DOI: 10.26434/chemrxiv-2024-610nl (*submitted*)
- 2) **Chang, W.J.**†; Sakotic, Z.†; Ware, A.; Green, A.M.; Benjamin, R.J.; Kim, K.; Truskett, T.M.; Wasserman, D.; Milliron, D.J. Wavelength Tunable Infrared Perfect Absorption in Plasmonic Nanocrystal Monolayers. *ACS Nano*, 2024, 18, 972–982
- 3) **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*. 2022, 126, 15247–15253
- 4) **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*. 2021, 125, 25634-25642
- 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.* 2020, 12, 36523-36529
- 6) **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.* 2018, 6, 19-25
- 7) **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* 2017, 2, 1009-1018,
- 8) Park, S.†; **Chang, W.J.**†; 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* 2016, 2, 1-8 – **selected as a cover**

Co-authored

- 1) Green, A.M.; **Chang, W.J.**; Sherman, Z.M.; Sakotic, Z.; Kim, K.; Wasserman, D.; Milliron, D.J.; Truskett, T.M. Structural Order and Plasmonic Response of Nanoparticle Monolayers. *ACS Photonics*, 2024, DOI: 10.1021/acsp Photonics.3c01813
- 2) Kim, K.; Sherman, Z.M.; Cleri, A.; **Chang, W.J.**; Maria, J.-P.; Truskett, T.M.; Milliron, D.J. Hierarchically Doped Nanocrystal Metamaterials. *Nano Lett.* 2023, 23, 7633–7641
- 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. *J. Am. Chem. Soc.* 2023, 145, 19655-19661
- 4) 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*, 2022, 16, 4408-4414
- 5) 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.* 2020, 1, 011305
- 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/TiO₂ Photocatalysts. *Nat. Mater.* 2019, 18, 620-626
- 7) Lee, J.; Yun, J.; Kwon, S. R.; **Chang, W.J.**; Nam, K.T.; Chung, T.D. Reverse Electrodialysis-Assisted Solar Water Splitting. *Sci. Rep.* 2017, 7, 1-9
- 8) 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* 2017, 13, 1603893
- 9) 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.* 2015, 25, 2369-2377

In prep (1st author only)

- 1) **Chang, W.J.**; Benjamin, R.J.; Green, A.M.; Truskett, T.M.; Milliron, D.J. Tuning Molecular Vibration through Resonant Coupling with Tin-Doped Indium 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 Conference Presentations (2 out of 11)

- “Tuning Molecular Vibration with Plasmonic NC by Resonant Coupling: A Study Using Tin-Doped Indium Oxide Nanocrystals.”, American Chemical Society Fall, Oral Presentation, August 16th, 2023
- “Polariton Emission Pathway from CdSe Nanoplatelets Based Optical Cavity.” American Chemical Society Spring, Oral Presentation, March 22nd, 2022

Invited Talks

- “Engineering Nanocrystals Towards Optical Quantum Information Applications” – Seoul National University, Department of Materials Science and Engineering, July 4th, 2022
- “Engineering Nanocrystals Towards Optical Quantum Information Applications” – Korea Institute of Science and Technology, Center for Nanophotonics, July 5th, 2022
- “Organized Nanostructure as a Platform for Non-Linear Optical Response” – Pohang University of Science and Technology, Department of Chemistry, December 18th, 2023

LEADERSHIP AND COMMUNITY ENGAGEMENT

STEM Muse, Austin Area

Austin, Texas

Mentoring women undergraduate student in STEM field

September 2023 -

MITE Program, The University of Texas at Austin

Austin, Texas

Assistant for Hands-on Lab Session

July 26th 2023

Materials Science Umbrella Society, Northwestern University

Evanston, Illinois

President/Board Member

December 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.

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

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 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), Illustrator