Curriculum Vitae

DOHYUNG KIM

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Google Scholar: https://scholar.google.com/citations?hl=en&user=8K3x8szoF1gC

Academic Positions

Assistant Professor — Aug 2022 – Present
Department of Chemical and Biomolecular Engineering
Member of Vagelos Institute of Energy Science and Technology (VIEST)
Member of The Laboratory for Research on the Structure of Matter (LRSM)
University of Pennsylvania

Postdoctoral Scholar — Oct 2018 – Apr 2022
Department of Chemical Engineering, Stanford University
Supervisor: Prof. Matteo Cargnello

Education

Ph.D. in Materials Science and Engineering — Aug 2012 – May 2018
University of California, Berkeley
Advisor: Prof. Peidong Yang, Department of Chemistry
GPA: 4.0/4.0 | Dissertation: Nanoparticle Catalysts for Chemical Valorization of Carbon Dioxide

B.S. in Materials Science and Engineering — Mar 2006 – Jun 2012
(2 yrs of military service)
Seoul National University
Advisor: Prof. Chong Rae Park, Department of Materials Science & Eng.
GPA: 4.18/4.3 (Rank 1/103 in dept.)
Graduate with honors (*summa cum laude*)

Awards/Honors

Hanwha Non-tenured Faculty Award / 2023
Kavli Energy NanoScience Institute Best Thesis Prize / 2018
Schmidt Science Fellow Finalist (Inaugural cohort) / 2018
MRS Graduate Student Award - Silver / 2018
Gareth Thomas Materials Excellence Award / 2017
Samsung Scholar / 2012 – 2017
National scholarship for natural sciences and engineering / 2006 – 2012
MSE Best Poster Award (SNU) / 2011

Research Areas

Electrochemistry, Surface and Interface Science, Nanomaterials, Catalysis, Energy Conversion and Storage

Publications (*equal contribution)

27. Sun, E.*, Zhai, S.*, **Kim, D.***, Gigantino, M., Haribal, V., Dewey, O., Williams, S., Wan, G., Nelson, A., Marin-Quiros, S., Martis, J., Zhou, C., Oh, J., Randall, R., Kessler, M., Kong, D., Rojas, J., Tong, A., Xu, X., Huff, C., Pasquali, M., Gupta, R., Cargnello, M. & Majumdar, A. A semi-continuous process for co-production of CO_2-free hydrogen and carbon nanotubes via methane pyrolysis. *Cell Reports Physical Science*, (2023).

26. Louisia, S.*, **Kim, D.***, Li, Y., Gao, M., Yu, S., Roh, I. & Yang, P. The presence and role of the intermediary CO reservoir in heterogeneous electroreduction of CO_2. *Proc. Natl. Acad. Sci. U. S. A.* **119,** 1–9 (2022).
(***highlighted in Nature Energy, doi: 10.1038/s41560-022-01049-y*)**

25. Yu, S.*, **Kim, D.***, Qi, Z., Louisia, S., Li, Y., Somorjai, G.A., & Yang, P. Nanoparticle Assembly Induced Ligand Interactions for Enhanced Electrocatalytic CO_2 Conversion. *J. Am. Chem. Soc.*, **143**, 19919–19927 (2021).

24. **Kim, D.**, Zhou, C., Zhang, M. & Cargnello, M. Voltage cycling process for the electroconversion of biomass-derived polyols. *Proc. Natl. Acad. Sci.* **118**, e2113382118 (2021).

23. **Kim, D.***, Yu, S.*, Zheng, F., Roh, I., Li, Y., Louisia, S., Qi, Z., Somorjai, G.A., Frei, H., Wang, L.W. & Yang, P. Selective CO_2 electrocatalysis at the pseudocapacitive nanoparticle/ordered-ligand interlayer. *Nat. Energy* **5**, 1032-1042 (2020).

22. Li, Y.*, **Kim, D.***, Louisia, S., Xie, C., Kong, Q., Yu, S., Lin, T., Aloni, S., Fakra, S. C. & Yang, P. Electrochemically scrambled nanocrystals are catalytically active for CO_2-to-multicarbons. *Proc. Natl. Acad. Sci.* **117,** 9194-9201 (2020).

21. **Kim, D.** & Cargnello, M. Formic acid oxidation boosted by Rh single atoms. *Nat. Nanotechnol.* 1–2 (2020).

20. Xie, C.*, Niu, Z.*, **Kim, D.***, Li, M. & Yang, P. Surface and Interface Control in Nanoparticle Catalysis. *Chem. Rev.* **120,** 1184–1249 (2020).

19. Ross, M. B., De Luna, P., Li, Y., Dinh, C. T., **Kim, D.**, Yang, P. & Sargent, E. H. Designing materials for electrochemical carbon dioxide recycling. *Nat. Catal.* **2,** 648–658 (2019).

18. Ross, M. B., Li, Y., De Luna, P., **Kim, D.**, Sargent, E. H. & Yang, P. Electrocatalytic Rate Alignment Enhances Syngas Generation. *Joule* **3**, 257–264 (2019).

17. Wong, A. B.*, Bekenstein, Y.*, Kang, J., Kley, C. S., **Kim, D.**, Gibson, N. A., Zhang, D., Yu, Y., Leone, S. R., Wang, L., Alivisatos, A. P. & Yang, P. Strongly Quantum Confined Colloidal Cesium

Tin Iodide Perovskite Nanoplates: Lessons for Reducing Defect Density and Improving Stability. *Nano Lett.* **18,** 2060–2066 (2018).

16. Becknell, N.*, Son, Y.*, **Kim, D.**, Li, D., Yu, Y., Niu, Z., Lei, T., Sneed, B. T., More, K. L., Markovic, N. M., Stamenkovic, V. R. & Yang, P. Control of Architecture in Rhombic Dodecahedral Pt–Ni Nanoframe Electrocatalysts. *J. Am. Chem. Soc.* **139,** 11678-11681 (2017).

15. **Kim, D.**, Kley, C. S., Li, Y., & Yang, P. Copper Nanoparticle Ensembles for Selective Electroreduction of CO_2 to C_2-C_3 products. *Proc. Natl. Acad. Sci.* **114,** 10560-10565 (2017). (***highlighted in 17 news outlets including LBNL news, C&EN, and etc.***)

14. Ross, M. B., Dinh, C. T., Li, Y., **Kim, D.**, De Luna, P., Sargent, E. H. & Yang, P. Tunable Cu Enrichment Enables Designer Syngas Electrosynthesis from CO_2. *J. Am. Chem. Soc.* **139,** 9359–9363 (2017).

13. **Kim, D.***, Xie, C.*, Becknell, N., Yu, Y., Karamad, M., Chan, K., Crumlin, E. J., Norskov, J. K. & Yang, P. Electrochemical Activation of CO_2 through Atomic Ordering Transformations of AuCu Nanoparticles. *J. Am. Chem. Soc.* **139,** 8329–8336 (2017).

12. Niu, Z.*, Cui, F.*, Yu, Y., Becknell, N., Sun, Y., Khanarian, G., **Kim, D.**, Dou, L., Dehestani, A., Schierle-Arndt, K. & Yang, P. Ultrathin Epitaxial Cu@Au Core–Shell Nanowires for Stable Transparent Conductors. *J. Am. Chem. Soc.* **139,** 7348–7354 (2017).

11. **Kim, D.**, Becknell, N., Yu, Y. & Yang, P. Room-Temperature Dynamics of Vanishing Copper Nanoparticles Supported on Silica. *Nano Lett.* **17,** 2732–2737 (2017).

10. Li, Y.*, Cui, F.*, Ross, M. B., **Kim, D.**, Sun, Y. & Yang, P. Structure-Sensitive CO_2 Electroreduction to Hydrocarbons on Ultrathin 5-fold Twinned Copper Nanowires. *Nano Lett.* **17,** 1312–1317 (2017).

9. Choi, K. M.*, **Kim, D.***, Rungtaweevoranit, B., Trickett, C. A., Barmanbek, J. T. D., Alshammari, A. S., Yang, P. & Yaghi, O. M. Plasmon-Enhanced Photocatalytic CO_2 Conversion within Metal–Organic Frameworks under Visible Light. *J. Am. Chem. Soc.* **139,** 356–362 (2017).

8. Kong, Q.*, **Kim, D.***, Liu, C., Yu, Y., Su, Y., Li, Y. & Yang, P. Directed Assembly of Nanoparticle Catalysts on Nanowire Photoelectrodes for Photoelectrochemical CO_2 Reduction. *Nano Lett.* **16,** 5675–5680 (2016).

7. Niu, Z.*, Becknell, N.*, Yu, Y., **Kim, D.**, Chen, C., Kornienko, N., Somorjai, G. A. & Yang, P. Anisotropic phase segregation and migration of Pt in nanocrystals en route to nanoframe catalysts. *Nat. Mater.* **15,** 1188–1194 (2016).

6. Cao, Z.*, **Kim, D.***, Hong, D., Yu, Y., Xu, J., Lin, S., Wen, X., Nichols, E. M., Jeong, K., Reimer, J. A., Yang, P. & Chang, C. J. A Molecular Surface Functionalization Approach to Tuning Nanoparticle Electrocatalysts for Carbon Dioxide Reduction. *J. Am. Chem. Soc.* **138,** 8120–8125 (2016).

5. Kornienko, N.*, Zhao, Y.*, Kley, C. S., Zhu, C., **Kim, D.**, Lin, S., Chang, C. J., Yaghi, O. M. & Yang, P. Metal–Organic Frameworks for Electrocatalytic Reduction of Carbon Dioxide. *J. Am. Chem. Soc.* **137,** 14129–14135 (2015).

4. Lin, S.*, Diercks, C. S.*, Zhang, Y. B.*, Kornienko, N., Nichols, E. M., Zhao, Y., Paris, A. R., **Kim, D.**, Yang, P., Yaghi, O. M. & Chang, C. J. Covalent organic frameworks comprising cobalt porphyrins for catalytic CO_2 reduction in water. *Science* **349,** 1208–1213 (2015).
(***highlighted in 14 news outlets including Materials Today, Phys.org, Nanowerk and etc.***)

3. **Kim, D.**, Sakimoto, K. K., Hong, D. & Yang, P. Artificial Photosynthesis for Sustainable Fuel and Chemical Production. *Angew. Chemie Int. Ed.* **54,** 3259–3266 (2015).

2. **Kim, D.**, Resasco, J., Yu, Y., Asiri, A. M. & Yang, P. Synergistic geometric and electronic effects for electrochemical reduction of carbon dioxide using gold–copper bimetallic nanoparticles. *Nat. Commun.* **5,** 4948 (2014).
(***highlighted in 15 news outlets including LBNL news, Phys.org, ScienceDaily and etc.***)

1. **Kim, D.**, Yang, S. J., Kim, Y. S., Jung, H. & Park, C. R. Simple and cost-effective reduction of graphite oxide by sulfuric acid. *Carbon* **50,** 3229–3232 (2012).

Invited Presentations / Seminars / Lectures / Panel Discussions

27. *My Path to Becoming a Researcher*
Road2Research (R2R) at Penn (Feb 2023)

26. *BEYOND SURFACE Facilitates Electrocatalytic Reactions of Renewable Carbons*
KU BK21 Mini-symposium (Jan 2023)

25. Faculty Perspectives on the Academic Job Search, Panel discussion
Penn Engineering (Dec 2022)

24. 2022 Stanford Chemical Engineering Academic Job Seekers Panel
PRAC, Department of Chemical Engineering, Stanford University (Jul 2022)

23. *BEYOND SURFACE Facilitates Electrocatalytic Reactions of Renewable Carbons*
Department of Chemical and Biomolecular Engineering, The Ohio State University (Mar 2022)

22. *BEYOND SURFACE Facilitates Electrocatalytic Reactions of Renewable Carbons*
Department of Chemistry, University of Georgia (Mar 2022)

21. *BEYOND SURFACE Facilitates Electrocatalytic Reactions of Renewable Carbons*
Department of Chemical Engineering, University of South Carolina (Mar 2022)

20. *BEYOND SURFACE Facilitates Electrocatalytic Reactions of Renewable Carbons*
Department of Chemical Engineering, University of Washington (Mar 2022)

19. *BEYOND SURFACE Facilitates Electrocatalytic Reactions of Renewable Carbons*
Department of Chemical and Biomolecular Engineering, NC State University (Feb 2022)

18. *BEYOND SURFACE Facilitates Electrocatalytic Reactions of Renewable Carbons*
Department of Chemical and Biomolecular Engineering, University of Pennsylvania (Feb 2022)

17. *BEYOND SURFACE Facilitates Electrocatalytic Reactions of Renewable Carbons*
Department of Chemical Engineering and Materials Science, University of Minnesota (Feb 2022)

16. *BEYOND SURFACE Facilitates Electrocatalytic Reactions of Renewable Carbons*
Department of Chemical & Biomolecular Engineering, University of Delaware (Jan 2022)

15. *The Overlooked Potential of Nanoparticles as Catalysts in Electrochemistry*
School of Chemical and Biological Engineering, Seoul National University (Dec 2021)

14. *The Overlooked Potential of Nanoparticles as Catalysts in Electrochemistry*
Department of Chemistry, Seoul National University (Dec 2021)

13. *The Overlooked Potential of Nanoparticles as Catalysts in Electrochemistry*
Department of Chemistry, The University of Chicago (Jan 2021)

12. *Colloidal Synthesis of Metal Nanoparticles for Electrochemical Transformations of Carbon Dioxide*
257th ACS National Meeting (Apr 2019 / Orlando, FL)

11. *Nanoparticle Catalysts for Electrochemical Transformation of Carbon Dioxide to Value-added Products*
2018 MRS Fall Meeting (Nov 2018 / Boston, MA)

10. *Nanoparticle dynamics and its implications for catalysis*
Gareth Thomas Award Symposium (Nov 2018 / UC San Diego)

9. *Nanoparticle Electrocatalysts for Chemical Valorization of CO2*
256th ACS National Meeting (Aug 2018 / Boston, MA)

8. *Nanoparticle Catalysts for Chemical Valorization of CO_2*
Gareth Thomas Award Symposium, Award nominee (Nov 2017 / UC Berkeley)

7. *Interfacing Nanomaterials for Solar-to-fuel Conversion*
2017 MRS Spring Meeting (Apr 2017 / Phoenix, AZ)

6. *Interfacing Nanomaterials for Solar-to-fuel Conversion*
253rd ACS National Meeting (Apr 2017 / San Francisco, CA)

5. *Nanostructured Materials for CO_2 Reduction in Artificial Photosynthesis*
Plenary talk – Global Artificial Photosynthesis : Breakthroughs for the Sustainocene (ANU) (Sep 2016 / Lord Howe Island, AUS)

4. *Materials Interaction of Nanoparticles in Catalysis: from Atomic to Macroscopic*
ANU College of Engineering and Computer Science (Sep 2016 / Canberra, AUS)

3. *Nanostructured Materials for CO_2 Reduction in Artificial Photosynthesis*
Plenary talk – Advancing Energy Sustainability by Governance Leadership in Artificial Photosynthesis, Australian National University (ANU) (Sep 2016 / Canberra, AUS)

2. *Materials Interaction of Nanoparticles in Catalysis: from Atomic to Macroscopic*
2016 MRS Spring Meeting (Mar 2016 / Phoenix, AZ)

1. *Nanoparticle Catalyst Design for Electrochemical Reduction of Carbon Dioxide*
249th ACS National Meeting (Mar 2015 / Denver, CO)

Contributed Presentations

9. *Control of Nanoparticle Interfaces for Electrocatalytic Applications*
   2021 AIChE Annual Meeting, Faculty Candidate Session (Nov 2021 / Boston, MA)
8. *The Control of Electrochemical Interfaces in Heterogeneous Catalysis*
   (Poster) The 4th World Laureates Forum (Nov 2021 / Virtual)
7. *Voltage Cycling Process for the Electroconversion of Biomass-derived Polyols*
   (Poster) SUNCAT Summer Institute 2021 (Aug 2021 / Virtual)
6. *Electroconversion of Biomass-Derived Polyols by Voltage Cycling*
   2020 AIChE Annual Meeting (Nov 2020 / Virtual)
5. *Electrochemical Conversion of Biomass-derived Polyols*
   (Poster) SUNCAT Summer Institute 2019 (Aug 2019 / SLAC)
4. *Structural Transformation of Cu NP Ensembles for CO_2 Reduction to Multicarbon Products*
   2018 MRS Spring Meeting (Apr 2018 / Phoenix, AZ)
3. *Nanoparticle Catalysts for Chemical Valorization of CO_2*
   MRS Graduate Student Award Finalist (Apr 2018 / Phoenix, AZ)
2. *Electrochemical Reduction of Carbon Dioxide*
   (Poster) 2017 Review of DOE/BES Chemical Sciences Research Programs (Sep 2017)
1. *Au-Cu Bimetallic Nanoparticles for Electrochemical Reduction of Carbon Dioxide*
   (Poster) Bio-Inspired Solar Energy Program Meeting, CIFAR (Dec 2015 / San Francisco, CA)

Patents

4. **U.S. Provisional Patent Application No. 63/480,875** – Semi-Continuous Process for Co-Production of CO2-Free Hydrogen and High Value Carbon via Hydrocarbon Pyrolysis
3. **U.S. Patent App. 17498260** – Nanoparticle-Ligand Composite Catalyst Including a Pseudocapacitive Interface for Carbon Dioxide Electrolysis (related publication *Nat. Energy* **5**, 1032-1042 (2020))
2. **U.S. Patent No. 11047055** – Method of depositing nanoparticles on an array of nanowires (related publication *Nano Lett.* **16,** 5675–5680 (2016))
1. **U.S. Patent No. 10704153** – Copper nanoparticle structures for reduction of carbon dioxide to multicarbon products (related publication *PNAS* **114,** 10560-10565 (2017))

Media coverage / Interviews

"A New Direction towards Carbon Management" interviewed by *Chemical Today* magazine (Dec 2017, Vol 2, Issue 7, pg. 54-55, http://www.worldofchemicals.com/chemicaltoday/digitalissue.html)

Teaching

CBE 5000, Electrochemistry Fundamentals, Practices, and Analysis (Spring 2023, UPenn)
CBE 4510, Chemical Reactor Design (Fall 2022, UPenn)
(Teaching Assistant) MSE 111, Properties of Electronic Materials (Spring 2017, UC Berkeley)

Mentoring

Univ. of Pennsylvania
Graduate students
Rani Baidoun (PhD, CBE), Nidhi Ohri (BS/MS, CBE), Yidong Hua (MS, CBE)

Previously at other institutions
Graduate students
Inwhan Roh (Chemistry, UC Berkeley)
Sheena Louisia (Chemistry, UC Berkeley) / Postdoc at Leiden University
Sunmoon Yu (MSE, UC Berkeley) / Postdoc at MIT
Yifan Li (Chemistry, UC Berkeley) / Senior Research Scientist at Lockheed Martin

Undergraduate students
Alexander Jisaburo Hamamura Nelson (Chemistry, Stanford)
Tom Lin (ChemE and MSE, UC Berkeley) / Graduate student at MIT
Jesika Barmanbek (ChemE, UC Berkeley) / Engineer at Alcon

Professional Development

Penn Engineering Junior Faculty Teaching Program (Fall 2022, CTL, University of Pennsylvania)

Introduction to Teaching at Penn (Summer 2022, CTL, University of Pennsylvania)

Course Design Institute for Graduate Students and Postdoctoral Scholars (Summer 2021, Center for Teaching and Learning (CTL), Stanford)

Memberships / Certification

American Chemical Society (ACS), American Institute of Chemical Engineers (AIChE), Materials Research Society (MRS), The Electrochemical Society (ECS)

SUNCAT Summer Institute (2013/2019/2021)

Service / Outreach

Faculty liaison/advisor to the AIChE student chapter at Penn

Penn CBE graduate admissions committee; VIEST postdoctoral fellowship evaluation committee

Guest lecturer for the Korea-Penn Engineers and Scientists Association (K-PENSA) event (2023), Road-to-Research (R2R) student organization (2023), Vagelos Integrated Program in Energy Research (VIPER) (2023)

Student Representative, Kavli ENSI (2015-17)

Served as a peer reviewer for:
Nature Nanotechnology, Nature Energy, JACS, ACS Nano, Joule, ACS Sensors, ACS Catalysis, Chem Catalysis, Applied Catalysis A, and Applied Catalysis B

Ad-hoc reviewer for proposals submitted to:
DOE, Office of Science, Basic Energy Sciences