

CURRICULUM VITAE

PERSONAL INFORMATION

Name	KYEOUNGHAK KIM
Current Address	Department of Chemical Engineering, Hanyang University, 222, Wangsimni-ro, Seongdong-gu, Seoul, 04763, Korea Computational Design of Catalysts and Energy Materials Laboratory (CDCE) #535, 5nd Materials Science & Chemical Engineering Building
E-mail	chemekim@hanyang.ac.kr
Current position	Assistant Professor (Dept. of Chemical Engineering) (J.A.) Division of Materials Science & Engineering

EDUCATION

- Sep 2018 – Feb 2021 **Pohang University of Science and Technology (POSTECH)** Pohang, Korea
Doctor of Philosophy in Chemical Engineering
Lecturer & Graduate Research Assistant
Advisor: Prof. Jeong Woo Han
Dissertation: Computational studies of cation stability in perovskite based electrode materials for high performance solid oxide fuel cells
- Mar 2014 – Feb 2018 **University of Seoul** Seoul, Korea
Master of Science in Chemical Engineering
Finished the Ph.D. Coursework in Chemical Engineering
Graduate Research Assistant
Advisor: Prof. Jeong Woo Han
Dissertation: Density Functional Theory Studies for Design of High Performance Nanocatalysis
- Feb 2008 – Feb 2014 **University of Seoul** Seoul, Korea
Bachelor of Science in Chemical Engineering

EXPERIENCE

- Sep 2021 – **Hanyang University** Seoul, Korea
Assistant Professor
Department of Chemical Engineering
Adjunct Professor of Materials Science and Engineering
- Feb 2021 – Aug 2021 **Pohang University of Science and Technology (POSTECH)** Pohang, Korea
Postdoctoral researcher & Lecturer
Research Project: Controlling Cation Stability in Perovskite Based Electrode Materials for High Performance Solid Oxide Fuel Cells
- Feb 2018 – Sep 2018 **Pohang University of Science and Technology (POSTECH)** Pohang, Korea
Researcher
Research Project: Development of Kinetic Monte Carlo (KMC) simulation tool for the analysis of molecular-level of thin film deposition process

Publications

Published 38, Submitted 2, in preparation 3, ongoing research 2
First author: 19, Co-author: 17, Corresponding author: 2

- 2022 Jun Kyu Kim†, Sangwoo Kim†, Seunghyun Kim, Hyung Jun Kim, **Kyeounghak Kim***, WooChul Jung*, and Jeong Woo Han*, Dynamic Surface Evolution of Metal Oxides for Autonomous Adaptation to Catalytic Reaction Environments, in Press. Adv. Mater. (2022) (IF=30.849) *co-corresponding authors.
- 2022 Hyo Min You, Yeongjun Yoon, and **Kyeounghak Kim***, DFT-guided Design of Nickel-based Catalysts for Dry Reforming of Methane, Catalysis (2022).
*corresponding authors.
- 2021 **Kyeounghak Kim†**, Jinuk Byun†, Hyunjoong Kim†, Kug-Seung Lee, Hyeon Seok Lee, Jiheon Kim, Taeghwan Hyeon*, Jae Jeong Kim*, and Jeong Woo Han*, Design of highly efficient core-shell electrocatalysts for N₂O reduction, ACS Catal. 11 (2021) 15089-15097. (IF=13.084) †co-first authors
**Selected as a Front cover*
- 2021 Jong Jun Lee†, **Kyeounghak Kim†**, Kyeong Joon Kim, Hyung Jun Kim, Young Min Lee, Tae Ho Shin*, Jeong Woo Han*, and Kang Taek Lee*, In-Situ Exsolution of Ni Nanoparticles to Achieve an Active and Stable Solid Oxide Fuel Cell Anode Catalyst on A-Site Deficient La_{0.4}Sr_{0.4}Ti_{0.94}Ni_{0.06}O_{3-δ}, J. Ind. Eng. Chem. J. Ind. Eng. Chem. 103 (2021) 264-274. (IF=6.064). †co-first authors (IF=6.064)
- 2021 Sandip Maiti†, Kakali Maiti†, Matthew T. Curnan, **Kyeounghak Kim**, Kyung-Jong Noh, and Jeong Woo Han*, Engineering electrocatalyst nanosurfaces to enrich activity by inducing lattice strain, Energy Environ. Sci. (2021). In press (IF=38.532)
**Selected as an Inside Front Cover*
- 2021 Kakali Maiti, **Kyeounghak Kim**, Kyung-Jong Noh, and Jeong Woo Han*, Cobalt phosphosulfide uniformly encapsulated by heteroatom-doped graphene as excellent electrocatalyst for oxygen reduction, Chem. Eng. J. 423 (2021) 130233. (IF=13.273)
- 2021 Sangwook Joo†, **Kyeounghak Kim†**, Ohhun Kwon, Jinkyung Oh, Linjuan Zhang, Jing Zhou, Jian-Qiang Wang, Hu Young Jeong, Jeong Woo Han*, and Guntae Kim*, Enhancing Thermocatalytic Activities via Up-shift of the d-Band Center of Exsolved Co-Ni-Fe Ternary Alloy Nanoparticles for Dry Reforming of Methane, Angew. Chem. Int. Ed. 60, 2-10 (2021) †co-first authors (IF=15.336)
- 2021 **Kyeounghak Kim**, Sangwook Joo, Rui Huang, Hyung Jun Kim, Guntae Kim*, and Jeong Woo Han*, Mechanistic insights into phase transition and metal ex-solution phenomena of Pr_{0.5}Ba_{0.5}Mn_{0.85}Co_{0.15}O_{3-δ} from simple to layered perovskite under reducing conditions and enhanced catalytic activity, Energy Environ. Sci. 14 (2021) 873-882. (IF=38.532)
**Selected as a Back Cover*
- 2020 Ohhun Kwon†, Yong In Kim†, **Kyeounghak Kim†**, Jong Chan Kim, Jong Hoon Lee, Sung Soo Park, Jeong Woo Han*, Young-Min Kim*, Guntae Kim*, and Hu Young Jeong*, Probing One-Dimensional Oxygen Vacancy Channels Driven by Cation-Anion Double Ordering in Perovskites, Nano Lett. 20 (2020) 8353-8359. †co-first authors (IF=11.238)
- 2020 Ji-Soo Jang†, Jun Kyu Kim†, **Kyeounghak Kim**, Wan-Gil Jung, Chasung Lim, Sangwoo Kim, Dong-Ha Kim, Bong-Joong Kim*, Jeong Woo Han*, WooChul Jung*, and Il-Doo Kim*, Dopant-driven Positive Reinforcement in Ex-solution Process: New Strategy to Develop Highly Capable and Durable Catalytic Materials, Adv. Mater. 32 (2020) 2003983. (IF=27.398)
**Selected as an Inside Front Cover*
- 2020 **Kyeounghak Kim†**, Chaesung Lim†, and Jeong Woo Han*, Computational approaches to the exsolution phenomenon in perovskite oxides with a view to design highly durable and active anodes for solid oxide fuel cells, Korean J. Chem. Eng. 37 (2020) 1295-1305. †co-first authors (IF=2.690)
**Invited review paper, The first prize at Daelim Research Award*

- 2020 **Kyeounghak Kim**†, Bonjae Koo†, Yong-Ryun Jo, Siwon Lee, Jun Kyu Kim, Bong-Joong Kim*, WooChul Jung*, and Jeong Woo Han*, Control of transition metal - oxygen bond strength boosts the redox ex-solution in perovskite oxide surface, Energy Environ. Sci. 13 (2020) 3404-3411. †co-first authors (IF=30.289)
**Selected as a Front Cover*
- 2020 Sangwook Joo†, Arim Seong†, Ohhun Kwon, **Kyeounghak Kim**, Jong Hoon Lee, Raymond J. Gorte, John M. Vohs*, Jeong Woo Han*, and Guntae Kim*, Highly active dry methane reforming catalysts with boosted in-situ grown Ni-Fe alloy nanoparticles on perovskite oxide via atomic layer, Sci. Adv. 6 (2020) eabb1573. (IF=13.116)
- 2020 Rui Huang, **Kyeounghak Kim**, Hyung Jun Kim, Myeong Gon Jang, and Jeong Woo Han*, Size-Controlled Pd Nanoparticles Loaded on Co₃O₄ Nanoparticles by Calcination for Enhanced CO Oxidation, ACS Appl. Nano Mater. 3 (2020) 486-495.
**Selected as a Supplementary cover*
- 2020 Mincheol Shin, Ji Yeon Shin, **Kyeounghak Kim**, Byeongseon Yang, Jeong Woo Han, Nak-Kyoon Kim, and Hyung Joon Cha*, The position of lysine controls the catechol-mediated surface adhesion and cohesion in underwater mussel adhesion, J. Colloid Interface Sci. 563 (2020) 168-176. (IF=7.489)
- 2020 **Kyeounghak Kim**†, Seungyeon Baek†, Jae Jeong Kim, and Jeong Woo Han, Catalytic decomposition of N₂O on Pd_xCu_y alloy catalysts: A density functional theory study, Appl. Surf. Sci. 510 (2020) 145349. †co-first authors (IF=6.182)
- 2020 Seungyeon Baek†, **Kyeounghak Kim**†, Oh Sung Kwon, Hyeonsu Kim, Jeong Woo Han, Oh Joong Kwon, and Jae Jeong Kim, Pd-Cu alloy catalyst synthesized by citric acid-assisted galvanic displacement reaction for N₂O reduction, J. Appl. Electrochem. 50 (2020) 395-405. †co-first authors (IF=2.384)
- 2020 Hyunwoo Yook†, **Kyeounghak Kim**†, Ji Hoon Park, Young-Woong Suh, and Jeong Woo Han*, Density functional theory study on the dehydrogenation of 1,2-dimethyl cyclohexane and 2-methyl piperidine on Pd and Pt catalysts, Catal. Today 352 (2020) 345-353. (IF=5.825)
- 2020 Mingi Choi, Ismail A.M. Ibrahim, **Kyeounghak Kim**, Ja Yang Koo, Seo Ju Kim, Ji-Won Son, Jeong Woo Han*, and Wonyoung Lee*, Engineering of the Charged Defects at the Perovskite Oxide Surfaces for Exceptionally Stable Solid Oxide Fuel Cell Electrodes, Appl. Mater. Interfaces, 12 (2020) 21494-21504. (IF=8.758)
- 2019 Kyung-Jong Noh†, **Kyeounghak Kim**†, Hyungjun Kim and Jeong Woo Han*, Improved CO Oxidation via Surface Stabilization of Ceria Nanoparticles Induced by Rare-Earth Metal Dopants, ACS Appl. Nano Mater. 2 (2019) 6473-6481.
- 2019 Jae Yul Lim†, **Kyeounghak Kim**†, Eui Yong Kim*, and Jeong Woo Han*, Density Functional Theory Study of NO_x Adsorption on Alkaline Earth Metal Oxide and Transition Metal Surfaces, Korean J. Chem. Eng. 36 (2019) 1258. †co-first authors
**Daelim Research Award* (IF=2.476)
- 2019 Sangwook Joo, Ohhun Kwon, **Kyeounghak Kim**, Seona Kim, Hyunmin Kim, Jeeyoung Shin, Hu Young Jeong, Sivaprakash Sengodan, Jeong Woo Han, and Guntae Kim*, Cation swapping approach to maximize exsolution capability via post-deposition in layered perovskite, Nat. Commun. 10 (2019) 697. (IF=11.878)
- 2019 Yong-Ryun Jo†, Bonjae Koo†, Min-Ji Seo, Jun Kyu Kim, Siwon Lee, **Kyeounghak Kim**, Jeong Woo Han, WooChul Jung, and Bong-Joong Kim*, Growth kinetics of individual Co particles ex-solved on SrTi_{0.75}Co_{0.25}O_{3-δ} polycrystalline perovskite thin films, J. Am. Chem. Soc. 141 (2019) 6690-6697. (IF=14.695)
- 2019 Jiyong Chung†, Jeong Hee Lee†, **Kyeounghak Kim**†, Jaeyoung Lee, Sung Jong Yoo, Jeong Woo Han*, Jinsoo Kim*, and Taekyung Yu*, A new etching process for zinc oxide with etching rate and crystal plane control: experiment, calculation, and membrane application, Nanoscale, 11 (2019) 12337-12346. (IF=6.970)

- 2019 Yeongdong Mun†, **Kyeounghak Kim†**, Seonggyu Lee†, Seongbeen Kim, Seunghyun Lee, Sujeong Kim, Wonyong Choi, Soo-kil Kim, Jeong Woo Han, * and Jinwoo Lee *, Novel Versatile Strategy for Tuning ORR Activity of a Single Fe-N₄ Site by Controlling Electron Withdrawing/Donating Properties of Carbon Plane, J. Am. Chem. Soc. 141 (2019) 6254-6262. †co-first authors (IF=14.695)
- 2018 Ohhun Kwon, **Kyeounghak Kim**, Sangwook Joo, Hu Young Jeong, Jeeyoung Shin, Jeong Woo Han, Sivaprakash Sengodan, and Guntae Kim, Self-assembled alloy nanoparticles in layered double perovskite as a fuel oxidation catalyst for solid oxide fuel cells, J. Mater. Chem. A, 6 (2018) 15947-15953. (IF=9.931)
**Selected as a Front Cover and 2018 Journal of Materials Chemistry A HOT Paper*
- 2018 Bonjae Koo†, **Kyeounghak Kim†**, Jun Kyu Kim†, Jeong Woo Han*, and WooChul Jung*, Sr Segregation in Perovskite Oxides: Why It Happens and How It Exists, Joule, 2 (2018) 1476-1499. †co-first authors, *review article* (IF=27.054)
News
JoongAng Ilbo : goo.gl/aBEHq3
Newsis : http://www.newsis.com/view/?id=NISI20180820_0000189342
etnews : <http://www.etnews.com/20180820000133>
- 2018 Yeongdong Mun†, **Kyeounghak Kim†**, Seongbeen Kim, Seunghyun Lee,^a Seonggyu Lee, Sujeong Kim, Wonyong Choi, Soo-kil Kim, Jeong Woo Han, * and Jinwoo Lee *, A Novel Strategy to Develop Non-noble Metal Catalyst for CO₂ Electroreduction: Hybridization of Metal-Organic Polymer, Appl. Catal. B-Environ. (2018) 154-161. †co-first authors (IF=11.698)
- 2017 **Kyeounghak Kim**, Jinho Oh, Tae Wan Kim, Ji Hoon Park, Jeong Woo Han*, and YoungWoong Suh*, Different Catalytic Behavior of Pd and Pt Metals in Decalin Dehydrogenation to Naphthalene, Catal. Sci. Tech. 7 (2017) 3728-3735. (IF=5.773)
**Selected as a Back Cover*
- 2017 Ohhun Kwon, Sivaprakash Sengodan, **Kyeounghak Kim**, Hu Young Jeong, Young-Wan Ju, Jeong Woo Han*, and Guntae Kim*, Periodicity and Co-segregation Aspects of Self-Grown Catalyst Nanoparticles in Perovskites, Nat. Commun. 8 (2017) 15967. (IF=12.124)
- 2017 **Kyeounghak Kim†**, JeongDo Yoo†, Siwon Lee, Minseok Bae, Joongmyeon Bae, WooChul Jung*, and Jeong Woo Han*, A Simple Descriptor to Rapidly Screen CO Oxidation Activity on Rare-Earth Metal Doped CeO₂: from Experiment to First-Principles, ACS Appl. Mater. Interfaces 9 (2017) 15449-15458. †co-first authors (IF=7.504)
- 2017 Shin Wook Kang, **Kyeounghak Kim**, Dong Hyun Chun, Jung-Il Yang, Ho-Tae Lee, Heon Jung, Jung Tae Lim, Sanha Jang, Chul Sung Kim, Chan-Woo Lee, Sang Hoon Joo*, Jeong Woo Han*, and Ji Chan Park*, High-performance Fe₅C₂@CMK-3 nanocatalyst for selective and high-yield production of gasoline-range hydrocarbons, J. Catal. 349 (2017) 66-74. (IF=6.844)
- 2017 **Kyeounghak Kim** and Jeong Woo Han*, Mechanistic study for enhanced CO oxidation activity on (Mn,Fe) co-doped CeO₂(111), Catal. Today 293-294 (2017) 82-88. (IF=4.636)
- 2016 **Kyeounghak Kim** and Jeong Woo Han*, Effect of caffeic acid adsorption in controlling the morphology of gold nanoparticles: role of surface coverage and functional groups, Phys. Chem. Chem. Phys. 18 (2016) 27775-27783. (IF=4.449)
**Selected as an Inside Back Cover*
- 2016 Song-Hyun Cha, Youmie Park, Jeong Woo Han, **Kyeounghak Kim**, Hyun-Seok Kim, Hong-Lae Jang, and Seonho Cho*, Cold welding of gold nanoparticles on mica substrate: Self-adjustment and enhanced diffusion, Sci. Rep. 6 (2016) 32951. (IF=5.228)
- 2016 Hyun-Seok Kim, Yu Seon Seo, **Kyeounghak Kim**, Jeong Woo Han, Youmie Park, and Seonho Cho, Concentration Effect of Reducing Agents on Green Synthesis of

- Gold Nanoparticles: Size, Morphology, and Growth Mechanism, *Nanoscale Res. Lett.* 11 (2016) 1-9. (IF=2.584)
- 2016 Yeongdong Mun, Jongmin Shim, **Kyeounghak Kim**, Jeong Woo Han, Soo-Kil Kim, Youngjin Ye, Jongkook Hwang, Seonggyu Lee, JongHyun Jang, Yong-Tae Kim, and Jinwoo Lee, Direct access to aggregation-free and small intermetallic nanoparticles in ordered, large-pore mesoporous carbon for electrocatalyst, *RSC Adv.* 6 (2016) 88255-88264. (IF=3.289)
 - 2016 **Kyeounghak Kim**, Wonyoung Lee*, and Jeong Woo Han*, First-Principles Study of Enhanced Oxygen Incorporation near the Grain Boundary on Yttria-Stabilized Zirconia, *Sci. Adv. Mater.* 8 (2016) 196-200. (IF=1.812)
 - 2015 Geonyeop Lee, Jihyun Kim*, **Kyeounghak Kim**, and Jeong Woo Han*, Precise control of defects in graphene by using oxygen plasma, *J. Vac. Sci. Tech. A* 33 (2015) 060602. *Featured as the MOST READ list this month (IF=1.464)
 - 2015 Gwangseok Yang, Byung-Jae Kim, **Kyeounghak Kim**, and Jeong Woo Han*, and Jihyun Kim*, Energy and dose dependence of proton-irradiation damage in monolayer graphene, *RSC Adv.* 5 (2015) 31861-31865. (IF=3.840)
 - 2013 Jeonghyun Ko†, Ho Seong Song†, **Kyeounghak Kim**†, and Jeong Woo Han *, Recent research trend in catalyst design based on density functional theory calculations, *Catalysis* 29 (2013) 1-16. †co-first authors

Presentations

(Presentor *)

- 2022 **Kyeounghak Kim***, Computational Design of Catalytic Materials for Hydrogen Production, Storage, and Applications, KIEC Spring Meeting, Jeju, Korea, May 11-13, 2022.
(*invited talk*)
- 2022 **Kyeounghak Kim***, Mechanistic Study of Hydrogen Production and Applications, KIEC Spring Meeting, Jeju, Korea, May 11-13, 2022
(*invited talk*)
- 2022 **Kyeounghak Kim***, Basics of DFT calculation (technical training session), KIEC Spring Meeting, Jeju, Korea, May 11-13, 2022.
(*invited talk*)
- 2022 **Kyeounghak Kim***, Computational Materials Design for Energy Applications, KICChE Spring Meeting, Jeju, Korea, Apr. 20-23, 2022.
(*invited talk*)
- 2022 **Kyeounghak Kim***, Computational Design of Catalytic Materials, Nano-Convergence Technology Division, National Nanofab Center, Daejeon, Apr. 13, 2022.
(*invited talk*)
- 2022 **Kyeounghak Kim***, Computational Design of Electrode Materials in Solid Oxide Fuel Cells, KECS Spring Meeting, Jeju, Apr. 7, 2022.
(*invited talk*)
- 2022 **Kyeounghak Kim***, Computational Design of Anode Materials in SOFCs, ERICA (Hanyang University) Department Seminar, Ansan, Mar. 10, 2022.
(*invited talk*)
- 2022 **Kyeounghak Kim***, Engineering of B-metal Exsolution for Enhanced Anode Materials in Solid Oxide Fuel Cells, Nano Convergence 2022, Konjiam Resort, Jan. 19, 2022.
(*invited talk*)
- 2021 **Kyeounghak Kim***, Computational Chemistry in Chemical Engineering, Hanyang

University, Seoul, Korea, May, 20, 2021.
(*invited talk*)

- 2021 **Kyeounghak Kim***, and Jeong Woo Han, A mechanistic study of phase transition from simple perovskite to layered one with Co ex-solution for enhanced anode material in solid oxide fuel cell, KICHe Spring Meeting, Pusan, Korea, April, 21-23, 2021. (*oral presentation*)
- 2020 **Kyeounghak Kim***, and Jeong Woo Han, Engineering of cation stability for highly stable and active perovskite-based SOFC electrode materials, KICHe Fall Meeting, Online, August 14-16, 2020. (*Best poster award*)
- 2020 **Kyeounghak Kim***, and Jeong Woo Han, Engineering of cation exchange to boost Ni ex-solution on $(La_{0.5}Sr_{0.5})(Ti_{1-x}Ni_x)O_{3-\delta}$, KCS spring Meeting, Online, July 6-9, 2020. (*oral presentation*)
- 2019 **Kyeounghak Kim*** and Jeong Woo Han, “A DFT Study for Engineering of B-metal Exsolution Tendency in Perovskite Materials”, KCS Fall Meeting, Seoul, Korea, November 13-15, 2019. (*oral presentation*)
- 2019 **Kyeounghak Kim***, Jae Yul Lim and Jeong Woo Han, NO_x Adsorption on Alkaline Earth Metal Oxide and Transition Metal Surfaces: A Density Functional Theory Study, ICMS, Jeju, Korea, November 3-6, 2019.
- 2019 **Kyeounghak Kim***, and Jeong Woo Han, A DFT Study of B-metal Exsolution for Superior Catalytic Activity of Anode Materials in Solid Oxide Fuel Cells, 22nd International Conference on Solid State Ionics, Pyeongchang, Korea, June 16-21, 2019.
- 2019 **Kyeounghak Kim*** and Jeong Woo Han, Enhanced Catalytic Activity of CO Oxidation on Exsolved Co Nanoparticles by Controlling the Stability of B-metal (Co) in SrTi_{1-x}Co_xO_{3-δ}, Korean SOFC symposium, Pusan, Korea, January 18-19, 2019. (*Best poster award*)
- 2018 **Kyeounghak Kim***, and Jeong Woo Han, Controlling the Stability of B-metal (Co) in SrTi_{1-x}Co_xO_{3-δ} for Enhancing the Exsolution on Perovskite Materials, ENGE 2018, Jeju, Korea, Nov 11-14, 2018. (*Best poster award, Gold prize*)
- 2018 **Kyeounghak Kim***, and Jeong Woo Han, How to Control B-metal Exsolution on Perovskite Materials, Materials Challenges in Alternative and Renewable Energy (MCARE), Vancouver, Canada, August 18-25, 2018. (*invited talk*)
- 2018 **Kyeounghak Kim***, Jeong Woo Han, and YoungWoong Suh, Different Catalytic Behavior of Pd and Pt Metals in Decalin Dehydrogenation to Naphthalene, KICHe catalysis research debate, Pyeongchang, Korea, June 20-22, 2018.
- 2018 **Kyeounghak Kim*** and Jeong Woo Han, “Mechanistic Study for the Formation of Exsolved Alloy Nanoparticles on Transition Metal Doped PaBaMnO_{5+δ} under Reducing Environment”, KICHe Spring Meeting, Daejeon, Korea, April 25-27, 2018. (*oral presentation*) (*Best Research Presentation Award*)
- 2017 **Kyeounghak Kim*** and Jeong Woo Han, “A DFT Study for Phase Transition and Metallic Nanoparticle Exsolution on PaBaMn_{2-x}T_xO₆ (T = Co and Fe) under Reducing Environment”, KICHe Fall Meeting, Daejeon, Korea, November 25-27, 2017. (*oral presentation*)
- 2017 **Kyeounghak Kim** and Jeong Woo Han*, “First-Principles based Mechanistic Study for the Exsolution of Ni Nanoparticles on $(La,Sr)_xNi_yTi_{1-y}O_3$ Perovskite”, The 17th Congress of Asian Pacific Confederation of Chemical Engineering, Hong Kong, China, August 23- 27, 2017. (*oral presentation*)
- 2017 **Kyeounghak Kim*** and Jeong Woo Han, “Mechanistic Study for B-site Metal Ex-

solution on $\text{PrBaT}_x\text{Mn}_{2-x}\text{O}_{5+\delta}$ (T = Mn, Fe, Co, and Ni) under Reduction Conditions”, 21st International Conference on Solid State Ionics, Padua, Italy, June 18-23, 2017.

(oral presentation)

- 2017 **Kyeounghak Kim***, Kyung-Jong Noh, WooChul Jung, and Jeong Woo Han, “A Comprehensive Study to Enhance CO Oxidation Activity by Using Doped CeO_2 ” 16th Korea-Japan Symposium on Catalysis & 3rd International Symposium of Institute for Catalysis, Sapporo, Hapan, May 15-17, 2017.
- 2017 **Kyeounghak Kim***, Jinho Oh, Tae Wan Kim, Ji Hoon Park, Young-Woong Suh, and Jeong Woo Han, “Mechanistic Study of Catalytic Dehydrogenation of Decalin to Tetralin to Naphthalene on Pd(111) and Pt(111)” KICHe Spring Meeting, JeJu, Korea, April 26-28, 2017. *(oral presentation)* ***Hoimyung Research Award**
- 2016 **Kyeounghak Kim***, JeongDo Yoo, Siwon Lee, WooChul Jung, and Jeong Woo Han, “Fast Prediction of CO Oxidation Activity on Rare-Earth Metal Doped CeO_2 ”, AIChE Fall Meeting, San Francisco, CA, November 13-18, 2016.
- 2016 **Kyeounghak Kim*** and Jeong Woo Han, “Mechanistic Study for Metallic Nano Particle Exsolution on $\text{PaBaMn}_{2-x}\text{M}'_x\text{O}_{5+\delta}$ (M' = Co and Fe) Perovskite”, KICHe Fall Meeting, Daejeon, Korea, October 19-21, 2016. *(oral presentation)*
- 2016 **Kyeounghak Kim** and Jeong Woo Han*, “Density Functional Theory based Computational Screening of Metallic Nanoparticle Exsolution on AB_2O_3 Perovskites”, The International Conference on Technological Advances of Thin Films & Surface Coatings, Singapore, July 12-15, 2016 *(invited talk)*
- 2016 **Kyeounghak Kim**, JeongDo Yoo, Siwon Lee, WooChul Jung, and Jeong Woo Han*, “Mechanistic Study for the Fast Screening of CO Oxidation Activity on Rare-Earth Metal Doped CeO_2 ”, The International Symposium on Catalytic Conversion of Energy and Resources, Seoul, Korea, June 30-July 2, 2016
- 2016 **Kyeounghak Kim*** and Jeong Woo Han, “The effects of functional group and surface coverage on the morphology of gold nanoparticle”, KICHe Spring Meeting, Busan, Korea, April 27-29, 2016. *(oral presentation)*
- 2016 **Kyeounghak Kim*** and Jeong Woo Han, “Molecular Adsorption and Surface Coverage Effects on the Morphology of Gold Nanoparticles”, 251st ACS National Meeting, San Diego, CA, March 13-17, 2016.
- 2016 **Kyeounghak Kim*** and Jeong Woo Han, “Exsolution Mechanism of Nanoparticles on Double Layered Perovskite under Reduction Condition”, 251st ACS National Meeting, San Diego, CA, March 13-17, 2016.
- 2015 **Kyeounghak Kim*** and Jeong Woo Han, “Fast screening of CO oxidation activity on rare-earth metal doped $\text{CeO}_2(111)$ surfaces”, ICAE 2015, Jeju, Korea, November 17-20, 2015. ***(Best poster award)***
- 2015 **Kyeounghak Kim***, Wonyoung Lee, and Jeong Woo Han, “First-Principles Study of Enhanced Oxygen Incorporation near the Grain Boundary on Yttria-Stabilized Zirconia”, The Korean Society of Clean Technology, Gyeongju, Korea, September 24-26, 2014. AIChE National Meeting, Salt Lake City, November 8-13, 2015.
- 2015 **Kyeounghak Kim*** and Jeong Woo Han, “First-Principles based Comparative Study of Oxygen Incorporation Process on Grain and Grain Boundary of Yttria-Stabilized Zirconia”, KICHe Fall Meeting, KINTEX, Korea, October 21-23, 2015
- 2015 **Kyeounghak Kim***, Wonyoung Lee, and Jeong Woo Han, “Density Functional Theory Study of Surface Oxygen Incorporation Mechanism on the Yttria-Stabilized Zirconia”, Nano Korea, Seoul, Korea, July 1-3, 2015. ***(Best poster award)***

- 2014 **Kyeounghak Kim*** and Jeong Woo Han, “Density Functional Theory Study for the Evaluation of M-doped TiO₂(101) (M=Cr, Mn, Fe, Co and Ni) over CO Oxidation”, ENGE 2014, Jeju, Korea, November 16-19, 2014.
- 2014 **Kyeounghak Kim***, Wonyoung Lee, and Jeong Woo Han, “Mechanistic Studies of Enhanced Oxygen Incorporation near the Grain Boundary on Ytria-Stabilized Zirconia”, The Korean Society of Clean Technology, Gyeongju, Korea, September 24-26, 2014. **(Best poster award)**
- 2014 **Kyeounghak Kim*** and Jeong Woo Han, “First-principles Study of Enhanced Oxygen Incorporation near the Grain Boundary on Ytria-Stabilized Zirconia”, KICHe Fall Meeting, Daejeon, Korea, October 22-24, 2014 (**oral presentation**)
- 2014 **Kyeounghak Kim***, Sungju Yu, Jongheop Yi, and Jeong Woo Han, “Density Functional Theory Study for the Evaluation of M-doped TiO₂(101) (M = Cr, Mn, Fe, Co and Ni) over CO Oxidation”, 10th KIAS Electronic Structure Calculation Workshop, Seoul, Korea, June 19-20, 2014.
- 2014 **Kyeounghak Kim***, Wonyoung Lee, and Jeong Woo Han, “First Principles calculations of Enhanced Oxygen Incorporation near the Grain Boundary on Ytria-Stabilized Zirconia”, KICHe Spring Meeting, Changwon, Korea, April 23-25, 2014.
- 2013 **Kyeounghak Kim***, Sungju Yu, Jongheop Yi, and Jeong Woo Han, “Density Functional Theory Study for the Evaluation of M-doped TiO₂(101) (M = Cr, Mn, Fe, Co and Ni) over CO Oxidation”, KICHe Fall Meeting, Daegu, Korea, October 23-25, 2013.

RESEARCH EXPERIENCES

- July 2022 – Present
To June 2026
Researcher
“Development of technology for the production of 100% biomass-based bioplasticizers replacing petroleum-based plasticizers. Climate Change Technology Development, National Research Foundation of Korea (NRF). **Researcher, ₩30,000,000/year**”
- July 2022 – Present
To June 2029
Principal investigator (Co-PI)
“Center for Decentralized Low-carbon Hydrogen Production”, Engineering Research Center, National Research Foundation of Korea (NRF). **Co-Principal investigator, ₩120,000,000/year**”
- May 2021 – Present
To Apr 2022
Principal investigator (PI)
“Design of highly active and stable electrodes by controlling cation stability in perovskite based materials”, KISTI HPC supercomputing resources support.
- Mar 2021 – Present
To Feb 2026
Principal investigator (PI)
“Controlling Cation Stability in Perovskite Based Electrode Materials for High Performance Solid Oxide Fuel Cells”, Sejong Science Fellowship, National Research Foundation of Korea (NRF). **Principal investigator (PI), ₩135,000,000/year**”
- Mar 2019 – Feb 2021
Principal investigator (PI)
“The development of enhance anode materials in SOFCs by using B-metal exsolution”, Global PhD Fellowship, National Research Foundation of Korea (NRF). **Principal investigator (PI), ₩30,000,000/year**”
- Apr 2018 – Aug 2021
Research Assistant (RA)
“Rational Design of Enhanced Metal Catalyst Supported on Metal Oxide for Water-Gas Shift Reaction: from Computational Chemistry to Experimental Validation”, Mid-Career Grant from the National Research Foundation of Korea (NRF).
- Dec 2015 – Dec 2020
Main Researcher
“Research on technology and commercialization of metal-supported solid oxide fuel cell for utilization of hydrocarbon fuels”, Korea Institute of Energy Technology Evaluation and Planning (KIETEP).

- Dec 2016 – Dec 2020
Main Researcher
“In-situ growth of self-assembled metal nano-catalysts using spontaneous metal/oxide phase separation”, Samsung Research Funding Center for Future Technology.
- Jan 2016 – Sep 2020
Main Researcher
“The multiscale technology for long-term stabilized SOFC”, Global Frontier Center for Multiscale Energy System from the National Research Foundation of Korea.
- May 2016 – Mar 2019
Main Researcher
“Development of Liquid Organic Hydrogen Carriers as a Renewable Storage and Transport using Modified Heat-transfer Fluids”, Korea Institute of Energy Technology Evaluation and Planning
- May 2018 – Mar 2019
Research Assistant (RA)
“Computational design of composite catalysts for SOFCs ”, National Research Foundation of Korea.
- Feb 2016 – Feb 2019
Research Assistant (RA)
“Computational design of catalysis/support with high performance and stability for high temperature co-electrolysis”, KIST Institution Program
- Feb 2018 – Feb 2019
Main Researcher
“Development of Kinetic Monte Carlo (KMC) simulation tool for the analysis of molecular-level of thin film deposition process”, SK hynix, Inc.
- Feb 2016 – Aug 2018
Research Assistant (RA)
“Computational design of catalysis/support with high performance and stability for high temperature co-electrolysis”, KIST Institution Program.
- Dec 2015 – Aug 2018
Main Researcher
“Super Ultra Low Energy & Emission Vehicle Center”, Engineering Research Center (ERC) from the National Research Foundation of Korea.
- May 2016 – Jan 2018
Main Researcher
“Development of single-atom electrocatalysts for H₂ production and utilization”, Samsung Research Funding Center for Future Technology
- Mar 2015 – Jan 2016
Main Researcher
“Rational design of key materials for high performance solid oxide and proton exchange membrane fuel cells via computational materials science”, Global Frontier Center for Multiscale Energy System from the National Research Foundation of Korea
- May 2015 – Jan 2016
Research Assistant (RA)
“Green Synthesis of Gold Nanoparticles using Caffeic Acid (CA)”, National Creative Research Initiatives Center for Isogeometric Optimal Design
- Sep 2015 – Dec 2015
Teaching Assistant : Physical Chemistry
Computational Catalysis and Energy Materials Lab, University of Seoul
- Dec 2014 – Feb 2015
R&D Internship Program
Research for the Improvement of Thermal Efficiency on Cooling System, Trane Korea
- May 2014 – Jun 2017
Research Assistant (RA)
“Computational Rational Design of Catalysis for Eco-friendly Energy Sources: from Co-electrolysis to Synthetic Hydrocarbon Fuel”, New Faculty Grant from the National Research Foundation of Korea
- Sep 2014 – Dec 2014
Teaching Assistant : General Chemistry
Division of General Chemistry, University of Seoul
- Oct 2015 – Aug 2016
Main Researcher
“Design of exsolved metal nano-catalysts using spontaneous metal/oxide phase separation for Intelligence electrode materials of SOFCs”, KISTI HPC supercomputing resources support, (KSC-2015-C3-045)
“Super science 2017” issued by KISTI HPC supercomputing center.
- Oct 2014 – Sep 2015
Main Researcher
“Design of electrode and electrolyte materials for SOFCs with high efficiency and stability”, KISTI HPC supercomputing resources support, (KSC-2014-C2-048)

TECHNICAL SKILLS AND COMPETENCES

Density Functional Theory (DFT) calculation
Vienna Ab initio Simulation Package (VASP) , Material Studio (MS)

Molecular Dynamics Simulation (Basic)
Large-scale Atomic/Molecular Massively Parallel Simulator (LAMMPS)
Kinetic Monte Carlo Simulation (Medium level)

MATLAB (Medium level)
Multi-paradigm Numerical Computing Environment and Fourth-generation
Programming Language

HONORS / AWARDS

- 2021 Best Graduate Student in 2021
BK21, POSTECH
- 2021 Graduate *summa cum laude* (Ph.D.) / Dept. of Chemical Engineering in POSTCH
POSTECH
- 2021 Brain Korea21 (BK21) Scholarship Program (2018 ~ 2020)
Korean Ministry of Education
- 2020 Graduate Student Research Award (Catalysis)
The Korean Institute of Chemical Engineers, Fall Meeting
- 2020 Best Paper Award
The Korean Institute of Chemical Engineers, Fall Meeting
- 2020 Best Paper Award
BK21, POSTECH
- 2020 The First Prize at Daelim Research Award (Catalysis/Materials)
Daelim Industrial Co. Ltd.
- 2019 Best Paper Award
BK21, POSTECH
- 2019 Silver Prize (2nd) at Samsung Electro-Mechanics Research Award
Samsung Electro-Mechanics Co. Ltd.
- 2019 Global PhD Fellowship
National Research Foundation of Korea
- 2019 Best Poster Award at Korean SOFC symposium 2019
- 2018 Best "ENGE" acrostic poem Award
- 2018 Best Poster Award at ENGE 2018
- 2018 Best Research Presentation Award
The Korean Institute of Chemical Engineers, Spring Meeting
- 2017 Outstanding Paper Award II
University of Seoul
- 2017 Hoimyung Research Award
Hoimyung Industrial Co. Ltd. & KIChE

- 2017 Scholarship for Research Assistant, Postgraduate Fellowship
University of Seoul
- 2017 Outstanding Paper Award I
University of Seoul
- 2016 Scholarship for Teaching Assistant, Teaching Fellowship
University of Seoul
- 2016 Scholarship for Undergraduate Student Tutoring
University of Seoul
- 2016 Outstanding Paper Award I
University of Seoul
- 2015 Best Poster Award
3th International Conference on Advanced Electromaterials (ICAE 2015)
- 2015 Scholarship for Excellent Achievement
University of Seoul
- 2015 Best Poster Award
13th International Nanotech Symposium (Nano Korea 2015)
- 2014 Best Poster Award at Fall Meeting
The Korean Society of Clean Technology
- 2013 Alumni Association Scholarship
University of Seoul
- 2013 University Development Fund Scholarship
University of Seoul
- 2008 Merit Scholarship
University of Seoul

Journal Reviewer

Nature Communications (Nature publishing group)
 Korean Journal of Chemical Engineering (Springer)
 Molecular Catalysis (Elsevier)
 Applied Surface Science (Elsevier)
 Electrochem (MDPI)
 Catalysis (MDPI)
 Physical Chemistry Chemical Physics (RSC)

References

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 Pohang University of Science and Technology (POSTECH)
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Dr. Jin-Woo Lee

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Korea Advanced Institute of Science & Technology (KAIST)
jwlee1@kaist.ac.kr
Reference paper: J. Am. Chem. Soc. 141 (2019) 6254-6262.

Dr. WooChul Jung
Sustainable Energy Materials Laboratory (SEML)
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Korea Advanced Institute of Science & Technology (KAIST)
wcjung@kaist.ac.kr
Reference paper: Energy Environ. Sci. 13 (2020) 3404-3411.

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Ulsan National Institute of Science and Technology (UNIST)
gtkim@unist.ac.kr
Reference paper: Nat. Commun. 8 (2017) 15967, Nat. Commun. 10 (2019) 697.