

# Minjoon Park, Ph.D.



## Associate Professor

Department of Nanoenergy Engineering

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## EDUCATION

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Aug.27 2012–Feb.21 2017 **Combined M.S. and Ph.D.**, Ulsan National Institute of Science and Technology (UNIST), Energy Engineering (Battery science and technology), Ulsan, Republic of Korea, (*Advisor: Prof. Jaephil Cho*)

Mar.2 2010–Feb.24 2012 **B.S.**, Hanyang University (Seoul), Resources and Environmental Engineering, Republic of Korea

## CAREER

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Mar. 1 2020 – Present **Associate Professor**, Pusan National University, Department of Nanoenergy Engineering, Republic of Korea

Oct.1 2018 – Feb.15 2020 **Staff Research Engineer**, Samsung SDI, Portable Lithium-ion Battery Development Group, Republic of Korea

Jun.1 2017 – Aug.31 2018 **Postdoctoral Fellow**, Harvard University, School of Engineering and Applied Science, MA, USA, (*Prof. Michael J. Aziz*)

Jan.14 2007 – Mar.21 2009 **Military Service**, Republic of Korean Air force, Honorable Discharge (Sergeant)

## RESEARCH PROJECT

### 1. National Research Foundation of Korea, Excellent Young Researchers (Principal Investigator)

- Project name: Development of Core Technologies for a Novel Hybrid Redox Flow Battery for Next-Generation Large-Capacity Power Storage Systems with Sustained High Voltage and High Energy Density

### 2. National Research Foundation of Korea, Basic Research Laboratory (Collaborative Research)

- Project name: Design and Development of Novel Photon-Ion Fusion Energy Storage Materials and Systems

- Period: June 1, 2021 to May 31, 2024 (3 years, 500 million KRW)

### 3. National Research Foundation of Korea, Basic Research (Principal Investigator)

- Project name: Development of a High-Voltage Hybrid Redox Flow Secondary Battery for Next-Generation ESS

- Period: June 1, 2020 to May 31, 2021 (1 year, 50 million KRW)

### 4. Samsung SDI (Participating Research)

- Project name: Capacity fading mechanism of flexible lithium-ion batteries

- Period: Aug. 1, 2015 – Jul. 31, 2016 (1 year)

### 5. Samsung SDI (Participating Research)

- Project name: High energy organic redox flow battery

- Period: Jul. 1, 2014 – Jun. 30, 2015 (1 year)

### 6. Hyundai Heavy Industry (Participating Research)

- Project name: Development of the stack components for 5 kW all-vanadium redox flow batteries

- Period: Jan. 1, 2012 – Dec. 31, 2012. (1 year)

## PUBLICATIONS

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1. Linghong Yin, Dingcheng Yang, Injun Jeon, Jangwon Seo, Hong Chen, Min Seung Kang, **Minjoon Park**, Chae-Ryong Cho\*  
“Enhancing Li-Ion Battery Anodes: Synthesis, Characterization, and Electrochemical Performance of Crystalline C60 Nanorods with Controlled Morphology and Phase Transition”  
[ACS Applied Materials & Interfaces](#) (2024)
2. Woo Sub Heo, Woong Kwon, Taewoong Lee, Seongwook Chae, Jae Bin Park, **Minjoon Park**, Euigyung Jeong\*, Jin Hong Lee\*, Seung Geol Lee\*  
“Structural Engineering of Carbon Host derived from Organic Pigment toward Physicochemically Confinement and Efficient Conversion of Polysulfide for Lithium Sulfur Batteries”  
[Small Methods](#) (2024)
3. Young Je Kwon, Ji-Oh Kim, E. Vivek, Eunji Kim, Se Hun Kim, Taekyun Kwon, Eunyoung Lim, Seongwook Chae, **Minjoon Park**, Youngho Eom, Ji-Hoon Baik\*, Jin Hong Lee\*, Kie Yong Cho\*  
“A stress-adaptive interlinked 3D network binder for silicon anodes via tailored chemical bonds and conformation of functionalized poly(vinylidene fluoride) (PVDF) terpolymers”  
[Chemical Engineering Journal](#), 479, 147860 (2024)
4. I.Jeon, T.Kim, J.-W.Seo, I.-K.Jeong, J.H.Lee, **Minjoon Park**, Y.Park, D.Yang, and C.-R.Cho\*  
“Enhanced electrochemical performance and interdiffusion behavior of sodium ions in onion-derived freeze-dried and KOH-activated carbon for sodium-ion battery anodes”  
[Applied Surface Science](#), 648, 159023 (2024)
5. Jinyeong Choi, Hyeokjun Jang, Jihan Park, Duho Han, Joohyuk Park\*, **Minjoon Park\***  
“Progress and Challenges in Engineering the Atomic Structure of Oxygen Electrocatalysts for Zinc-air batteries”  
[ACS Applied Materials & Interfaces](#) 15 (48), 55692-55702. (2023)
6. Jihan Park+, Minsoo Kim+, Jinyeong Choi, Soobeom Lee, Duho Han, Jinhye Bae\*, **Minjoon Park\***

- "Controllable carbon felt etching by binary nickel bismuth cluster for Vanadium-Manganese Redox Flow Batteries"  
[ACS Applied Materials & Interfaces](#), 15, 31, 37390–37400 (2023)
7. Hyungyeon Cha, Jaeseong Hwang, Taeyong Lee, Jihyeon Kang, **Minjoon Park\***, Jaephil Cho\*  
 "Exploring Degradation Pathways of Nickel-rich Cathode During High-Temperature Storage in High-Energy Lithium-ion Batteries"  
[Journal of Materials Chemistry A](#), 11, 15475-15481 (2023)
  8. Jinyeong Choi+, Joohyuk Park+, Jihan Park, Minsoo Kim, Soobeom Lee, Min Gyu Kim, Jaewong Choi\*, Jun-Woo Park\*, **Minjoon Park\***  
 "A low-index facets polyhedron shaped binary cerium titanium oxide for high-voltage aqueous zinc-vanadium redox flow battery"  
[ACS Applied Materials & Interfaces](#), Accepted (2023)
  9. Gwang-Hun Kim, You-Jin Lee, Jun-Woo Park, Asif Raza, Muhammad Bilal Raza, Doohun Kim, **Minjoon Park\***, Hae-Young Choi\*  
 "Enhanced Performance of Lithium-Sulfur Battery Cathode via Composition Optimization Using Modified MWCNTs as a Conductive Material and Poly (Acrylic Acid) as a Binder"  
[International Journal of Electrochemical Science](#), 18, 8 (2023)
  10. Soobeom Lee, Jihan Park, Minsoo Kim, Jinyeong Choi, Joonhee Kang\*, **Minjoon Park\***  
 "A high-voltage aqueous zinc-vanadium redox flow battery with bi-modal tin and copper clusters by a continuous-flow electrometallurgical synthesis"  
[ACS Applied Materials & Interfaces](#) 15, 5, 7002-7013 (2023)
  11. Minsoo Kim, Soobeom Lee, Jinyeong Choi, Jihan Park, Jun-Woo Park\*, **Minjoon Park\***  
 "Reversible metal ionic catalysts for high-voltage aqueous hybrid zinc-manganese redox flow batteries"  
[Energy Storage Materials](#) 55, 698-707 (2023) (IF : 20.4, JCR%: 4.20)
  12. Jaechan Ryu, Joohyuk Park, Jihan Park, Min Gyu Kim, **Minjoon Park\***  
 "Molecular engineering of atomically dispersed Fe-N4 and Cu-N4 dual-sites in carbon nitride nanotubes for bifunctional oxygen electrocatalysts"  
[Energy Storage Materials](#) 55, 397-405 (2023) (IF : 20.4, JCR%: 4.20)
  13. Jihan Park, Minsoo Kim, Jinyeong Choi, Soobeom Lee, Jueun Kim, Duho Han, Hyeokjun Jang, **Minjoon Park\***  
 "Recent Progress in High-voltage Aqueous Zinc-based Hybrid Redox Flow Batteries"  
[Chemistry – An Asian Journal](#), 18(2): e202201052. (2023)
  14. Mihee Park, **Minjoon Park\***  
 "Carbon nanofiber decorated ternary transition metal oxide anodes for fast charging lithium-ion batteries"  
[Energy Technology](#), 2200293. (2022)
  15. Soobeom Lee, Jinyeong Choi, Minsoo Kim, Jihan Park, **Minjoon Park\***, Jaephil Cho\*  
 "Material Design and Surface Chemistry for Advanced Rechargeable Zinc-Air Batteries"  
[Chemical Science](#), 13, 6159-6180 (2022)
  16. Linghong Yin, Jiung Cho, Su Jae Kim, Il Jeon, Injun Jeon, Mihee Park, **Minjoon Park**, Se-Young Jeong, Dae Hyung Lee, Dong-Hwa Seo\*, Chae-Ryong Cho\*  
 "Abnormally High-Lithium Storage in Pure Crystalline C60 Nanoparticles"  
[Adv. Mater.](#) 31, 20, 1804784 (2021), Sep, 12
  17. Linghong Yin, Mihee Park, Injun Jeon, Jin Hyun Hwang, Jong Pil Kim, Hyung Woo Lee, **Minjoon Park**, Se Young Jeong, Chae-Ryong Cho\*

"Silicon nanoparticle self-incorporated in hollow nitrogen-doped carbon microspheres for lithium-ion battery anodes"

*Electrochimica Acta*, 368, 1, 137630, (2021), Feb, 2021

18. **Minjoon Park**, Eugene S. Beh, Eric M. Fell, Yan Jing, Emily F. Kerr, Diana De Porcellinis, Marc-Antoni Goulet, Jaechan Ryu, Andrew A. Wong, Roy G. Gordon, Jaephil Cho\*, Michael J. Aziz\*

"A high voltage aqueous zinc-organic hybrid flow battery"

*Adv. Energy Mater.* (2019), 9, 25, 1900694

19. Dong-Seon Shin+, **Minjoon Park\***, Jaechan Ryu, Inchan Hwang, Jeong Kon Seo, Kwanyong Seo\*, Jaephil Cho\*, Sung You Hong\*

"Nonaqueous Arylated Quinone Catholytes for Lithium-Organic Flow Batteries"

*J. Mater. Chem. A*, 6,14761-14768 (2018)

20. Jaechan Ryu, **Minjoon Park\***, Jaephil Cho\*

"Advanced technologies for high-energy aluminum-air batteries"

*Adv. Mater.* 1804784 (2018) (\*Corresponding author)

21. Hyungyeon Cha, Yoonji Lee, **Minjoon Park\***, Jaephil Cho\*

"Flexible three-dimension interlocking lithium-ion batteries",

*Adv. Energy Mater.* 8, 1801917 (2018)

22. Jaechan Ryu, Haeseong Jang, Joohyuk Park, Youngshin Yoo, **Minjoon Park\***, Jaephil Cho\*

"Seed-mediated atomic-scale reconstruction of silver manganate nanoplates for oxygen reduction towards high-energy aluminum-air flow batteries",

*Nature Commun.* 9, 3715 (2018)

23. Yoonkook Son, Jung-Soo Lee, Min Choi, Yeonguk Son, Noejung Park, Minseong Ko, Ji-Hyun Jang\*, **Minjoon Park\***

"Exploring the correlation between MoS<sub>2</sub> nanosheets and 3D graphene-based nanostructures for reversible lithium storage"

*Appl. Surf. Sci.* 459, 98-104 (2018)

24. Yoonkook Son, Soojin Sim, Hyunsoo Ma, Min Choi, Yeonguk Son, Noejung Park\*, Jaephil Cho\*, **Minjoon Park\***

"Exploring critical factors affecting strain distribution in one-dimensional silicon-based nanostructures for lithium-ion battery anodes"

*Adv. Mater.* 30,1705430 (2018)

25. Hyungyeon Cha, Junhyeok Kim, Yoonji Lee, Jaephil Cho\*, **Minjoon Park\***

"Issues and challenges facing flexible lithium-ion batteries for practical application"

*Small*, 14,1702989 (2018)

26. Junhyeok Kim, Hyunsoo Ma, Hyungyeon Cha, Hyomyung Lee, Jaekyung Sung, Minho Seo, **Minjoon Park\***, Jaephil Cho\*

"A highly stabilized nickel-rich cathode material by nanoscale epitaxy control for high-energy lithium-ion batteries"

*Energy Environ. Sci.* 11,1449-1459 (2018)

27. Junhyeok Kim, Hyomyung Lee, Hyungyeon Cha, Moonsu Yoon, **Minjoon Park\***, Jaephil Cho\*

"Prospect and reality of Ni-rich cathode for commercialization"

*Adv. Energy Mater.* 8,1702028 (2018)

28. Joohyuk Park, Manabu Shirai, Gwan Yeong Jung, Sung O. Park, **Minjoon Park**, Jaechan Ryu, Sang Kyu Kwak\*, Jaephil Cho\*

- "Correlation of Low-Index Facets to Active Sites in Micron-Sized Polyhedral Pyrochlore Electrocatalyst", *ACS Catalysis*, 8 (10), 9647-9655 (2018)
29. **Minjoon Park\***, Hyungyeon Cha\*, Yoonji Lee, Jaehyung Hong, Sung Youb Kim, Jaephil Cho\*  
 "Post-patterned electrodes for flexible node-type lithium-ion batteries"  
*Adv. Mater.* 29 (11), 1605773 (2017) *selected as "Front Cover"*
30. Junhyeok Kim, Jieun Lee, Hyunsoo Ma, Hu Young Jeong, Hyungyeon Cha, Hyomyung Lee, Youngshin Yoo, **Minjoon Park\***, Jaephil Cho\*  
 "Controllable solid electrolyte interphase in nickel-rich cathodes by an electrochemical rearrangement for stable lithium-ion batteries"  
*Adv. Mater.* 30,1704309 (2017) (\*Corresponding author) *selected as "Front Cover"*
31. Junhyeok Kim, Hyeon Cho, Hu Young Jeong, Hyunsoo Ma, Jieun Lee, Jaeseong Hwang, **Minjoon Park\***, Jaephil Cho\*  
 "Self-induced concentration gradient in nickel-rich cathodes by sacrificial polymeric bead clusters for high energy lithium-ion batteries"  
*Adv. Energy Mater.* 7, 1602559 (2017) *selected as "Front Cover"*
32. Joohyuk Park, **Minjoon Park**, Gyutae Nam, Min-Gyu Kim\*, Jaephil Cho\*  
 "Unveiling the catalytic origin of nanocrystalline yttrium ruthenate pyrochlore as a bi-functional electrocatalyst for Zn-air batteries"  
*Nano Lett.*, 17(6) 3974-3981 (2017)
33. **Minjoon Park**, Jaechan Ryu, Wei Wang\*, Jaephil Cho\*  
 "Material design and engineering of next-generation flow battery technologies"  
*Nature Rev. Mat.*, 2, 16080 (2016)
34. **Minjoon Park**, In-Yup Jeon, Jaechan Ryu, Haeseong Jang, Jong-Beom Back, and Jaephil Cho\*  
 "Edge-halogenated graphene nanoplatelets with F, Cl, or Br as electrocatalysts for all-vanadium redox flow batteries"  
*Nano Energy*, 26, 233-240 (2016)
35. Xien Liu, **Minjoon Park**, Min Gyu Kim, Shiva Gupta, Xiaojuan Wang, Gang Wu\*, Jaephil Cho\*  
 "High-performance non-spinel cobalt-manganese mixed oxide-based bifunctional electrocatalysts for rechargeable zinc-air batteries"  
*Nano Energy*, 20, 315-325 (2016)
36. Joohyuk Park, Marcel Risch, Gyutae Nam, **Minjoon Park**, Tae Joo Shin, Suhyeon Park, Min Gyu Kim, Yang Shao-Horn\*, Jaephil Cho\*  
 "Single crystalline pyrochlore nanoparticles with metallic conduction as efficient bi-functional oxygen electrocatalysts for Zn-air batteries"  
*Energy Environ. Sci.* 10,129 (2016)
37. Jaechan Ryu, **Minjoon Park**, Jaephil Cho\*  
 "Catalytic effects of B/N-co-doped porous carbon incorporated with ketjenblack nanoparticles for all-vanadium redox flow batteries"  
*J. Electrochem. Soc.*, 163, A5144-A5149 (2016)
38. **Minjoon Park**, Dong-Seon Shin, Jaechan Ryu, Noejung Park, Sung You Hong\*, Jaephil Cho\*  
 "Organic-catholyte-containing flexible rechargeable lithium batteries"  
*Adv. Mater.*, 27, 5141-5146 (2015) *selected as "Inside Cover"*
39. **Minjoon Park**, In-Yup Jeon, Jaechan Ryu, Jong-Beom Baek, Jaephil Cho\*,  
 "Exploration of the effective location of surface oxygen defects in graphene-based electrocatalysts for all-

vanadium redox-flow batteries”

*Adv. Energy Mater.*, 5, 1401550 (2015)

40. **Minjoon Park**, Jaechan Ryu, Jaephil Cho\*

“Nanostructured electrocatalysts for all-vanadium redox flow batteries”

*Chem. Asian J.*, 10, 2096 (2015) *selected as “Back Cover”*

41. Joohyuk Park, **Minjoon Park**, Gyutae Nam, Jang-soo Lee, Jaephil Cho\*

“All-solid-state cable-type flexible zinc–air battery”

*Adv. Mater.*, 27, 1396-1401 (2015) *selected as “Frontispiece”*

42. Xien Liu, **Minjoon Park**, Min Gyu Kim, Shiva Gupta, Gang Wu\*, Jaephil Cho\*

“Integrating NiCo alloys with their oxides as efficient bifunctional cathode catalysts for rechargeable zinc–air batteries”

*Angew. Chem. Int. Ed.*, 54, 9654-9658 (2015)

43. Xien Liu, Wen Liu, Minseong Ko, **Minjoon Park**, Min Gyu Kim, Pilgun Oh, Sujong Chae, Suhyeon Park, Anix Casimir, Gang Wu\*, Jaephil Cho\*

“Metal (Ni, Co)-metal oxides/graphene nanocomposites as multifunctional electrocatalysts”

*Adv. Funct. Mater.*, 25, 5799-5808 (2015)

44. **Minjoon Park**, Jaechan Ryu, Youngsik Kim\*, Jaephil Cho\*

“Corn protein-derived nitrogen-doped carbon materials with oxygen-rich functional groups: a highly efficient electrocatalyst for all-vanadium redox flow batteries”

*Energy Environ. Sci.*, 7, 3727-3735 (2014)

45. **Minjoon Park**, Yang-Jae Jung, Jaechan Ryu, Jaephil Cho\*

“Material selection and optimization for highly stable composite bipolar plates in vanadium redox flow batteries”

*J. Mater. Chem. A*, 2, 15808-15815 (2014)

46. **Minjoon Park**, Yang-jae Jung, Jungyun Kim, Ho il Lee, Jaephil Cho\*

“Synergistic effect of carbon nanofiber/nanotube composite catalyst on carbon felt electrode for high-performance all-vanadium redox flow battery”

*Nano Lett.*, 13, 4833-4839 (2013)

## INTERNATIONAL CONFERENCES

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1. *MRS Fall Meeting*, Boston, MA, U.S., Nov. **2016**, “Tube-Type Li-Organic Flow Batteries with Quinone-Based Organic-Catholytes”, Oral presentation
2. *Next-Generation Energy Storage*, San diego, CA, U.S., Apr. **2016**, “A post-patterned electrode for flexible node-type lithium-ion batteries”, Poster presentation
3. *ECS Conference*, Scotland, Jul. **2015**, “Research Progress on Electrocatalyst for All-Vanadium Redox Flow Batteries and Flexible Li-Organic Flow Batteries”, Oral presentation
4. *Beyond Lithium Ion VIII*, TN, U.S., Jun. **2015**, “An Organic Catholyte for Flexible Lithium-Organic Redox Flow Batteries”, Poster presentation
5. *ACS Spring Meeting*, Denver, CO, U.S., Mar. **2015**, “High-Performance All-Vanadium Redox Flow Batteries: Exploration of the Effective Location of Surface Oxygen Defects in Graphene-Based Electrocatalysts”, Oral presentation
6. *International Flow Battery Forum*, Hamburg, Germany, Jul. **2014**, “Corn protein-derived nitrogen-doped carbon materials with oxygen-rich functional groups: A highly efficient

electrocatalyst for the all-vanadium redox flow batteries”, Poster presentation

7. *MRS Fall Meeting*, Boston, MA, U.S., Dec. **2013**, “Synergistic Effect of Carbon Nanofiber / Nanotube Composite Catalyst on Carbon Felt Electrode for High-performance All-Vanadium Redox Flow Battery”, Poster presentation

## **DOMESTIC CONFERENCES**

1. *KECS Fall Meeting*, Korea, Oct. **2015**, “An Organic Catholyte for Flexible Lithium-Organic Redox Flow Batteries”, Poster presentation
2. *KECS Fall Meeting*, Korea, Nov. **2014**, “High-Performance All-Vanadium Redox Flow Batteries: Exploration of the Effective Location of Surface Oxygen Defects in Graphene-Based Electrocatalysts”, Oral presentation
3. *KCERS Spring Meeting*, Korea, Apr. **2014**, “N-doped Graphene-Coated Carbon Blacks Driven by Corn Protein Self-Assembly: Metal-free Electrocatalyst for All-Vanadium Redox Flow Batteries”, Poster/Oral presentation
4. *KECS Spring Meeting*, Korea, Apr. **2013**, “Vapor-grown Carbon Nanofiber/Graphite felt electrode as Enhanced Electrocatalytic material for All-Vanadium Redox Flow Battery”, Poster presentation

## **RESEARCH INTERESTS**

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1. Aqueous electrochemical energy storage (EES) system
  - A. Vanadium redox flow battery (VRFB)
  - B. Metal-organic hybrid flow battery
  - C. Aluminum-air flow battery
2. Mechanical flexible batteries
  - A. Lithium-organic based tube-type flexible battery
  - B. High energy density post-patterned electrode for flexible lithium-ion battery
  - C. Cable-type Zn-air battery
3. Nanostructured electrode materials for lithium-ion batteries
  - A. Nickel-rich cathode materials
  - B. High-energy anode materials (graphene, silicon)
4. Electrocatalysts for VRFBs
  - A. Vapor grown carbon nanotube (CNT)
  - B. Hetero-atom doped carbon nanomaterials
  - C. Graphene nanoplatelets

## **TECHNICAL SKILLS**

1. Stack assembly and tests for redox flow batteries
2. Electrochemical measurements and analysis
3. Synthesis of carbon- and metal-based electrocatalysts
4. Design of lithium-ion battery and electrode preparation (coin-type half-cell, pouch cell)

5. Tests for flexible batteries (flexing test, adhesion force, tensile strength)
6. Scanning electron microscopy (SEM) operation
7. Scientific graphic designs by Photoshop, Illustrator, and 3ds Max

## **SCHOLARSHIP AND AWARDS**

1. *UNIST Best Research Award* (Feb. 2017)
2. *Nine Bridges Fellowship*, UNIST (Nov. 2014)
3. *Outstanding Poster Award*, Beyond Lithium Ion VIII at Oak Ridge National Laboratory, TN, U.S. (Jun. 2015)
4. *Outstanding Graduate Student Award in School of Energy and Chemical Engineering*, UNIST (2013, 2014, 2015, 2016)