

YOUNG-WOON BYEON

Postdoctoral research fellow

Date of Birth: 09. 29. 1988
Address: 033-0338P, 1 Cyclotron Rd., Berkeley, CA 94720, United States
Phone: +1-510-990-5521, +82-10-3268-2420
E-mail: (Personal) youngwoonbyeon@gmail.com
(Office) ywbyeon@lbl.gov, eternalcloud9@korea.ac.kr
Webpage: [Linkedin](#), [Google scholar](#), [Researchgate](#), [ORCID](#)

RESEARCH INTERESTS

Correlative studies on the degradation of $\text{LiNi}_x\text{Co}_y\text{Mn}_z\text{O}_2$ (NCM) cathode material:

- Irreversible phase transition behavior induced by cation mixing and lattice strain in NCM materials
- Characterization of the solid-electrolyte interphase (SEI) at the surface of cathode material
- Correlation study between performance degradation of battery material and process parameters (particle size, coating material, thickness, binder distribution, composite cathode, etc.)

Diffusion behavior of charge carriers in anode materials of Li/Na-ion battery:

- *In-situ* studies on the diffusion behavior of charge-carrier ions in the lithiation/sodiation reactions

EDUCATION

09/2013 – 02/2020 **Korea University** Seoul, Korea
Ph.D. Candidate in Materials Science and Engineering.
Thesis title: Studies of sodiation behaviors in Sn anodes using *in situ* electron microscopy
(Advisor: Prof. Jae-Chul Lee, Dr. Jae-Pyoung Ahn)

03/2007 – 08/2013 **Korea University** Seoul, Korea
B.S. in Materials Science and Engineering.
(Advisor: Prof. Ho Jang)

WORK EXPERIENCES

03/2020 – present **Postdoctoral research fellow** Berkeley, CA, USA
(Principal Investigator: Dr. Haegyum Kim, Dr. Peter Ercius)
Kim Group, Materials Sciences Division
Lawrence Berkeley National Laboratory (LBNL)

- Work1
- Work2
- Work3
- Work4

05/2013 – 02/2020 **Research Assistant** Seoul, Korea
(Principal Investigator: Dr. Jae-Pyoung Ahn)
Electron Microscopy Group, Advanced Analysis Center
Korea Institute of Science and Technology (KIST)

- Studied various TEM functions and analytical techniques
- Developed an airtight sample transfer system to characterize air-sensitive materials
- Pioneered the correlative analysis of battery electrode materials by using various analytical instruments (XRD, XPS, SEM, TEM, EDS, EELS, and APT)
- Observed the formation and growth behavior of SEI layer during fast charging/discharging

- 03/2014 – 12/2017 **Teaching Assistant** Seoul, Korea
Department of Materials Science and Engineering, Korea University
- *Course Offering:* Engineering Mathematics II (2017); Mechanical Properties of Materials (2015); Metallic Material Processing (2014); Engineering Mathematics I (2014)
- 01/2012 – 02/2012 **Undergraduate Intern** Seoul, Korea
(Principal Investigator: Dr. Chang-Woo Lee)
Research team, Battelle-Korea
- Synthesized nanoparticles (NiO, MgO) and applied them to energy storage technology
- 03/2009 – 04/2011 **Sergeant (honorable discharged)** Jinju, Korea
Education & Training Command, Republic of Korea Air Force
- Produced e-learning contents for aircraft maintenance and air-traffic control

SELECTED RESEARCH PROJECTS

- “Advanced characterization and mechanism clarification for designing the fast chargeable and high-power battery” Samsung Research Funding & Incubation Center for Future Technology, Korea (2016-2019)
- “Development of characterization techniques of cell and material of Li-ion all solid-state battery” Hyundai Motor Company, Korea (2017-2020)
- “Development of convergence typed big data platform and construction of ecosystem” Ministry of Science and ICT, National Research Foundation of Korea (2018-2020)
- “Development of all solid-state battery technology based on NCM cathode / solid electrolyte design” Ministry of Science and ICT, National Research Foundation of Korea (2017-2019)
- “Development of high capacity layered structure cathode material and Si anode material” Samsung Fine Chemical, Korea (2014-2015)

ORAL TALKS FOR INTERNATIONAL CONFERENCES

- [2] “Isotropic and Ultrafast Sodiation Behavior of Sn Crystals”
2018 Material Research Society (MRS) Fall meeting, Boston, MA, US, November 25-30 (2018.11.27).
- [1] “Lattice Strain and Phase Transition Induced by Li Migration in Cyclic NCM111 ($\text{LiNi}_{1/3}\text{Co}_{1/3}\text{Mn}_{1/3}\text{O}_2$)”
5th International Conference on Electronic Materials and Nanotechnology for Green Environment (ENGE 2018), Jeju, Korea, November 11-14 (2018.11.12).

AWARDS AND HONORS

- 2019.10.29 **Best Poster Award**, 2019 Fall conf. of Korean Institute of Metals and Materials (KIM), Daegu, Korea
- 2019.01.31 **2nd Prize of Best Student Researcher**, Korea Institute of Science and Technology
- 2018.11.29 **Best Poster Award**, 2018 MRS Fall Meeting, Boston, MA, USA
- 2018.06.22 **Best Poster Award**, 2018 Spring conf. of Korean Society of Microscopy, Jeju, Korea
- 2017.10.27 **Best Poster Award**, 2017 Fall conf. of KIM, Daegu, Korea
- 2016.05.13 **Excellence Paper Award**, 2016 Spring conf. of Korean Battery Society, Seoul, Korea
- 2016.04.29 **Best Poster Award**, 2016 Spring conf. of KIM, Gyungju, Korea
- 2015.10.30 **Best Poster Award**, 2015 Fall conf. of KIM, Daejeon, Korea
- 2015.04.24 **Best Poster Award**, 2015 Spring conf. of KIM, Changwon, Korea
- 2014.10.24 **Best Poster Award**, 2014 Fall conf. of KIM, Jeongseon, Korea
- 2012.02.02 **Best Paper Award**, 4th Internship papers competition for undergraduates, Korea University
- 2017.12.20 **Industrial Scholarship (2018-2019)**, LG Chem
- 2014.05.07 **Korea Technocomplex Scholarship (2014)**, Korea University
- 2012.02.24 **Undergraduate Scholarship (2012-2013)**, Haedong Foundation for Science and Culture

PROFICIENCY

Operation skills of analytical instrument:

- **TEM** (*Transmission Electron Microscope*)
 - Thermo Fisher Scientific (former FEI): TITAN Themis (300kV, Cs-corrected), TALOS F200, TECNAI G2
 - STEM, HRTEM, SAED, PED, CBED, EELS, EDS, *in-situ* TEM (heating and indenting)
- **SEM** (*Scanning Electron Microscope*) / **Dual-beam FIB** (*Focused Ion Beam*)
 - FEI: Inspect F50, FEG-Nova 600, Quanta 3D FEG, Nova FIB, Helios FIB
 - TEM sampling, EDS, EBSD, EBIC, *in situ* analysis (Nano-indentation, manipulation, 4-probe measurement)
 - 3D tomography visualization and analysis (Amira, Avizo Software Suite)
- For more information, please visit the website of my team (<https://aac.kist.re.kr/eng/team1>)

Experiences of material analysis:

- **Correlative characterizations:** XRD, XPS, SEM, FIB, TEM, APT (*macro to sub-nm scale*)
- **In-situ experiments:** Mechanical / Chemical / Electrical / Structural analyses
- **Simulation and data process:** JEMS (Electron Microscopy Simulation), MATLAB, C++
- **Sample preparation:** Airtight sample transfer system for oxygen/water sensitive materials (Li, S, etc.)

IT/Software skills:

- Origin, DataGraph, OmniGraffle, OmniOutliner, Adobe Illustrator, Adobe Photoshop, Microsoft Office, Autodesk AutoCAD, Autodesk 3Ds MAX (3D graphic artwork), Bootstrap (responsive web design)
- Well known to colleagues as ‘Best Poster Award Hunter’ and ‘PPT Meister’

Personal strengths:

- Strong and positive attitudes to learn and improve expertise
- Work well with other people with flexible and considerable communication skills

JOURNAL PUBLICATIONS

You can also see at [Google scholar](#), [Researchgate](#), and [ORCID](#) († equal contribution, * corresponding author)

- [14] **Young-Woon Byeon**, Hyun-Jeong Lee, Soon-Ri Yoon, Hyung Cheoul Shim*, and Jae-Pyoung Ahn* “Formation of Solid Electrolyte Interphase and Its Properties During the Cyclic Test of $\text{LiNi}_{1/3}\text{Co}_{1/3}\text{Mn}_{1/3}\text{O}_2$ cathode”, In preparation, (2020).
- [13] **Young-Woon Byeon**, Hyun-Jeong Lee, Hyun-Woo Kim, Hye-Ryoung Kim and Jae-Pyoung Ahn* “Understanding the Degradation Mechanism of High-Ni $\text{LiNi}_x\text{Co}_y\text{Mn}_z\text{O}_2$ Cathode Material in Lithium All-solid-state Batteries”, In preparation, (2020).
- [12] Hyun-Jeong Lee, Jong-Hyun Seo, Jong-Seok Moon, **Young-Woon Byeon**, Jae-Chul Lee*, and Jae-Pyoung Ahn* “*In-situ* lithiation sequence of multi phases in single Si-C composite”, *Submitted*, (2020).
- [11] **Young-Woon Byeon**, Hong-Kyu Kim, Hyun-Jeong Lee, Jun Dong Kim, Ji Yeong Lee, Hyung Cheoul Shim*, Jae-Chul Lee*, and Jae-Pyoung Ahn* “Understanding the Degradation Mechanism of $\text{LiNi}_{1/3}\text{Co}_{1/3}\text{Mn}_{1/3}\text{O}_2$ Cathode Material in Lithium-ion Batteries”, *Submitted*, (2020).
- [10] **Young-Woon Byeon**, Jae-Pyoung Ahn, and Jae-Chul Lee*, “Diffusion along dislocations mitigates self-limiting Na diffusion in crystalline Sn”, *Small*, 2004868 (2020).
- [9] Jun-Hyoung Park, Yong-Seok Choi, **Young-Woon Byeon**, Jae-Pyoung Ahn, and Jae-Chul Lee*, “Diffusion kinetics governing the diffusivity and diffusional anisotropy of alloying anodes in Na-ion batteries”, *Nano Energy*, vol. 65, 104041 (2019).
- [8] **Young-Woon Byeon**†, Yong-Seok Choi†, Jae-Pyoung Ahn, and Jae-Chul Lee*, “Isotropic Sodiation Behavior of Ultrafast-chargeable Sn Crystals”, *ACS Applied Materials & Interfaces*, vol. 10, no. 48, pp. 41389-41397 (2018).
- [7] Yong-Seok Choi, **Young-Woon Byeon**, Jae-Pyoung Ahn, and Jae-Chul Lee*, “Evaluation of energy loss at Sn anodes based on phase transition behaviors and formation of electrically resistive phases of Na-Sn batteries”, *Journal of Materials Chemistry A*, vol. 6, no. 20, pp.9428-9436 (2018).
- [6] Yong-Seok Choi†, **Young-Woon Byeon**†, Jun-Hyoung Park, Jong-Hyun Seo, Jae-Pyoung Ahn, and Jae-Chul Lee*,

- “Ultrafast Sodiation of Single-Crystalline Sn Anodes”, *ACS Applied Materials & Interfaces*, vol. 10, no. 1, pp. 560-568 (2017).
- [5] **Young-Woon Byeon**[†], Yong-Seok Choi[†], Jae-Pyoung Ahn, and Jae-Chul Lee*, “Origin of high Coulombic loss during sodiation in Na-Sn battery”, *Journal of Power Sources*, vol. 343, pp. 513–519 (2017).
- [4] Yong-Seok Choi[†], **Young-Woon Byeon**[†], Jae-Pyoung Ahn, and Jae-Chul Lee*, “Formation of Zintl Ions and Their Configurational Change during Sodiation in Na-Sn Battery”, *Nano Letters*, vol. 17, no. 2, pp. 679–686 (2017).
- [3] Jung Sub Kim, A-Young Kim, **Young-Woon Byeon**, Jae-Pyoung Ahn, Dongjin Byun, and Joong Kee Lee*, “Porous Zn₂GeO₄ nanowires with uniform carbon-buffer layer for lithium-ion battery anodes with long cycle life”, *Electrochimica Acta*, vol. 195, pp. 43–50 (2016).
- [2] **Young-Woon Byeon**, Yong-Seok Choi, Jong-Hyun Seo, Ka-Hyun Hur, Jae-Pyoung Ahn, and Jae-Chul Lee*, “A Simple Method of Analyzing the Phase Transition Behavior of a Na-Sn Battery Using Energy-Dispersive X-Ray Spectroscopy”, *Korean Journal of Metals and Materials*, vol. 53, no. 12, pp. 926–930 (2015).
- [1] Jin-Woo Cho, Sung-Hoon Kim, **Young-Woon Byeon**, Ji Yeong Lee, Jae-Pyoung Ahn*, “Next-Generation Analysis Technologies of Nano materials: Based on Electron Microscopy”, *Trends in Metals and Materials Engineering*, vol. 28, pp. 26-43 (2015).

PATENTS

- [1] Shape-controlled multi-pod nanowire structure for direct methanol fuel cell application and preparation method thereof, *KR Patent: 1014211040000* (2014)

REFERENCES

Dr. Jae-Pyoung Ahn

*Thesis Advisor**

Principal Scientist, Head
Research Resources Division
Korea Institute of Science and
Technology, Seoul, Korea
jpahn@kist.re.kr
+82-2-958-5536

Prof. Jae-Chul Lee

*Thesis Advisor**

Professor
Department of Materials Science and
Engineering
Korea University, Seoul, Korea
jclee001@korea.ac.kr
+82-2-3290-3283

Dr. Hyung-Cheoul Shim

Senior Researcher
Department of Nano Mechanics
Korea Institute of Machinery and
Material, Daejeon, Korea
scafes@kimm.re.kr
+82-10-9144-7705

Dr. Tae-Hwan Yu

Director
R&D Center
A123 Systems
Waltham, MA, USA
tyu@a123systems.com
+82-10-2287-7253

Dr. Donghan Kim

Principal Researcher
Research Center
Samsung SDI
Suwon, Korea
donghan7612@gmail.com
+82-10-6337-7612