

# JAE CHUL KIM

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## CURRENT POSITION

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**Stevens Institute of Technology**, Hoboken, NJ                    07/2018-Present  
Assistant Professor, Department of Chemical Engineering & Materials Science

## EDUCATION

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**Massachusetts Institute of Technology**, Cambridge, MA  
Ph.D., Materials Science and Engineering (2014)  
Dissertation: Designing novel Li storage materials with a polyanionic framework  
Committee: Gerbrand Ceder (advisor), Donald R. Sadoway, Jeffrey C. Grossman

**Korea University**, Seoul, Korea  
M.E., Materials Science and Engineering (2007)  
Committee: Sahn Nahm (advisor)  
B.E. with Honors, Materials Science and Engineering (2005)

## EXPERIENCE

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**Korea University**, Seoul, Korea                                    02/2020-01/2022  
Visiting Professor, Department of Materials Science and Engineering

**Lawrence Berkeley National Laboratory**, Berkeley, CA                                    10/2015-07/2018  
Postdoctoral Fellow, Materials Sciences Division

**Massachusetts Institute of Technology**, Cambridge, MA                                    12/2013-10/2015  
Postdoctoral Associate, Department of Materials Science and Engineering

## HONORS AND AWARDS

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**Early Career Research Program Award 2022**, Department of Energy, Basic Energy Sciences

**Doctoral New Investigator Award 2021**, American Chemical Society, PRF

**ACTIVE GRANTS**

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<b>Public Service Enterprise Group</b>	01/2018-12/2024
Co-PI, Stevens-PSEG energy innovation, \$1,500,000	
<b>American Chemical Society</b>	09/2021-08/2023
PI, Petroleum Research Fund-Doctoral New Investigator, \$110,000	
<b>Korean Institute of Energy Research</b>	10/2021-09/2022
PI, Joint Research Program, \$84,000	
<b>Department of Energy</b>	08/2022-07/2027
PI, Early Career Research Program, \$750,000	

**PAST GRANTS**

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<b>Stevens Institute of Technology</b>	12/2019-05/2020
PI, Bridging Grant, \$20,000	
<b>LG Energy Solution</b>	08/2020-01/2022
PI, Battery Innovation Contest, \$150,000	

**RESEARCH INTERESTS**

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<b>Solid-State Chemistry for Energy Storage Materials Design</b>	Synthesis science and crystallography of functional inorganics materials for next-generation battery applications
<b>Electrochemistry and Interface Engineering</b>	Electrochemical analysis of interfaces in energy storage materials and in situ x-ray scattering and spectroscopic techniques
<b>Large-Scale Manufacturing of Powder and Fibrous Structures</b>	Advanced Manufacturing of functional materials via electrostatic spraying, spinning, and writing for 1, 2, and 3-D structures

**PUBLICATIONS** (<https://scholar.google.com/citations?user=I7VUCawAAAAJ&hl=en>)

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- [36] J. Han and **J. C. Kim\***, A solid-state route to stabilize cubic  $\text{Li}_7\text{La}_3\text{Zr}_2\text{O}_{12}$  at low temperature for all-solid-state-battery applications, *Chem. Commun.*, 56, (2020), 15197-15200
- [35] Y. Yang, J. Han, M. DeVita, S. S. Lee, and **J. C. Kim\***, Lithium and chlorine-rich preparation of mechanochemically activated antiperovskite composites for solid-state batteries, *Front. Chem.*, 8, (2020), 562549

- [34] **J. C. Kim**, D.-H. Kwon, J. Yang, H. Kim, S. H. Bo, L. Wu, H. Kim, D.-H. Seo, T. Shi, J. Wang, Y. Zhu, and G. Ceder\*, Direct observation of alternating octahedral and prismatic sodium layers in O3-type transition metal oxides, *Adv. Energy Mater.*, 10, (2020), 2001151
- [33] H. Kim, D.-H. Kwon, **J. C. Kim**, B. Ouyang, H. Kim, J. Yang, and G. Ceder\*,  $\text{Na}^+$  redistribution by electrochemical  $\text{Na}^+/\text{K}^+$  exchange in layered  $\text{Na}_x\text{Ni}_2\text{SbO}_6$ , *Chem. Mater.*, 32, (2020), 4312–4323
- [32] J. Han, J. S. Chae, **J. C. Kim\***, and K. C. Roh\*, Facile preparation of composite electrodes for supercapacitors by CNT entrapment into carbon matrix derived from pitch at a softening point, *Carbon*, 163, (2020), 402-407
- [31] Y. Xiao, Y. Wang, S.-H. Bo, **J. C. Kim**, L. J. Miara, and G. Ceder\*, Understanding interface stability in solid-state batteries, *Nat. Rev. Mater.*, 5, (2019), 105-126
- [30] R. Zhang, A. Palumbo, **J. C. Kim**, J. Ding, and E.-H. Yang, Flexible Graphene-, Graphene-Oxide-, and Carbon-Nanotube-Based Supercapacitors and Batteries, *Ann. Phy.*, (2019) 1800507, In press
- [29] H. Ji, D. Kitchev, Z. Lun, H. Kim, E. Foley, D.-H. Kwon, Y. Tian, M. Balasubramanian, M. Bianchini, Z. Cai, Zijian, R. Clement, **J. C. Kim**, and G. Ceder\*, Computational investigation and experimental realization of disordered high-capacity Li-ion cathodes based on Ni redox, *Chem. Mater.*, 31, (2019) 2431
- [28] H. Ji, A. Urban, D. A. Kitchev, D.-H. Kwon, N. Artrith, C. Ophus, W. Huang, Z. Cai, T. Shi, **J. C. Kim**, H. Kim, and G. Ceder\*, Hidden structural and chemical order controls lithium transport in cation-disordered oxides for rechargeable batteries, *Nat. Comm.*, 10, (2019) 592
- [27] H. Kim, D.-H. Seo, M. Bianchini, R. J. Clément, H. Kim, **J. C. Kim**, W. S. Yoon, and G. Ceder\*, A new strategy for high voltage cathodes for K-ion batteries: stoichiometric KVPO<sub>4</sub>F, *Adv. Energy Mater.*, (2018) in press
- [26] N. Suzuki, W. D. Richards, Y. Wang, L. J. Miara, **J. C. Kim**, I. Jung, T. Tsujimura, and G. Ceder\*, Synthesis and electrochemical property of I-4 type  $\text{Li}_{1+2x}\text{Zn}_{1-x}\text{PS}_4$  solid electrolyte, *Chem. Mater.*, 30, (2018) 2236
- [25] H. Kim<sup>†</sup>, **J. C. Kim<sup>†</sup>**, M. Bianchini<sup>†</sup>, D.-H. Seo, J. Rodriguez, and G. Ceder\*, Recent progress and perspective in electrode materials for K-ion batteries, *Adv. Energy Mater.*, 8, (2018) 1702384 (<sup>†</sup> equal contribution)
- [24] P. Vassilaras, S. T. Dacek, H. Kim, T. T. Fister, S. Kim, G. Ceder, and **J. C. Kim\***, O3-type layered oxide with a quaternary transition metal composition for Na-ion battery cathodes:  $\text{NaTi}_{0.25}\text{Fe}_{0.25}\text{Co}_{0.25}\text{Ni}_{0.25}\text{O}_2$ , *J. Electrochem. Soc.*, 164, (2017) A3484
- [23] H. Kim, D.-H. Seo, **J. C. Kim**, S. H. Bo, L. Liu, T. Shi, and G. Ceder\*, Investigation of potassium storage in layered P3-type  $\text{K}_{0.5}\text{MnO}_2$  cathode, *Adv. Mater.*, 29, (2017) 1702480

- [22] H. Kim, **J. C. Kim**, S. H. Bo, T. Shi, and G. Ceder\*, Potassium ion batteries based on a P2-type  $K_{0.6}CoO_2$  cathode, *Adv. Energy Mater.*, 7, (2017) 1700098
- [21] Y. Tian, T. Shi, W. D. Richards, J. Li, **J. C. Kim**, S. H. Bo, and G. Ceder\*, Compatibility issues between electrodes and electrolytes in solid-state batteries, *Energy Environ. Sci.*, 10, (2017) 1150 – **Hot article of Energy. Environ. Sci. in 2017**
- [20] P. Vassilaras, D.-H. Kwon, S. Dacek, T. Shi, D.-H. Seo, G. Ceder, and **J. C. Kim\***, Electrochemical properties and structural evolution of O3-type layered sodium mixed transition metal oxides with trivalent nickel, *J. Mater. Chem. A*, 5, (2017) 4596
- [19] W. D. Ricahrds, Y. Wang, L. J. Miara, **J. C. Kim**, and G. Ceder\*, Design of  $Li_{1+2x}Zn_{1-x}PS_4$ , a new lithium ion conductor, *Energy Environ. Sci.*, 9, (2016) 3272
- [18] M. Moradi, **J. C. Kim**<sup>†</sup>, J. Qi<sup>†</sup>, K. Xu, X. Li, G. Ceder, and A. M. Belcher\*, A bio-facilitated synthetic route for nano-structured complex electrode materials, *Green Chem.*, 18, (2016) 2619 (<sup>†</sup> equal contribution)
- [17] W. D. Richards, T. Tsujimura, L. J. Miara, Y. Wang, **J. C. Kim**, S. P. Ong, I. Uechi, N. Suzuki, and G. Ceder\*, Design and synthesis of the superionic conductor  $Na_{10}SnP_2S_{12}$ , *Nat. Commun.*, 7, (2016) 11009
- [16] W. D. Richards, L. J. Miara, Y. Wang, **J. C. Kim**, and G. Ceder\*, Interface stability in solid-state batteries, *Chem. Mater.*, 28, (2016) 266 – **Top 20 downloaded article of Chem. Mater. in 2016, 2017, 2018**
- [15] S. H. Bo, Y. Wang, **J. C. Kim**, W. D. Richards, and G. Ceder\*, Computational and experimental investigations of Na-ion conduction in cubic  $Na_3PSe_4$ , *Chem. Mater.*, 28, (2016) 252
- [14] L. J. Miara, N. Suzuki, W. D. Richards, Y. Wang, **J. C. Kim**, and G. Ceder\*, Li-ion conductivity in  $Li_9S_3N$ , *J. Mater. Chem. A*, 3, (2015) 20338
- [13] Y. Wang, W. D. Richards, S. P. Ong, L. J. Miara, **J. C. Kim**, Y. Mo, and G. Ceder\*, Design principles for solid-state lithium superionic conductors, *Nat. Mater.*, 14, (2015) 1026
- [12] **J. C. Kim**, X. Li, B. Kang, and G. Ceder\*, High-rate performance of a mixed olivine cathode with off-stoichiometric composition, *Chem. Commun.*, 51, (2015) 13279
- [11] **J. C. Kim**, D.-H. Seo, and G. Ceder\*, Theoretical capacity achieved in a  $LiMn_{0.5}Fe_{0.4}Mg_{0.1}BO_3$  cathode by using topological disorder, *Energy Environ. Sci.*, 8, (2015) 1970
- [10] **J. C. Kim**, D.-H. Seo, H. Chen, and G. Ceder\*, The effect of antisite disorder and particle size on Li intercalation kinetics in monoclinic  $LiMnBO_3$ , *Adv. Energy Mater.*, 5, (2015) 1401916
- [9] **J. C. Kim**, X. Li, C. J. Moore, S. H. Bo, P. G. Khalifah, C. P. Grey, and G. Ceder\*, Analysis of charged state stability for monoclinic  $LiMnBO_3$  cathode, *Chem. Mater.*, 26, (2014) 4200

- [8] **J. C. Kim**, C. J. Moore, B. Kang, G. Hautier, A. Jain, and G. Ceder\*, Synthesis and electrochemical properties of monoclinic  $\text{LiMnBO}_3$  as a Li intercalation material, *J. Electrochem. Soc.*, 158, (2011) A309
- [7] **J. C. Kim**, Y. H. Jeong, J. B. Lim, K. P. Hong, S. Nahm\*, H. J. Sun, and H. J. Lee, High capacitance metal-insulator-metal capacitors using amorphous  $\text{Sm}_2\text{Ti}_2\text{O}_7$  thin film, *J. Electrochem. Soc.*, 154, (2007) G220
- [6] Y. H. Jeong, **J. C. Kim**, J. B. Lim, K. P. Hong, S. Nahm\*, H. J. Sun, and H. J. Lee, Electrical properties of the  $\text{Sm}_2\text{Ti}_2\text{O}_7$  thin films for metal-insulator-metal capacitor, *J. Appl. Phys.*, 101, (2007) 084108
- [5] Y. H. Jeong, J. B. Lim, J. C. Kim, S. Nahm\*, H. J. Sun, and H. J. Lee, Microstructure and dielectric properties of amorphous  $\text{BaSm}_2\text{Ti}_4\text{O}_{12}$  thin films for MIM capacitor, *J. Eur. Ceram. Soc.*, 27, (2007) 2849
- [4] **J. C. Kim**, M. H. Kim, S. Nahm\*, J. H. Paik, J. H. Kim, and H. J. Lee, Microwave dielectric properties of  $\text{Re}_3\text{Ga}_5\text{O}_{12}$  (Re: Nd, Sm, Eu, Dy and Yb) ceramics and effect of  $\text{TiO}_2$  on the microwave dielectric properties of  $\text{Sm}_3\text{Ga}_5\text{O}_{12}$  ceramics, *J. Eur. Ceram. Soc.*, 27, (2007) 2865
- [3] **J. C. Kim**, M. H. Kim, J. B. Lim, S. Nahm\*, J. H. Paik, J. H. Kim, and H. J. Lee, Synthesis and microwave dielectric properties of  $\text{Re}_3\text{Ga}_5\text{O}_{12}$  (Re: Nd, Sm, Eu, Dy, Yb, and Y) ceramics, *J. Am. Ceram. Soc.*, 90, (2007) 641
- [2] M. H. Kim, J. B. Lim, **J. C. Kim**, S. Nahm\*, J. H. Paik, J. H. Kim, and K. S. Park, Synthesis of  $\text{BaCu}(\text{B}_2\text{O}_5)$  ceramics and their effect on the sintering temperature and microwave dielectric properties of  $\text{Ba}(\text{Zn}_{1/3}\text{Nb}_{2/3})\text{O}_3$  ceramics, *J. Am. Ceram. Soc.*, 89, (2006) 3124
- [1] J. B. Lim, M. H. Kim, **J. C. Kim**, S. Nahm\*, J. H. Paik, J. H. Kim, and H. J. Lee, Effect of  $\text{BaCu}(\text{B}_2\text{O}_5)$  additive on the sintering temperature and microwave dielectric properties of  $\text{BaTi}_4\text{O}_9$  ceramics, *Jpn. J. Appl. Phys.*, 45, (2006) L242

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## PATENTS

- [7] L. J. Miara, N. Suzuki, W. D. Richards, Y. Wang, **J. C. Kim**, and G. Ceder, Sulfide barrier coating or solid electrolyte, Patent Application, 20170047610
- [6] G. Ceder, **J. C. Kim**, L. J. Miara, W. D. Richards, T. Tsujimura, Y. Wang, N. Suzuki, Solid electrolyte and lithium battery including the same, US Patent No. 10,446,872
- [5] G. Ceder, **J. C. Kim**, L. J. Miara, W. D. Richards, and Y. Wang, Computing system for identification of solid-solid interphase product, US Patent, No. 10,324,138
- [4] L. J. Miara, W. D. Richards, Y. Wang, **J. C. Kim**, and G. Ceder, Solid electrolyte and/or electroactive material, US Patent, No. 10,177,406

- [3] G. Ceder, **J. C. Kim**, C. J. Moore, B. Kang, G. Hautier, and A. Jain, Electrochemical device comprising lithium manganese borate compounds, US Patent, No. 9,172,090
- [2] G. Ceder, A. Jain, G. Hautier, **J. C. Kim**, B. Kang, and R. Daniel, Mixed phosphate-diphosphate electrode materials and methods of manufacturing same, US Patent, No. 9,159,991
- [1] J. H. Paik, D. H. Yeo, J. H. Kim, S. Nahm, and **J. C. Kim**, Microwave dielectric ceramics and the manufacturing method thereof, Korean Patent, KR 10-0754865-0000

## CONFERENCE TALKS

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		10/2021
[13] <b>J. C. Kim</b> , Complex Phase Transformations Observed in Na Storage Materials, MS&T21, Columbus, OH		10/2021
[12] <b>J. C. Kim</b> , Complex Phase Transformations in Sodium Storage Materials with a Layered Structure, IUMRS-ICA 2021, Jeju, Korea		10/2020
[11] <b>J. C. Kim</b> , Complex Phase Transitions in Sodium Transition Metal Oxides, ECS PRIME 2020, Virtual		12/2020
[10] <b>J. C. Kim</b> , Elucidating the Intergrowth of Octahedral and Prismatic Na Layers in Sodium Transition Metal Oxides, the Materials Research Society Fall Meetings 2020, Virtual.		10/2019
[9] <b>J. C. Kim</b> , Materials Design Strategies for K-ion Batteries, Battery and Energy Storage Workshop, the American Institute of Chemical Engineers, New York, NY		05.2018
[8] Joah Han and <b>J. C. Kim*</b> , Interphase Engineering for Solid-State Batteries by Additive-Assisted Low-Temperature Densification, The 22nd International Conference on Solid State Ionics, Pyeongchang, Korea		05.2016
[7] <b>J. C. Kim</b> , S.-H. Bo, H. Kim, and G. Ceder, Structural evolution and electrochemical properties of O <sub>3</sub> -type layered oxide with a quaternary transition metal composition, The 233th meeting of the Electrochemical Society, Seattle, WA		02/2014
[6] <b>J. C. Kim</b> , D.-H. Seo, and G. Ceder, From 1-D to 3-D Li intercalation: Channel-to-channel migration facilitated by antisite disorder, The 229 <sup>th</sup> meeting of the Electrochemical Society, San Diego, CA		10/2012
[5] <b>J. C. Kim</b> , D.-H. Seo, and G. Ceder, Three-dimensional Li migration facilitated by antisite disorder in Li storage materials with a one-dimensional diffusion channel, Gordon Research Conference: Batteries, Ventura, CA		06/2010
[4] <b>J. C. Kim</b> , D.-H. Seo, X. Li, and G. Ceder, Enhanced electrochemical performance of monoclinic LiMnBO <sub>3</sub> -based Li storage material via partial substitution, The 226 <sup>th</sup> meeting of the Electrochemical Society, Cancun, Mexico		10/2010
		06/2006

- [3] **J. C. Kim**, C. J. Moore, and G. Ceder, Effects of Mn substitution on electrochemical performance of a LiMnBO<sub>3</sub> cathode, The 16<sup>th</sup> meeting of the international meetings on lithium ion batteries, Jeju, Korea
- [2] **J. C. Kim**, B. Kang, C. J. Moore, G. Hautier, and G. Ceder, Synthesis and electrochemical properties of LiMnBO<sub>3</sub> as a potential cathode material for Li-ion batteries, The 218<sup>th</sup> meeting of the electrochemical society, Las Vegas, NV
- [1] **J. C. Kim**, M. H. Kim, J. B. Lim, S. Nahm, J. H. Paik, J. H. Kim, and H. J. Lee, Microstructure and microwave dielectric properties of Re<sub>3</sub>Ga<sub>5</sub>O<sub>12</sub> (Re: Nd, Sm, Eu, Dy, Yb, and Y) ceramics for microwave integrated circuit applications, The 4<sup>th</sup> meeting of the microwave materials and their applications, Oulu, Finland