

# Mun Sek Kim

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## EDUCATION

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09/2019 – 06/2024	<b>Stanford University</b> Doctor of Philosophy (Ph.D.) in Chemical Engineering	California, USA
08/2014 – 05/2016	<b>Cornell University</b> Master of Science (M.S.) in Chemical and Biomolecular Engineering	New York, USA
08/2010 – 05/2014	<b>University of California, Berkeley</b> Bachelor of Science (B.S.) in Chemical & Biomolecular Engineering	California, USA

## PROFESSIONAL EXPERIENCES

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01/2020 – Present	<b>Nanomaterials Science and Engineering Lab with Professor Yi Cui</b> <b>Stanford University</b> <i>Graduate Student Researcher</i> (Advisor/Dissertation committees: Yi Cui, Zhenan Bao, and Jian Qin) <ul style="list-style-type: none"><li>• Developed suspension electrolytes for high-performance lithium metal batteries</li><li>• Established suspension electrolyte design platform to effectively analyze characteristics of solid-electrolyte interphases on lithium metal anodes</li><li>• Revealed pivotal features and working mechanisms of inorganic solid-electrolyte interphase compounds for lithium batteries</li><li>• Developed functional and electrochemically active electrolyte additives for lithium metal anodes</li></ul>	
06/2022 – 08/2022	<b>Cell E-Chem design engineer</b> <b>Rivian</b> <i>Internship</i> <ul style="list-style-type: none"><li>• Developed facile and industry-scale lithium battery electrode evaluation and material screening protocols</li><li>• Created autonomous electrochemical data evaluation scripts for the cell electrode and electrolyte analyses</li></ul>	
07/2016 – 07/2019	<b>Center for Energy Storage Research</b> <b>Korea Institute of Science and Technology</b> <i>Research Scientist</i> (In lieu of military service) <ul style="list-style-type: none"><li>• Developed Langmuir-Blodgett artificial solid-electrolyte interphase coatings for lithium metal batteries</li><li>• Optimized electrolyte formulations and pouch-cell designs for high-performance lithium metal batteries</li><li>• Synthesized functionalized graphene, carbon nanotubes, metal-oxides, MXene, Li-intermetallic, and MoS<sub>2</sub> for fabricating reliable lithium metal and sulfur batteries</li></ul>	
08/2014 – 06/2016	<b>Electrochemical Energy Storage Laboratory with Professor Lynden A. Archer</b> <b>Cornell University</b> <i>Graduate Student Researcher</i> (Advisor: Lynden A. Archer) <ul style="list-style-type: none"><li>• Developed Langmuir-Blodgett (layer-by-layer, large-scale, nanoparticulate, binder-free, and multi-component) coating techniques for lithium batteries</li><li>• Developed separator modification strategies with diverse coating configurations and functionalized nanomaterials designed for high-performance lithium sulfur batteries</li></ul>	
05/2011 – 05/2014	<b>Applied Materials &amp; Surface Science Laboratory with Professor Roya Maboudian</b> <b>University of California, Berkeley</b> <i>Undergraduate Student Researcher</i> (Advisor: Roya Maboudian) <ul style="list-style-type: none"><li>• Developed a thin film transfer technique for flexible micro-supercapacitor electrodes</li><li>• Synthesized high-voltage SiC nanowires, pseudocapacitive porous carbon thin film, and bicontinuous 3D graphene networks with controllable geometry for micro-supercapacitor electrodes</li><li>• Established a pyrolysis method for fabricating porous carbon on-chip micro-supercapacitor electrodes</li></ul>	
12/2012 – 01/2013	<b>Korea Electrotechnology Research Institute</b> <i>Internship</i> <ul style="list-style-type: none"><li>• Fabricated electrocardiography (ECG) device with a patented piezoresistive pressure sensor</li><li>• Optimized polydimethylsiloxane (PDMS) thicknesses for the pressure sensor using Abaqus</li><li>• Calibrated the pressure sensor based on the surrounding and contact temperatures <i>via</i> Lab View</li></ul>	

## AWARD & RECOGNITION

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- **IOP Trusted Reviewer Award**, *Demonstrating a high level of peer review competence, with the ability to critique scientific literature to an excellent standard*, Institute of Physics (IOP) (2023)
- **KIST Award**, *The highest award of KIST given to the best employee who has provided the most creative and innovative contribution to KIST's development*, Korea Institute of Science and Technology (2018)
- **John M. Prausnitz Award for Outstanding Undergraduate Research in Chemical and Biomolecular Engineering**, *Highest graduation award for the one distinguished undergraduate*, Department of Chemical & Biomolecular Engineering at UC Berkeley (2014)
- **Dean's honor list of 2013**, *Recognition from College of Chemistry Dean for outstanding academic performance*, Department of Chemical & Biomolecular Engineering at UC Berkeley (2013)
- **College of Chemistry Undergraduate Research Stipend Winner**, *Research stipend grant from College of Chemistry Department to highly selective undergraduate researchers*, Department of Chemical & Biomolecular Engineering at UC Berkeley (2013)
- **Green Chemistry Competition third-prize winner**, *Proposing most innovative ideas on Green Chemistry with \$3,000 award*, Big Ideas at Berkeley (2011)

## SKILLS

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### *Characterization*

- **Cell electrodes**: Multi-probe cell electrode resistivity and interfacial resistance, Electrochemical impedance spectroscopy, Cyclic voltammetry, Scanning electron microscopy, Energy dispersive X-ray spectroscopy, Focused ion beam, beam milling, Four-point probe station, Raman spectroscopy, Brunauer-Emmett-Teller porosimeter, Thermogravimetric analysis, X-Ray diffractometer, and X-ray photoelectron spectroscopy.
- **Electrolyte**: Potentiometric Li<sup>+</sup> solvation energy measurement, Ultramicroelectrode exchange current density measurement, <sup>7</sup>Li & <sup>19</sup>F nuclear magnetic resonance, Zeta potential, Contact angle goniometer, Fourier transform infrared spectroscopy, and Inductively coupled plasma atomic emission spectroscopy.
- **Surface coating**: Langmuir-Blodgett trough, Galvanostatic nanostructured electroplating, e-beam evaporator, and Ultraviolet lithography.

### *Material Synthesis & Method*

- **Materials**: Suspension electrolytes, Langmuir-Blodgett films, functionalized graphene, amino-functionalized carbon nanotubes, sulfonated metal-oxide nanoparticles, MXene, flexible porous carbon thin-film, and Si/SiC nanowires.
- **Methods**: Modified Aurbach's Coulombic efficiency, Metal nucleation overpotential, Cryogenic transmission electron microscopy sample fabrication, Langmuir-Blodgett Scooping coating, Binder-free battery separator coatings, Air-spray coating, Carbonaceous and ceramic thin films *via* wet and dry process, Low and atmospheric pressure chemical & physical vapor deposition, Spin coating, Sulfonation and amino functionalization on nanomaterials *via* wet method, Pyrolysis, Spray pyrolysis, and Double thin film transfer.

### *Software*

- HIOKI RM2610, Maccor, Arbin, Land, Matlab, Adobe Illustrator, Igor pro, LabView, and Advanced Excel.

**PUBLICATIONS****Peer-Reviewed Journal Articles****FIRST AUTHOR PAPERS**

- **M.S. Kim**<sup>†</sup>, J. Wang<sup>†</sup>, W. Zhang<sup>†</sup>, P. Sayavong, Z. Zhang, S. T. Oyakhire, S. B. Shuchi, S. C. Kim, Y. Cui, Y. Chen, Z. Yu, H. Gong, R. Xu, J. Lee, J. H. Lee, K. A. Persson, J. Qin, Z. Bao, Y. Cui, In review.
- **M.S. Kim**, Z. Zhang, J. Wang, S. T. Oyakhire, S. C. Kim, Y. Zhiao, Y. Chen, D. T. Boyle, Y. Ye, Z. Huang, W. Zhang, R. Xu, P. Sayavong, S. F. Bent, J. Qin, Z. Bao, Y. Cui, “Revealing the multi-functions of  $Li_3N$  in the suspension electrolyte for lithium metal batteries”, *ACS Nano* 17(3), 3168-3180 (2023).
- **M.S. Kim**<sup>†</sup>, Z. Zhang<sup>†</sup>, P. Rudnicki, Z. Yu, J. Wang, S. T. Oyakhire, Y. Chen, S.C. Kim, W. Zhang, D. T. Boyle, X. Kong, R. Xu, Z. Huang, W. Huang, S. F. Bent, L.W. Wang, J. Qin, Z. Bao, Y. Cui, “Suspension electrolyte with modified  $Li^+$  solvation environment for lithium metal batteries”, *Nature Materials* 21, 445-454 (2022).
- S. Lee<sup>†</sup>, **M.S. Kim**<sup>†</sup>, J.-H. Lee, J.-H. Ryu, V. Do, B.G. Lee, W. Kim, W.I. Cho, “Li-In alloy anode and  $Nb_2CTX_2$  artificial solid-electrolyte interphase for practical Li metal batteries”, *Journal of Materials Chemistry A* 10, 4157-4169 (2022).
- **M.S. Kim**, Deepika, S.H. Lee, M.-S. Kim, J.-H. Ryu, K.-R. Lee, L.A. Archer, W.I. Cho, “Enabling reversible redox reactions in electrochemical cells using protected LiAl intermetallics as lithium metal anodes”, *Science Advances* 5, eaax5587 (2019).
- **M.S. Kim**, J.-H. Ryu, Deepika, Y.R. Lim, I.W. Nah, K.-R. Lee, L.A. Archer, W.I. Cho, “Langmuir-Blodgett artificial solid-electrolyte interphases for practical lithium metal batteries”, *Nature Energy* 3, 889-898 (2018) – **Hero image** cover.
- **M.S. Kim**, M.-S. Kim, V. Do, Y.R. Lim, I.W. Nah, L.A. Archer, W.I. Cho, “Designing solid-electrolyte interphases for lithium sulfur electrodes using ionic shields”, *Nano Energy* 41, 573-582 (2017).
- **M.S. Kim**, L. Ma, S. Choudhury, L.A. Archer, “Multifunctional Separator Coatings for High Performance Lithium sulfur Batteries”, *Advanced Materials Interfaces* 3(22), 1600450 (2016) – **Front cover**.
- **M.S. Kim**, L. Ma, S. Choudhury, S. Wei, L.A. Archer, “Fabricating multifunctional nanoparticle membranes by a fast layer-by-layer Langmuir-Blodgett process: application in lithium-sulfur Batteries”, *Journal of Materials Chemistry A* 4, 14709-14719 (2016).
- **M.S. Kim**, B. Hsia, C. Carraro, R. Maboudian, “Flexible micro-supercapacitors with high energy density from simple transfer of photoresist-derived carbon electrodes”, *Carbon* 74, 163-169 (2014).
- B. Hsia<sup>†</sup>, **M.S. Kim**<sup>†</sup>, L.E Luna<sup>†</sup>, N.R Mair, Y. Kim, C. Carraro, R. Maboudian, “Templated 3D CVD ultrathin graphite networks with controllable geometry: synthesis and application as supercapacitor electrodes”, *ACS Applied Materials & Interfaces* 6, 18413-18417 (2014).

**COAUTHOR PAPERS**

- W. Zhang, P. Sayavong, X. Xiao, S. T. Oyakhire, S. B. Shuchi, R. A. Vila, D. T. Boyle, S.C. Kim, **M.S. Kim**, S. E. Holmes, Y. Ye, D. Li, S. F. Bent, Y. Cui, “Recovery of isolated lithium through discharged state calendar ageing”, *Nature* 626, 306-312 (2024).
- S.C. Kim, X. Gao, S.-L. Liao, H. Su, Y. Chen, W. Zhang, L. C. Greenburg, J.-A. Pan, X. Zheng, Y. Ye, **M.S. Kim**, P. Sayavong, A. Brest, J. Qin, Z. Bao, Y. Cui, “Solvation-property relationship of lithium-sulphur battery electrolytes”, *Nature Communications*, 15, 1268 (2024).
- S. T. Oyakhire, S.-L. Liao, S. B. Shuchi, **M.S. Kim**, S.C. Kim, Z. Yu, R. A. Vila, P. E. Rudnicki, Y. Cui, S. F. Bent, “Proximity Matters: Interfacial Solvation Dictates Solid Electrolyte Interphase Composition”, *Nano Letters*, 23(16), 7524-7531 (2023).
- S.C. Kim, J. Wang, R. Xu, P. Zhang, Y. Chen, Z. Huang, Y. Yang, Z. Yu, S. T. Oyakhire, W. Zhang, L. Greenburg, **M.S. Kim**, D. T. Boyle, P. Sayavong, Y. Ye, J. Qin, Z. Bao, Y. Cui, “High Entropy Electrolytes for Practical Lithium Metal Batteries”, *Nature Energy* 8, 814-826 (2023).

- P. Sayavong, W. Zhang, S. T. Oyakhire, D. T. Boyle, Y. Chen, S.C. Kim, R. A. Vila, S. E. Holmes, **M.S. Kim**, S. F. Bent, Z. Bao, Y. Cui, “*Dissolution of the Solid Electrolyte Interphase and Its Effects on Lithium Metal Anode Cyclability*”, [JACS](#) 145(22), 12342-12350 (2023).
- S.C. Kim, S. T. Oyakhire, C. Athanitis, J. Wang, Z. Zhang, W. Zhang, D. T. Noyle, **M.S. Kim**, Z. Yu, X. Gao, T. Sogade, E. Wu, J. Qin, Z. Bao, S. F. Bent, Y. Cui, “*Data-driven electrolyte design for lithium metal anodes*”, [PNAS](#) 120(10), e2214357120 (2023).
- S. T. Oyakhire, W. Zhang, Z. Yu, S. E. Holmes, P. Sayavong, S.C. Kim, D. T. Boyle, **M.S. Kim**, Z. Zhang, Y. Cui, S. F. Bent, “*Correlating the formation protocols of solid electrolyte interphases with practical performance metrics in lithium metal batteries*”, [ACS Energy Letters](#) 8, 869-877 (2023).
- D. T. Boyle, Y. Li, A. Pei, R. A. Vila, Z. Zhang, P. Sayavong, **M.S. Kim**, W. Huang, H. Wang, Y. Liu, R. Xu, R. Sinclair, J. Qin, Z. Bao, Y. Cui, “*Resolving Current-Dependent Regimes of Electroplating Mechanisms for Fast Charging Lithium Metal Anodes*”, [Nano Letters](#) 22(20), 8224-8232 (2022).
- Z. Yu, P. Rudnicki, Z. Zhang, Z. Huang, H. Celik, S. T. Oyakhire, Y. Chen, X. Kong, S.C. Kim, X. Xiao, H. Wang, Y. Zheng, G. Kamat, **M.S. Kim**, S. F. Bent, J. Qin, Y. Cui, Z. Bao, “*Rational solvent molecule tuning for high-performance lithium metal battery electrolytes*”, [Nature Energy](#) 7, 94-106 (2022).
- J. Zheng, **M.S. Kim**, Z. Tu, S. Choudhury, T. Tang, L.A. Archer, “*Regulating electrodeposition morphology of lithium: towards commercially relevant secondary Li metal batteries*”, [Chemical Society Reviews](#) 49(9), 2701-2750 (2020).
- V. Do, Deepika, **M.S. Kim**, M.-S. Kim, K.-R. Lee, W.I. Cho, “*Carbon Nitride Phosphorus as an Effective Lithium Polysulfide Adsorbent for Lithium-Sulfur Batteries*”, [ACS Applied Materials & Interfaces](#) 11(12), 11431-11441 (2019).
- M.-S. Kim, **M.S. Kim**, V. Do, Y. Xia, W. Kim, W.I. Cho, “*Facile and scalable fabrication of high-energy-density sulfur cathodes for pragmatic lithium-sulfur batteries*”, [Journal of Power Sources](#) 422, 104-112 (2019).
- K.M. Kwon, I.G. Kim, K.Y. Lee, H. Kim, **M.S. Kim**, W.I. Cho, J. Choi, I.W. Nah, “ *$\alpha$ -Fe<sub>2</sub>O<sub>3</sub> anchored on porous N doped carbon derived from green microalgae via spray pyrolysis as anode materials for lithium ion batteries*”, [Journal of Industrial Engineering Chemistry](#) 69, 39-47 (2019).
- L. Ma, **M.S. Kim**, L.A. Archer, “*Stable artificial solid electrolyte interphases for lithium batteries*”, [Chemistry of Materials](#) 29(10), 4181-4189 (2017).
- L. Ma, H. Zhuang, S. Wei, K. Hendrickson, **M.S. Kim**, R.G. Hennig, L.A. Archer, “*Enhanced Li-S batteries using Amine-functionalized CNT in the Cathode: Electrochemistry and Kinetics of Polysulfide Dissolution*”, [ACS Nano](#) 10(1), 1050-9 (2015).
- B. Hsia, **M.S. Kim**, C. Carraro, R. Maboudian, “*Cycling characteristics of high energy density, electrochemically activated porous-carbon supercapacitor electrodes in aqueous electrolytes*”, [Journal of Material Chemistry A](#) 1, 10518-10523 (2013).
- B. Hsia, **M.S. Kim**, M. Vincent, C. Carraro, R. Maboudian, “*Photoresist-derived porous carbon for on-chip micro-supercapacitors*”, [Carbon](#) 57, 395-400 (2013).
- J.P. Alper, **M.S. Kim**, M. Vincent, B. Hsia, V. Radmilovic, C. Carraro, R. Maboudian, “*Silicon carbide nanowires as highly robust electrodes for micro-supercapacitors*”, [Journal of Power Sources](#) 230, 298-302 (2013).

## Peer-Reviewed Conference Proceedings

- **M.S. Kim**, B. Hsia, C. Carraro, R. Maboudian, “Flexible micro-supercapacitors from photoresist-derived carbon electrodes on flexible substrates”, The 27<sup>th</sup> International Conference ([IEEE MEMS 2014](#), San Francisco, USA), 389-392 (2014).
- B. Hsia, S. Wang, **M.S. Kim**, C. Carraro, R. Maboudian, “All solid-state micro-supercapacitors using ionogel electrolyte”, The 17<sup>th</sup> International Conference ([TRANSDUCERS 2013](#), Barcelona, Spain), 1328-1331 (2013).
- M. Vincent, **M.S. Kim**, C. Carraro, R. Maboudian, “Silicon carbide nanowires as an electrode material for high-temperature supercapacitor”, The 25<sup>th</sup> International Conference ([IEEE MEMS 2012](#), Paris, France), 39-42 (2012).
- B. Hsia, M. Vincent, **M.S. Kim**, C. Carraro, R. Maboudian, “Photoresist-derived porous carbon for integrated on-chip energy storage”, [2012 Hilton Head Solid-State Sensors, Actuators and Microsystems Workshop](#), 254-255 (2012).

## PATENTS

### US/WO PATENTS

- Organized nanoparticulate and microparticulate coatings and methods of making and using same  
**Mun Sek Kim**, Snehashis Choudhury, Lin Ma, Lynden A. Archer  
[US11309613B2](#) & 2022-04-19 (Registered)  
[KR20180113505A](#) & 2018-10-16  
[CN108602017A](#) & 2018-09-28  
[WO2017100758A1](#) & 2017-06-15
- Artificial solid electrolyte interphase of metallic anode for secondary battery including amino-functionalized carbon structures to protect anode material, method for producing anode and lithium metal secondary battery including anode produced by the method  
**Mun Sek Kim**, Won Il Cho, Seung Hun Lee, Min-Seop Kim, Van Dung Do, In Wook Nah, In-Hwan Oh  
[US10923726B2](#) & 2021-02-16 (Registered)
- Method for producing an anode for a lithium metal secondary battery including a MXene thin film  
**Mun Sek Kim**, Won Il Cho, Ji-Hyun Ryu, Seung Hun Lee  
[US10923725B2](#) & 2021-02-16 (Registered)
- Aqueous binder for lithium-sulfur secondary battery, preparation method thereof and lithium-sulfur secondary battery comprising the same  
Won Il Cho, Van Dung Do, **Mun Sek Kim**, In Wook Nah, Min-Seop Kim  
[US10840514B2](#) & 2020-11-17 (Registered)
- Electrolyte system for lithium metal secondary battery and lithium metal secondary battery including the same  
**Mun Sek Kim**, Won Il Cho, Ji-Hyun Ryu, In Wook Nah, Min-Seop Kim, Sun Min Park  
[US10804567B2](#) & 2020-10-13 (Registered)
- Polyethyleneimine-attached carbonaceous material and separator for lithium-sulfur battery coated with the same  
**Mun Sek Kim**, Won Il Cho, In Wook Nah, Young Rok Lim, Sun Min Park, In-Hwan Oh  
[US10727466B2](#) & 2020-07-28 (Registered)
- Anode including functionalized metal oxide nanoparticles, a method for manufacturing the anode, a secondary battery including the anode, and a device including the secondary battery  
**Mun Sek Kim**, Won Il Cho, In Wook Nah, In-Hwan Oh, Van Dung Do  
[US10658670B2](#) & 2020-05-19 (Registered)
- Lithium metal anode comprising Langmuir-Blodgett films as an artificial solid electrolyte interface layer, lithium metal battery comprising the same, and preparation method thereof  
**Mun Sek Kim**, Won Il Cho, In Wook Nah, Min Seop Kim, Lynden A. Archer, Snehashis Choudhury, Zhengyuan Tu  
[US10243197B2](#) & 2019-03-26 (Registered)

## ***KR PATENTS***

- Lithium-based hybrid anode material, preparation method thereof and lithium metal battery comprising the same  
**Mun Sek Kim**, Won Il Cho, Seung Hun Lee, Ji-Hyun Ryu, In Wook Nah  
[KR 102200268](#) & 2021-01-04 (Registered)
- Aqueous binder for lithium sulfur secondary battery, preparation method thereof and lithium sulfur secondary battery comprising the same  
Won Il Cho, Van Dung Do, **Mun Sek Kim**, In Wook Nah, Min-Seop Kim  
[KR 102152982](#) & 2020-09-01 (Registered)
- Artificial solid electrolyte interphase for protecting anode of rechargeable battery, preparation method thereof and lithium metal battery comprising the same  
**Mun Sek Kim**, Won Il Cho, Seung Hun Lee, Ji-Hyun Ryu, In Wook Nah  
[KR 102118023](#) & 2020-05-27 (Registered)
- Coating composition for separator of secondary battery comprising p-doped graphitic carbon nitride, preparation method thereof and li-s battery comprising the same  
Won Il Cho, Van Dung Do, **Mun Sek Kim**, Min-Seop Kim, In Wook Nah  
[KR 102113222](#) & 2020-05-14 (Registered)
- Anode for lithium metal battery comprising Nb<sub>2</sub>C thin film, preparation method thereof and lithium metal battery comprising the same  
**Mun Sek Kim**, Won Il Cho, Ji-Hyun Ryu, Seung Hun Lee  
[KR 102100849](#) & 2020-04-08 (Registered)
- Anode for lithium metal battery comprising Ti<sub>2</sub>C thin film, preparation method thereof and lithium metal battery comprising the same  
**Mun Sek Kim**, Won Il Cho, Ji-Hyun Ryu, Seung Hun Lee  
[KR 102100854](#) & 2020-04-08 (Registered)
- Anode for lithium metal battery comprising Ti<sub>3</sub>C<sub>2</sub> thin film, preparation method thereof and lithium metal battery comprising the same  
**Mun Sek Kim**, Won Il Cho, Ji-Hyun Ryu, Seung Hun Lee, Sun Min Park  
[KR 102100876](#) & 2020-04-08 (Registered)
- Electrolyte system and lithium metal battery comprising the same  
**Mun Sek Kim**, Won Il Cho, Ji-Hyun Ryu, In Wook Nah, Min-Seop Kim, Sun Min Park  
[KR 102099387](#) & 2020-04-03 (Registered)
- Interlayer for protecting anode of rechargeable battery, preparation method thereof and lithium metal battery comprising the same  
**Mun Sek Kim**, Won Il Cho, Min-Seop Kim, Sun Min Park, Van Dung Do, Ji-Hyun Ryu  
[KR 102069284](#) & 2020-01-16 (Registered)
- Electrolyte additive salts system and lithium metal battery comprising the same  
**Mun Sek Kim**, Won Il Cho, Ji-Hyun Ryu, Seung Hun Lee, Kyung Won Lee  
[KR 102063821](#) & 2020-01-02 (Registered)
- Electrolyte systems and lithium metal battery comprising the same  
**Mun Sek Kim**, Won Il Cho, Ji-Hyun Ryu, In Wook Nah, Min-Seop Kim, Sun Min Park  
[KR 102063821](#) & 2020-01-02 (Registered)
- Anode formed solid electrolyte interphase protective layer comprising graphene nanoparticle and lithium metal battery comprising the same  
**Mun Sek Kim**, Won Il Cho, In Wook Nah, Van Dung Do, Min-Seop Kim, Ji-Hyun Ryu, Sun Min Park  
[KR 102059104](#) & 2019-12-18 (Registered)
- Electrolyte additive solvents system and lithium metal battery comprising the same  
**Mun Sek Kim**, Won Il Cho, Ji-Hyun Ryu, Seung Hun Lee  
[KR 102046538](#) & 2019-11-13 (Registered)

# Mun Sek Kim

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- Phosphorus doped and phosphate functionalized reduced graphene oxide artificial solid electrolyte interphase and anode for lithium metal battery comprising the same  
**Mun Sek Kim**, Won Il Cho, In Wook Nah, Ji-Hyun Ryu, Min-Seop Kim, Sun Min Park  
[KR 102046554](#) & 2019-11-13 (Registered)
- Nitrogen doped reduced graphene oxide artificial solid electrolyte interphase and anode for lithium metal battery comprising the same  
**Mun Sek Kim**, Won Il Cho, In Wook Nah, Ji-Hyun Ryu, Sun Min Park, Min-Seop Kim  
[KR 102046547](#) & 2019-11-13 (Registered)
- Solid electrolyte interphase comprising amino functionalized multi-walled carbon nanotube for protecting anode of rechargeable battery, preparation method thereof and lithium metal battery comprising the same  
**Mun Sek Kim**, Won Il Cho, Seung Hun Lee, Min-Seop Kim, Van Dung Do  
[KR 102035778](#) & 2019-10-17 (Registered)
- Polyethyleneimine-attached carbonaceous material and separator for lithium-sulfur battery coated with the same  
**Mun Sek Kim**, Won Il Cho, In Wook Nah, Young Rok Lim, Sun Min Park, In-Hwan Oh  
[KR 101997074](#) & 2019-07-01 (Registered)
- Separator with sandwiched configuration for secondary battery, method for fabricating the same, and secondary battery comprising the same  
**Mun Sek Kim**, Won Il Cho, 나인, Min-Seop Kim, Sun Min Park, Byung Ik Jang, Seung Hun Lee  
[KR 101993277](#) & 2019-06-20 (Registered)
- Solid electrolyte interphase comprising amino functionalized reduced graphene oxide thin film for protecting anode of rechargeable battery, preparation method thereof and lithium metal battery comprising the same  
**Mun Sek Kim**, Won Il Cho, In Wook Nah, In-Hwan Oh, Seung Hun Lee  
[KR 101972034](#) & 2019-04-18 (Registered)
- Cathode for lithium-sulfur battery with polyethyleneimine and manganese dioxide, and lithium-sulfur battery comprising the same  
**Mun Sek Kim**, Won Il Cho, Van Dung Do, Seung Hun Lee, Byung Ik Jang, Min-Seop Kim, In Wook Nah  
[KR 101930395](#) & 2018-12-12 (Registered)
- Lithium metal anode comprising langmuir-blodgett layer, battery comprising the same, and preparation method thereof  
**Mun Sek Kim**, Won Il Cho, In Wook Nah, Min-Seop Kim, Lynden A. Archer  
[KR 101913338](#) & 2018-10-24 (Registered)
- Functionalized metal oxide nanoparticles and lithium anode for lithium-sulfur battery including the same  
**Mun Sek Kim**, Won Il Cho, In Wook Nah, In-Hwan Oh, Van Dung Do  
[KR 101897206](#) & 2018-09-04 (Registered)

## GRANT APPLICATIONS

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- **Lithium-metal based 260 Wh kg<sup>-1</sup> next-generation battery core technology, cell and pack-level development**

**Role:** Cowrote the grant proposal with Dr. Won Il Cho and won the grant

**Institution:** Korea Institute of Science and Technology

**Client:** Huge Science R&D Project Republic of Korea

**Amount:** \$1,340,482.57 USD

**Duration:** October 2016 – August 2019

**Status:** Successfully completed

- **Development of ship energy storage system degradation and life prediction technology**

**Role:** Cowrote the grant proposal with Dr. Won Il Cho and won the grant

**Institution:** Korea Institute of Science and Technology

**Client:** Energy Technology Development Republic of Korea

**Amount:** \$464,700.63 USD

**Duration:** June 2016 – December 2018

**Status:** Successfully completed

- **New Li-S battery core technology and pouch cell development**

**Role:** Participated in the grant proposal writing and won the grant

**Institution:** Korea Institute of Science and Technology

**Client:** Future Source Green City Technology R&D Project Republic of Korea

**Amount:** \$2,915,102.77 USD

**Duration:** Jan 2016 – December 2018

**Status:** Successfully completed

## JOURNAL REVIEWER

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Science Advances, Advanced Materials, Advanced Energy Materials, ACS Nano, Advanced Materials Interfaces, Materials Today Energy, Small, ACS Applied Materials & Interfaces, Science Bulletin, Journal of The Electrochemical Society, and Carbon

## TEACHING EXPERIENCE

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**Teaching Assistance:** Polymer Chemistry CHEMENG 464, Stanford University (Winter 2023)

**Selected feedback:**

“Always willing to help and explain concepts from the ground up, allowing me to understand the complexities of different pathways”

“He is very friendly and tries to help people. He acknowledges when he doesn't know an answer right away”

“Very helpful TA, truly does care about the students learning”

“He was a very nice TA. He was answering my questions very quickly and effectively”

“He did a great job of explaining the chemistry behind the homework synthesis papers”

“Simple explanations of complicated topics”

“Articulate, knowledgeable, respectful”

“Approachable Friendly Detailed”

**Teaching Assistance:** Solid structures and properties of polymers CHEMENG 469, Stanford University (Autumn 2021)

**Selected feedback:**

“He did a great job of taking care of logistical aspects of the course and helping everything run smoothly”

“He was very helpful with understanding problem sets”

“He helped my friend solve the homework, so she was able to help me solve the homework. He was always in class, always responsive, and helped the class logistics run smoothly”

“1) Timeliness - feedback for our work was returned quickly 2) Communication with the class via Canvas 3)

Assistance during lab demonstration”

“Dedication to helping on psets”



## PRESENTATIONS

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- **M.S. Kim**, “Suspension Electrolytes for Lithium Metal Batteries”, *Stanford University Chemical Engineering Convocation Distinguished Student Speaker*, September 2023. (Oral)
- **M.S. Kim**, “Suspension Electrolytes for Lithium Metal Batteries”, *Stanford StorageX Tech Talk*, March 2023. (Oral)
- **M.S. Kim**, “Suspension electrolyte with modified Li<sup>+</sup> solvation environment for lithium metal batteries”, *SLAC Battery 500*, May 2022. (Poster)
- **M.S. Kim**, “Suspension electrolyte with modified Li<sup>+</sup> solvation environment for lithium metal batteries”, *Stanford StorageX Tech Talk*, February 2022. (Oral)
- **M.S. Kim**, “Suspension Electrolytes for lithium metal batteries”, *SLAC Ola Electric*, February 2022. (Oral)
- **M.S. Kim**, “Langmuir-Blodgett Artificial Solid Electrolyte Interphase for Lithium Metal Batteries”, *The International Battery Association*, March 2018. (Poster)
- **M.S. Kim**, “Amino Functionalized Multi-walled Carbon Nanotube Framework as Stable Artificial Solid-Electrolyte Interphase for Lithium Metal Anode”, *17<sup>th</sup> Autumn Korea Electrochemical Society*, October 2017. (Poster)
- **M.S. Kim**, “Langmuir-Blodgett Artificial Solid Electrolyte Interphase layer for Lithium Metal Batteries”, *The 9<sup>th</sup> Asian Conference on Electrochemical Power Sources*, August 2017. (Poster)
- **M.S. Kim**, “Developing 260 Wh kg<sup>-1</sup> Lithium-metal based battery technology, cell, and pack-level”, *The Society for Aerospace System Engineering*, April 2017. (Oral)

## ACTIVITIES

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- 2020 - Present **Battery Journal Club, Member**  
• Discussing battery-related research with students at Stanford and UC Berkeley
- 2019 - Present **Roman Catholic Community, Member**  
• Roman Catholic member at the Church of Nativity, Menlo Park, CA
- 2016 - 2019 **Agape Youth Group, Alter server**  
• Roman Catholic fellowship for young Catholics
- 2014 - 2016 **CCCC, Cornell University, Member**  
• Roman Catholic fellowship for Korean and Korean-American students who strive to build a community of support in strengthening their faith in God
- 2012 - 2014 **Sigma Alpha Lambda, UC Berkeley, National Member**  
• Promotes academic excellence and leadership
- 2011 - 2014 **American Institute of Chemical Engineers (AIChE), UC Berkeley, National Member**  
• National organization that serves to foster excellence in chemical engineering education and global practice, and to create networking opportunities with professional members in the industry and academia
- 2010 - 2014 **Chun Jin Am, UC Berkeley, Planning Committee Member**  
• Roman Catholic fellowship for Korean and Korean-American students who strive to build a community of support in strengthening their faith in God

## MEDIA

- **ElectimesNews**, 02/07/2023, <https://www.electimes.com/news/articleView.html?idxno=315128>
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- **Newmediamax**, 01/28/2023, <https://www.newmediamax.com.tw/article/1ini5zjkirayf.html#gsc.tab=0>
- **Weixinqq**, 01/27/2023, <https://mp.weixin.qq.com/s/J3s57YFjXq3HrAFrgXwk1>
- **NaturePortfolioCommunity**, 02/22/2022, <https://engineeringcommunity.nature.com/posts/the-suspension-electrolyte-design-a-versatile-platform-for-electrolyte-development-of-lithium-metal-batteries>
- **ElectimesNews**, 01/18/2022, <http://www.electimes.com/news/articleView.html?idxno=227993>
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- **Baijiahao**, 01/18/2022, <https://baijiahao.baidu.com/s?id=1722258330348554246&wfr=spider&for=pcq>
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- **Weixinqq**, 01/18/2022, [https://mp.weixin.qq.com/s/\\_o3UUU1gt1Tf3aWHYg1yJg](https://mp.weixin.qq.com/s/_o3UUU1gt1Tf3aWHYg1yJg)
- **qq**, 01/18/2022, <https://new.qq.com/omn/20220118/20220118A01AJD00.html>
- **iikx**, 01/18/2022, <https://www.iikx.com/news/progress/17204.html>
- **ITBizNews**, 11/18/2019, <http://www.itbiznews.com/news/articleView.html?idxno=12078>
- **NewsWorks**, 11/17/2019, <http://www.newsworks.co.kr/news/articleView.html?idxno=411297>
- **HelloDD News Korea**, 11/17/2019, <https://www.hellodd.com/news/articleView.html?idxno=70323>
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- **Digital Journal**, 11/12/2018, [https://www.bizjournals.com/businesswire/press\\_releases/2018/11/12/20181112005008](https://www.bizjournals.com/businesswire/press_releases/2018/11/12/20181112005008)
- **Sys-con Media News**, 11/12/2018, <http://www.sys-con.com/node/4344492>
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- **HelloDD News Korea**, 10/25/2018, <http://www.hellodd.com/?mt=view&pid=66463>
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- **Seoul Economic Network News Korea**, 10/25/2018, <http://www.sedaily.com/NewsView/1S61UEJLTV>
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- **Maker News Korea**, 10/01/2018, <http://www.makernews.co.kr/news/articleView.html?idxno=733>
- **YTN Science Korea**, 09/27/2018, [http://science.ytn.co.kr/program/program\\_view.php?s\\_mcd=0082&s\\_hcd=&key=201809271434345872](http://science.ytn.co.kr/program/program_view.php?s_mcd=0082&s_hcd=&key=201809271434345872)
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- **Daily Hankook News Korea**, 09/25/2018, <http://daily.hankooki.com/lpage/economy/201809/dh20180925000118147770.htm>
- **Yonhap News Korea**, 09/25/2018, <http://www.yonhapnews.co.kr/bulletin/2018/09/21/0200000000AKR20180921082800017.HTML?input=1195m>
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