# Daehee Lee, Ph.D.

Staff Engineer

MLCC Development Team
Samsung Electro-Mechanics Co. Ltd.
Suwon 16674, Republic of Korea

Office: +82-31-8093-8952
E-mail:
daehee407.lee@samsung.com


## PERSONAL DETAILS

- Sex: Male
- Date of Birth: January 18th, 1982
- Nationality: Republic of Korea

## EXPERIENCE

| | |
|---|---|
| 2018. 12 – present | **Staff Engineer,** MLCC Development Team, Samsung Electro-Mechanics |
| 2017. 07 – 2018. 10 | **Visiting Scholar,** Department of Materials Science and Engineering, Northwestern University (Advisor: Prof. Sossina M. Haile) |
| 2015. 09 – 2018. 05 | **Research Professor**, Department of Materials Science and Engineering, Yonsei University |
| 2014. 09 – 2015. 08 | **Postdoctoral Associate**, Department of Materials Science and Engineering, Yonsei University |

## EDUCATION

| | |
|---|---|
| 2008. 03 – 2014. 08 | **Ph.D.** Materials Science and Engineering, **YONSEI UNIVERSITY**<br>Dissertation : Controlling the phase boundaries of solid oxide fuel cells (Advisor : Prof. Jooho Moon) |
| 2000. 03 – 2008. 02 | **B.S.** Materials Science and Engineering, **YONSEI UNIVERSITY** |

## RESEARCH INTERESTS

- Fabrication and characterization techniques for multilayer ceramic capacitors (MLCCs)
- Elucidation of physicochemical properties of oxide heterointerfaces
- Chemically modulated oxide heterostructures for electrochemical energy devices

## AWARDS AND GRANTS

1. Characterizing oxygen ion transport in chemically modulated hetero-interfaces (P5855), February, 2017, Australian Nuclear Science and Technology Organisation (ANSTO), **Principal Investigator**, 4 reactor cycles awarded (=34,400 AUD =24,973 USD).

2. Characterizing oxygen ion transport in chemically modulated hetero-interfaces (GUP-48111), December, 2016, Advanced Photon Source of Argonne National Laboratory, **Principal Investigator**, 18 shifts awarded.

3. Towards an atomic-scale understanding of ion intercalation to Molybdenum trioxide for next generation smart windows (KSC-2016-C3-0043), September, 2016 – August, 2017, Korea Institute of Science and Technology Information (KISTI), **Principal Investigator**, computing time 1.28 Mh

(=64,000,000 KRW =53,632 USD) granted.

4. Oxygen reduction reaction and effect of non-conventional support materials on single-atom Pt nanocatalyst: A First-principle Study (KSC-2015-C3-044), September, 2015 – August, 2016, Korea Institute of Science and Technology Information (KISTI), **Principal Investigator**, computing time 2 Mh (=1,000,000,000 KRW =83,800 USD) granted.

## PUBLICATIONS

1. Tan, J., **Lee, D.**, Ahn, J., Kim, B., Kim, J., Moon, J. "Thermally driven in situ exsolution of Ni nanoparticles from (Ni, Gd)$CeO_2$ for high-performance solid oxide fuel cells", *J. Chem. Mater. A*, 6, 18133-18142 (2018).

2. Kwon, H.-C., Yang, W., **Lee, D.**, Ahn, J., Lee, E., Ma, S., Kim, K., Yun, S.-C., Moon, J. "Investigating recombination and charge carrier dynamics in one-dimensional nanopillared perovskite absorber", *ACS Nano,* 12, 4233-4245 (2018).

3. Kim, B., Ahn, J., Oh, Y., Tan, J., **Lee, D.**, Lee, J.-K., Moon, J. "Highly porous carbon-coated silicon nanoparticles with canyon-like surfaces as a high-performance anode material for Li-ion batteries", *J. Mater. Chem. A,* 6, 3028-3037 (2018).

4. Kim, E., Kim, H., Bae, C., **Lee, D.**, Moon, J., Kim, J., Shin, H. "Formation of yttria-stabilized zirconia nanotubes by atomic layer deposition toward efficient solid electrolytes", *Nano Convergence*, 4, 31 (2017).

5. Choi, S.,† **Lee, D.**,† Kim, G., Lee, Y. Y., Kim., B., Moon, J., Shim, W. "Shape-reconfigurable aluminum-air batteries", *Adv. Funct. Mater.* 27 (Front Cover), 1702244 (2017). † These authors contributed equally to this work.

6. **Lee, D.**,† Wu, M.,† Kim, D.-H.,† Chae, C., Cho, M. K., Kim, J.-Y., Lee, S. S., Choi, Y., Chung, K. Y., Moon, J., Jeong, S. "Understanding the critical role of Ag nanophase in boosting the initial reversibility of transition metal oxide anodes for lithium ion batteries", *ACS Appl. Mater. Int.,* 9, 21715-21722 (2017). † These authors contributed equally to this work.

7. Yoon, M., Lee, S., **Lee, D.**, Kim, J., Moon, J. "All-solid-state thin film battery based on well-aligned slanted $LiCoO_2$ nanowires fabricated by glancing angle deposition", *Appl. Surf. Sci.*, 412, 537-544 (2017).

8. **Lee, D.**, Tan, J., Soon, A., Ahn, S.-J., Kim, J., Moon, J. "Chemically driven enhancement of oxygen reduction electrocatalysis in supported perovskite oxides", *J. Phys. Chem. Lett.*, 8, 235-242 (2017).

9. **Lee, D.**,† Myung, J.-H.,† Tan, J., Hyun, S.-H., Irvine, J. T. S., Kim, J., Moon, J. "Direct methane fueled solid oxide fuel cells via catalytic partial oxidation enabling complete coking tolerance of Ni based anodes", accepted, *J. Power Sources*, 345, 30-40 (2017). † These authors contributed equally to this work.

10. Lee, H., Kim, A., Kwon, H.-C., Yang, W., Oh, Y., **Lee, D.**, Moon, J. "Retarding crystallization during facile single coating of nacl-incorporated precursor solution for efficient large-area uniform perovskite solar cells", *ACS Appl. Mater. Int.,* 8, 29419 (2016).

11. Kwon, H.-C., Kim, A., Lee, H., **Lee, D.**, Jeong, S., Moon, J. "Parallelized nano-pillar perovskites for semitransparent solar cells using an anodized aluminum oxide scaffold", *Adv. Energy Mater.*, 6, 1601055 (2016).

12. Chae, C., Kim, K. W., Yun, Y. J., **Lee, D.**, Moon, J., Choi, Y., Lee, S. S., Choi, S., Jeong, S. "Polyethyleneimine-mediated electrostatic assembly of $MnO_2$ nanorods on graphene oxides for use as anodes in lithium-ion batteries", *ACS Appl. Mater. Int.*, 8, 11499 (2016).

13. Lee, D.,† **Lee, D.**,† Won, Y., Hong, H., Kim, Y., Song, H., Pyun, J.-C., Cho, Y. S., Moon, J. "Insertion of vertically aligned nanowires into living cells by inkjet printing of cells", *Small*, 12 (Front Cover), 1446 (2016). † These authors contributed equally to this work.

14. **Lee, D.**, Kim, B., Kim, J., Jeong, S., Cao, G., Moon, J. "Salami-like electrospun Si nanoparticle–ITO composite nanofibers with internal conductive pathways for use as anodes for Li-ion batteries", *ACS Appl. Mater. Int.*, 7, 27234 (2015).

15. Myung, J.-H., Kim, S.-D., Shin, T. H., **Lee, D.**, Irvine, J. T. S., Moon, J., Hyun, S.-H. "Nano-composite structural Ni–Sn alloy anodes for high performance and durability of direct methane fueled SOFCs", *J. Mater. Chem. A*, 3, 13801 (2015).

16. Chae, C., Kim, K. W., Kim, S. J., **Lee, D.**, Jo, Y., Yun, Y. J., Moon, J., Choi, Y., Lee, S. S., Choi, S., Jeong, S. "3D intra-stacked CoO/carbon nanocomposites welded by Ag nanoparticles for high-capacity, reversible lithium storage", *Nanoscale*, 7 (Front Cover), 10368 (2015).

17. **Lee, D.**, Kim, D., Kim. J., Moon, J. "Characterizing nano-scale electrocatalysis during partial oxidation of methane", *Sci. Rep.*, 4, 3937 (2014).

18. **Lee, D.**, Kim, J., Moon, J. "Co-planar single chamber solid oxide fuel cells with concentric electrodes", *J. Asian Ceram. Soc.*, 2, 185-189 (2014).

19. Kumar, R.D.V., Kim, I., Zhong, Z., Kim, K., **Lee, D.**, Moon, J. "Cu(II)–alkyl amine complex mediated hydrothermal synthesis of Cu nanowires: exploring the dual role of alkyl amines", *Phys. Chem. Chem. Phys.*, 16, 22107-22115 (2014).

20. Kim, K., Kim, I., Oh, Y., **Lee, D.**, Woo, K., Jeong, S., Moon, J. "Influence of precursor type on non-toxic hybrid inks for high-efficiency $Cu_2ZnSnS_4$ thin-film solar cells", *Green Chem.*, 16, 4323-4332 (2014).

21. Oh, Y., Woo, K., **Lee, D.**, Lee, H., Kim, K., Kim, I., Zhong, Z., Jeong, S., Moon, J. "Role of anions in aqueous sol–gel process enabling flexible $Cu(In,Ga)S_2$ thin-film solar cells", ACS *Appl. Mater. Interfaces*, 6, 17740-17747 (2014).

22. Lee, S. O., **Lee, D.**, Jung, I., Kim, D., Hyun, S. H., Kim, J., Moon, J. "Ceria interlayer-free $Ba_{0.5}Sr_{0.5}Co_{0.8}Fe_{0.2}O_{3-\delta}$–$Sc_{0.1}Zr_{0.9}O_{1.95}$ composite cathode on zirconia based electrolyte for intermediate temperature solid oxide fuel cells", *Int. J. Hydrogen Energy*, 38, 9320-9329 (2013).

23. Jung, I., **Lee, D.**, Lee, S. O., Kim, D., Kim, J., Hyun, S. H., Moon, J. "LSCM–YSZ nanocomposites for a high performance SOFC anode", *Ceram. Int.*, 39, 9753-9758 (2013).

24. Kim, D., **Lee, D.**, Kim, J., Moon, J. "Electrospun Ni-added $SnO_2$–carbon nanofiber composite anode for high-performance lithium-ion batteries", *ACS Appl. Mater. Interfaces*, 4, 5408-5415 (2012).

25. Oh, K., Kim, J., Choi. S. H., **Lee, D.**, Moon, J. "Influence of reduced substrate shunting current on cell performance in integrated planar solid oxide fuel cells", *Ceram. Int.*, 38, 695-700 (2012).

26. Kim, H., **Lee, D.**, Moon, J. "Co-electrospun Pd-coated porous carbon nanofibers for hydrogen storage applications", *Int. J. Hydrogen Energy*, 36, 3566-3573 (2011).

27. **Lee, D.**, Jung, I., Lee, S. O., Hyun, S. H., Jang, J. H., Moon, J. "Durable high-performance $Sm_{0.5}Sr_{0.5}CoO_3$–$Sm_{0.2}Ce_{0.8}O_{1.9}$ core-shell type composite cathodes for low temperature solid oxide fuel

cells", *Int. J. Hydrogen Energy*, 36, 6875-6881 (2011).

28. Song, K., Koo, C. Y., Jun, T., **Lee, D.**, Jeong, Y., Moon, J. "Low-temperature soluble InZnO thin film transistors by microwave annealing", *J. Cryst. Growth*, 326, 23-27 (2011).

29. Song, H. S., Lee, S., **Lee, D.**, Kim, H., Hyun, S. H., Kim, J., Moon, J. "Functionally-graded composite cathodes for durable and high performance solid oxide fuel cells", *J. Power Sources*, 195, 2628-2632 (2010).

30. **Lee, D.**, Ahn, S.-J., Kim, J., Moon, J. "Influence of water vapor on performance of co-planar single chamber solid oxide fuel cells", *J. Power Sources*, 195, 6504-6509 (2010).

## INTERNATIONAL CONFERENCES

1. **Lee, D.**, Tan, J., Kim, J., Moon, J. "Tuning the electrocatalytic activity of perovskite oxides for sofc cathodes by control of the oxygen ion conducting oxide support", *Materials Challenges in Alternative & Renewable Energy 2015*, Jeju Island, Republic of Korea, February 2015.

2. **Lee, D.**, Tan, J., Kim, J., Moon, J. "Durable and high-performance direct methane-fueled solid oxide fuel cells using partial oxidation of methane", *2014 MRS Fall Meeting*, Boston, Massachusetts, USA, December 2014.

3. **Lee, D.**, Kim, D., Kim, J., Moon, J. "Tuning the electrocatalytic activity of cathodes for SOFCs by control of the oxygen ion conducting oxide support", *2014 MRS Spring Meeting*, San Francisco, California, USA, April 2014.

4. **Lee, D.**, Kim, D., Kim, J., and Moon, J., "Unravelling the oscillation of Ni catalysts during partial oxidation of methane", *10$^{th}$ PACRIM Conference on Ceramic and Glass Technology*, San Diego, California, USA, June 2013.

5. Kim, D., **Lee, D.,** Kim, J., Jeong, S., and Moon, J. "Electrospun Si nanoparticles-conductive oxides composite fibers for large energy high rate anodes for Li-ion battery", *The 5$^{th}$ Asia-Oceania Ceramic Federation Conference*, Jeju Island, Republic of Korea, October 2013.

6. **Lee, D.**, Kim, J., and Moon, J. "Electrochemical characterization of surface state of nickel catalyst during partial oxidation of methane", *221$^{st}$ ECS Meeting*, Seattle, Washington, USA, May 2012.

7. **Lee, D.**, Kim, H., Kim, J., and Moon, J. "Concentric electrode-type on-planar single-chamber SOFCs", *Materials Challenges in Alternative & Renewable Energy 2010*, Cocoa Beach, Florida, USA, February 2010.

8. Kim, H., **Lee, D.**, and Moon, J. "Fabrication of palladium coated nanoporous carbon nanofibers via electrospinning", *Materials Challenges in Alternative & Renewable Energy 210*, Cocoa Beach, Florida, USA, February 2010.

9. **Lee, D.**, Kim, J., and Moon, J. "On-planar concentric electrode-type single-chamber SOFC", *PRiME 2008 International Joint Meeting: 214$^{th}$ ECS Meeting and 2008 Fall Meeting of The Electrochemical Society of Japan*, Honolulu, Hawaii, USA, October 2008.

## PATENTS

1. **Lee, D.**, Moon, J. "On-planar type single chamber solid oxide fuel cell", Republic of Korea,

registered, 10-0961641 (2010).

2. Song, H.S., Lee, S., **Lee, D.**, Moon, J. “Cathode for solid oxide fuel cell”, Republic of Korea, registered, 10-1098035 (2011).

3. **Lee, D.**, Lee, J.J., Hyun, S.H., Moon, J. “Operation conditions for direct hydrocarbon solid oxide fuel cells”, Republic of Korea, transferred to SSangyong Mater. Co. (Republic of Korea), 10-2012-0054111 (2012).

4. **Lee, D.**, Myung, J., Moon, J. “Direct hydrocarbon fueled solid oxide fuel cells”, Republic of Korea, registered, 10-1441812 (2014).

5. **Lee, D.**, Kim, D., Moon, J. “Oxide capped anode materials for high performance lithium ion batteries”, Republic of Korea, registered, 10-1490024 (2015).

6. **Lee, D.**, Kim, D., Moon, J. “Composite electrode materials for lithium ion batteries”, Republic of Korea, registered, 10-1553137 (2015).

7. **Lee, D.**, Tan, J., Moon, J. “An electrochemical catalyst structure, and method of fabricating the same”, Republic of Korea, applied, 10-2016-00828884 (2016).

8. **Lee, D.**, Tan, J., Moon, J. “An electrochemical catalyst structure, and method of fabricating the same”, USA, applied, 15637284 (2017).

9. **Lee, D.**, Tan, J., Moon, J. “Direct hydrocarbon fueled solid oxide fuel cells with coking free on-cell reformer”, Republic of Korea, registered, 10-1728982 (2017).

10. **Lee, D.**, Choi, S., Moon, J., Shim, W. “Foldable electrode assembly for aluminum-air battery, method for fabricating the same and aluminum-air battery comprising the same”, Republic of Korea, applied, 10-2017-0035323 (2017).