
Sung Keun Lee

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Seoul National University **Email:** sunglee@snu.ac.kr
Seoul, 08826 Korea **Website:** <https://g2mat.snu.ac.kr>

EDUCATION

2002. 6 Ph.D. Stanford University, Geological and Environmental Sciences
Ph.D. Minor: Chemistry
2001. 6 M.S. Stanford University, Chemical Engineering
1997. 8 M.S. Seoul National University, Korea. Geological Sciences
1994. 2 B.S. Seoul National University, Korea. Geological Sciences
Magna Cum Laude, Minor: Materials Science and Engineering

RESEARCH EXPERIENCE

- 2013 – present Professor, School of Earth and Environmental Sciences, Seoul National University
- 2008 – 2013 Associate Professor (with an early tenure), School of Earth and Environmental Sciences, Seoul National University
- 2004 – 2008 Assistant Professor, School of Earth and Environmental Sciences, Seoul National University
- 2002 – 2004 Carnegie Postdoctoral Fellow, Geophysical Laboratory, Carnegie Institution of Washington (Advisors and mentors: Drs. Bjorn Mysen, George Cody, Yingwei Fei, & Ho-kwang Mao)
- 1998 – 2002 Stanford Graduate Fellow, Stanford University (Advisor: Prof. Jonathan Stebbins)
- 1997 – 1998 Research Assistant, Stanford University (Advisor: Prof. Jonathan Stebbins)
- 1996 – 1997/
1994 Research and Teaching Assistant, Seoul National University (Advisor: Prof. Soojin Kim)
- 2011 – 2012 Visiting Associate in Geochemistry, School of Geol. & Planet. Sci. California Institute of Technology

BIOGRAPHY

Sung Keun Lee is a professor at Seoul National University (SNU), Korea. He was a Carnegie Fellow at Geophysical Laboratory, Carnegie Institution of Washington before joining a position at SNU. He obtained his Ph.D. in Geological and Environmental Sciences, with a Ph.D. minor in Chemistry, from Stanford University. He received an M.S. degree in Chemical Engineering during his stay at Stanford, and received B.S. and M.S. degrees in Geology, with a Materials Science and Engineering Minor from SNU.

Since joining a position at SNU, he has created a research group dedicated to elucidate the atomic origins of geological processes. One of his major contributions is quantifying the extent of molecular scale disorder in Earth materials under extreme environments, such as pressure, surface confinement, and friction. His group has explored key microscopic constraints on melt densification and chemical evolution in Earth interiors, large magnitude earthquakes, and surface processes. Particularly, together with his colleagues, Prof. Lee was the first to use X-ray Raman scattering to reveal the structural evolution in oxides glasses at high pressure (Lee, *Nature Materials* 2005; *RIMG* 2014), reporting the first XRS result of crystalline and amorphous matters above megabar pressures (e.g., Lee, *PNAS* 2018; *PRL* 2019; Kim, *GRL* 2019; *JACS* 2022; Li, *JACS* 2025), and two megabars (Lee, *Science Advance* 2023). His group has also been among the first to apply 2-dimensional solid-state NMR techniques to study the structures of Earth materials and magmas under compression (since Lee, *GRL* 2003; *GCA* 2004), unveiling the atomic origins of configurational entropy, boron isotope composition, and transport properties of mantle melts (e.g., Lee, *PNAS* 2020; Lee-A, *GCA* 2020; 2022; 2024) and planetary glasses (Lee, *Nat. Com.* 2025). He established the oxygen-specific densification mechanism of compressed magmas in mantle and those in super-Earth bodies (Lee, *PNAS* 2008; *PNAS* 2011; *PRL* 2019; Kim, *JACS* 2022). Prof. Lee proposed a new atomically-consistent melting mechanism where the friction process during coseismic slip is described by both equilibrium (controlled by particle size) and metastable melting, providing insights into the mechanism for large earthquakes (Lee, *Nature Geoscience* 2017). Prof. Lee's group revealed the electronic origins of the pronounced hardness of diamond under extreme compression up to 2 Mbar (Lee, *Science Advances* 2023) and hyperconnectivity in planetary glasses under deformation (Lee, *Nat. Com.* 2025).

RESEARCH INTEREST

Physics and Chemistry of Earth and Planetary Materials/ High Temperature-Pressure Geochemistry/ Mineral Physics/ Solid Earth Geophysics/ Silicate Melts and Magmas/ Physical Chemistry of Silicate Glasses/ Nuclear Magnetic Resonance/ Inelastic X-ray Scattering/ *ab initio* simulations/

Physical Chemistry & Condensed Matter Physics of Non-crystalline Matters under Extreme Conditions/

SELECTED PUBLICATIONS Full list of publications: <https://g2mat.snu.ac.kr>

1st author publication by a graduate student in the SKLee lab is underscored.

- Lee, S. K.**, E. El Ghazaoui, Kweon, J. K., Lee, S., Parq, J. Hyperconnected amorphous oxide networks under compression, *Nature Communications* **16** 9930 (2025)
- Li, S., Parq, J.-H., Yi, Y. S., Xiao, Y., Chow, P., Shen, G., **Lee, S. K.**, Electronic configurational transformation of network modifiers in aluminate glass above megabar pressures. *Journal of the American Chemical Society* **147** 32157-32166 (2025)
- Lee, S. K.**, Yi, Y., Kim, Y.-H., Kim, H.-I., Chow, P., Xiao, Y., Eng, P., Shen, G., Imaging of the electronic bonding of diamond at pressures up to two million atmospheres. *Science Advances* **9** eadg 4159 (2023)
- Lee, A. C., Kim, E. J., **Lee, S. K.**, Pressure-induced structural evolution in boron-bearing model rhyolitic glasses under compression: Implications for boron isotope compositions and properties of deep melts in Earth's interior. *Geochimica et Cosmochimica Acta* **332** 220-238 (2022)
- Kim, Y.-H., Yi, Y. S., Kim, H.-I., Chow, P., Xiao, Y., Shen, G., **Lee, S. K.**, Pressure-driven changes in electronic bonding environment of GeO₂ glass above megabar pressures. *Journal of the American Chemical Society* **144** 10025 (2022)
- Lee, S. K.**, Lee, A. C., Kweon, J. J., Probing medium-range order in oxide glasses at high pressure. *Journal of Physical Chemistry Letters* **12** 1330-1338 (2021)
- Lee, S. K.**, Mosenfelder, J., Park, S. Y., Lee, A. C., Asimow, P., Configurational entropy of basaltic melts in Earth's mantle. *Proceedings of the National Academy of Sciences* **117** 21938 (2020)
- Kim, Y.-H., Yi, Y. S., Kim, H.-I., Chow, P., Xiao, Y., Shen, G., **Lee, S. K.**, Structural transitions in MgSiO₃ melts at the core-mantle boundary observed *via* inelastic X-ray scattering. *Geophysical Research Letters* **46** 13756-13764 (2019)
- Lee, S. K.**, Kim, Y.-H., Yi, Y. S., Chow, P., Xiao, Y., Ji, C., Shen, G., Oxygen quadclusters in SiO₂ glass above megabar pressures up to 160 GPa revealed by X-ray Raman scattering. *Physical Review Letters* **123** 235701 (2019) selected as editor's suggestion
- Lee, S. K.**, Kim, Y.-H., Chow, P., Xiao, Y., Ji, C., Shen, G., Amorphous boron oxide at megabar pressures: A view from inelastic X-ray scattering. *Proceedings of the National Academy of Sciences* **115** 5855 (2018)
- Lee, S. K.**, Ryu, S. B., Direct probing of triply coordinated oxygen in amorphous Al₂O₃. *Journal of Physical Chemistry Letters* **9** 150 (2018)
- Lee, S. K.**, Han, R., Kim, E. J., Jeong, G. Y., Khim H., Hirose, T., Quasi-equilibrium melting of quartzite upon extreme friction. *Nature Geoscience* **10** 436 (2017)
- Lee, S. K.**, Eng, P. J., Mao, H., Probing of pressure-induced bonding transitions in crystalline and amorphous Earth materials: Insights from X-ray Raman scattering at high pressure. *Reviews in Mineralogy and Geochemistry* **78** 139 (2014)
- Lee, S. K.**, Simplicity in melt densification in multicomponent magmatic reservoirs in earth's interior. *Proceedings of the National Academy of Sciences* **107** 6847 (2011)
- Lee, S. K.**, Lee, S. B., Park, S. Y., Yi, Y. S., Ahn, C. W., Structure of amorphous aluminum oxides: high-resolution Al-27 NMR study. *Physical Review Letters* **103** 095501 (2009)

- Lee, S. K.**, Lin, J-F, Cai, Y. Q., Hiraoka, N., Eng, P. J., Okuchi, T., Mao, H., Meng, Y., Hu, M. Y., Chow, P., Shu, J., Li, B., Fukui, H., Lee, B. H., Kim, H. N., Yoo, C. S., X-ray Raman scattering study of MgSiO₃ glass at high pressure: Implication for triclustered MgSiO₃ melt in Earth's mantle. *Proceedings of the National Academy of Sciences* **105** 7925 (2008)
- Lee, S. K.**, Eng, P. Mao, H.K. Meng, Y. Shu, J. F., Structure of alkali borate glasses at high pressure. *Physical Review Letters* **98** 105502 (2007)
- Lee, S. K.**, Microscopic origins of macroscopic properties of silicate melts and glasses: Implications for melt generation and dynamics. *Geochimica et Cosmochimica Acta* **69** 3695-3710 (2005)
- Lee, S. K.**, Eng, P., Mao, H. K., Meng, Y. Newville, M., Hu, M. Y., Shu, J., Direct probing of bonding changes in borate glasses at high pressure. *Nature Materials* **4** 851 (2005)
- Lee, S. K.**, Mibe, K. Mysen, B. O, Cody, G. D., Fei, Y., Structure of B₂O₃ glasses at high pressure: B-11 solid state NMR study. *Physical Review Letters* **94** 165507 (2005)
- Lee, S. K.** Stebbins, J. F., The extent of inter-mixing among framework units in silicate glasses and melts. *Geochimica et Cosmochimica Acta* **66** 303 (2002)

HONORS & AWARDS

2025. 1 Fellow, Mineralogical Society of America
2024. 8 Plenary Speaker, the 37th International Geologic Congress
2022. 11 Fellow, The Korean Academy of Science and Technology (KAST)
2022. 9 National Academy of Science Award, The National Academy of Science, Korea
2021. 8 Axford Lecturer, Asia Oceania Geosciences Society (AOGS): Plenary lecture
2020. 3 Innovative Teaching Award, School of Natural Sciences, Seoul National University
2017. 12 Outstanding Research Award, The Geological Society of Korea
2015. 9 Outstanding Teaching Award, School of Natural Sciences, Seoul National University
2010. 5 Young Mineralogist Award, The Mineralogical Society of Korea
2009. 10 Best Paper Award, Earth Science Division, National Research Foundation, Korea
2008. 10 Promoted to Associate Professor with an early tenure, Seoul National University
2008. 4 Outstanding Research Award, School of Natural Sciences, Seoul National University
2007. 6 Outstanding Faculty Award, School of Natural Sciences, Seoul National University
2007. 3 Innovative Research Fellowship, School of Natural Sciences, Seoul National University
2006. 11 Young Geologist Award, The Geological Society of Korea
- 2002 - 2004 Carnegie Postdoctoral Fellowship at Geophysical Laboratory, Carnegie Institution of Washington, Carnegie Fellow
- 1998 - 2002 Stanford Graduate Fellowship, Stanford Graduate Fellow
(See <https://vpge.stanford.edu/fellowships-funding/sgf/details>)
- 2001 Shell Fund, Stanford University

RESEARCH HIGHLIGHTS

2023. 8 Research highlighted in HPCAT, Argonne National Laboratory, Advanced Photon Source (Lee et al. *Sci. Adv.* 2023)
2019. 12 Selected as editor's suggestion (Lee et al. *Phys. Rev. Letts.* 2019)
2019. 5 Research highlighted in annual report, Argonne National Laboratory, Advanced Photon Source (Lee et al. *PNAS* 2018)
2014. 8 Top 5 most cited articles published since 2010, Solid State Nuclear Magnetic Resonance (Lee et al. *Solid. State. Nucl. Mag. Res.* 2010)
2009. 11 Research highlighted in Nature Materials Asia (Lee et al. *Phys. Rev. Letts.* 2009)
2009. 5 Research highlighted in annual report, Argonne National Laboratory, Advanced Photon Source (Lee et al. *PNAS* 2008)
2009. 5 Research highlighted in annual report, Spring-8, Japan (Lee et al. *PNAS* 2008)
2008. 5 Research highlighted in annual report, Argonne National Laboratory, Advanced Photon Source (Lee et al. *Phys. Rev. Letts.* 2007)

SERVICES & PROFESSIONAL ACTIVITIES

- Executive Editor Episodes, 2024-present
- Associate Editor *Geochimica et Cosmochimica Acta*, 2020-present
Frontiers in Earth Science, *Earth and Planetary Materials*, 2014-present
- Editorial Board *Scientific Reports*, 2015-present
Journal of the Mineralogical Society of Korea, 2015-2023
- Peer Referee **Earth Science.** *Science*, *Proceeding of National Academy of Sciences*, *Nature Communications*, *Earth and Planetary Science Letters*, *Geophysical Research Letters*, *Geochimica et Cosmochimica Acta*, *Chemical Geology*, *American Mineralogists*, *European Mineralogist*, *American Journal of Science*, *Treatise on Geochemistry*, *Physics of the Earth and Planetary Interiors*
- Physics/ Materials Science.** *Physical Review Letters*, *Physical Review B*, *Physical Review E*, *Physical Review Applied*, *Physical Review Materials*, *Journal of Physics-Condensed Matter*, *Scientific Reports*, *NPG Asia Materials*, *Journal of Non-Crystalline Solids*, etc.
- Chemistry.** *Journal of the American Chemical Society*, *Angewandte Chemie*, *Chemistry of Materials*, *Journal of Physical Chemistry Letters*, *Journal of Physical Chemistry B*, *Journal of Physical Chemistry C*, *Solid State NMR*, *Journal of Chemical Physics*, *Inorganic Chemistry*, *Langmuir*, *Environmental Science & Technology*, *Nanoscale*, etc.
- Research Proposal.** U.S. NSF Proposal, HPSTAR institution evaluation report, SSRL synchrotron proposals, etc.

Convenor	<p>“Jonathan Stebbins symposium”, Glass & Optical Materials Division Meeting (GOMD 2025), American Ceramic Society, Vancouver, Canada, 2025. 5</p> <p>“Silicate Melts, Magmas, and Non-crystalline Earth Materials in Earth and Planetary Surfaces and Interior” The 37th International Geological Congress, Korea, 2024. 8</p> <p>“Properties of Magmas: Experiments, Theories, Models, and Application to Geochemistry and Volcanology” American Geophysical Union (AGU) Fall meeting, USA, 2021. 12</p> <p>“Recent News on Silicate Glasses and Melts” Goldschmidt Conference, Florence, Italia, 2013. 8</p> <p>“Melts and Fluids in Earth and Planetary Interiors” American Geophysical Union (AGU) Fall meeting, San Francisco, USA, 2012. 12</p> <p>“Structure and Properties of Melts and Glasses on the Earth’s Surfaces & its Interior” Western Pacific Geophysical Meeting, Taipei, Taiwan, 2010.6</p> <p>“Molten Earth: from the Core to Volcanism” A joint session of JpGU and EGU, Chiba city, Japan, 2010. 5</p> <p>“Masters of Terrestrial Igneous Activity: Magmas, Melts and Fluids” American Geophysical Union (AGU) Fall meeting, San Francisco, USA, 2009. 12</p> <p>“New Views on Discontinuities, Composition and Temperature of the Mantle” AGU Fall meeting, San Francisco, USA, 2008.12</p>
Secretary General	<p>4th Asian Conference on High Pressure Research, Seoul, Korea 2006 -2008 (http://hosting03.snu.ac.kr/~sungklee/ahp4.htm)</p> <p>Mineralogical Society of Korea, 2019-2021</p>
Local Organizer	<p>37th International Congress of Geology, Busan, Korea, 2020-2024</p> <p>9th Asian Conference on High Pressure Research, Seoul, Korea 2019-2021</p>
International Advisory Committee	<p>International Conference on High Pressure Science &Technology (AIRAP meeting) Tokyo, Japan, 2009. 7</p> <p>International Conference on Natural Glasses, Florence, Italia, 2013. 8</p>

INVITED LECTURES

> 90 invited talks and seminars at the international Conferences and Institutions abroad since 2003.

International Conferences

- 2026. 4 MRS Spring Meeting, Honolulu, Hawaii, USA
- 2025. 9 Stanford Synchrotron Radiation Laboratory/LCLS Users' Meeting and Workshops, Stanford, USA
- 2025. 8 17th International Conference on the Physics of Non-Crystalline Solids (PNCS17), Tsukuba, Japan
- 2024. 12 American Geophysical Union, Fall meeting, Washington D.C. USA
- 2024. 10 8th Int. Workshop on Flow and Fracture of Advanced Glasses, Tokyo, Japan
- 2024. 8 37th International Geological Congress (Plenary Speaker), Busan, Korea
- 2024. 8 International Commission on Glass Annual Meeting, Incheon, Korea
- 2024. 5 American Ceramic Society, glass and optical science division, Las Vegas, USA
- 2023. 11 International Commission on Glass Annual Meeting, Hangzhou, China
- 2023. 8 The 9th International Discussion Meeting on Relaxations in Complex Systems (9 IDMRCS), Chiba city, Japan
- 2022. 12 2022 IUCr (international union of crystallography) Commission on High Pressure, Chicago, USA
- 2021. 11 Asian Conference on High-Pressure Research, Korea: Keynote Speaker (virtual)
- 2021. 6 Axford Lecturer, Asia Oceania Geosciences Society (AOGS): Plenary lecture (virtual)
- 2021. 2 Molten 2021, International Conference on Molten slags, Fluxes and Salts, Seoul, Korea (virtual)
- 2020. 11 MS&T2020, Pittsburg, PA USA (virtual)
- 2020. 9 Advanced Spectroscopy Probes to Investigate Matter under Extreme Conditions, Argonne National Laboratory, Chicago, USA (virtual)
- 2019. 10 14th Silicate Melts Workshop, France
- 2019. 6 The 25th International Congress on Glass (ICG) 2019, Boston, USA
- 2018. 7 2018 IUCr Commission on High Pressure, Hawaii, USA
- 2018. 7 XV International Conference on the Physics of Non-Crystalline Solids (PNCS) and XIV European Society of Glass Conference (ESG), Saint-Malo, France
- 2018. 3 2018 International Forum on Micro-Nano Functional Materials, Wuhan, China
- 2017. 9 2017 International Conference for Backdu Magma Activity, Seoul, Korea

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2017. 8 International Conference on High Pressure Science & Technology (AIRAP meeting), Shanghai, China
2016. 12 2016 Asian Crystallographic Association Meeting, Hanoi, Vietnam
2016. 11 9th International Conference on Thin Film Physics and Applications, Shanghai, China
2016. 9 IUCr Commission on High Pressure, Pohang, Korea
2016. 5 American Ceramic Society, glass and optical science division, Madison, USA
2015. 12 American Geophysical Union, Fall meeting, San Francisco. USA
2015. 8 Pacific Rim Ceramic Society Conference Jeju, Korea
2015. 8 6th Asia-Pacific NMP Symposium (APNMR6), Hong Kong
2015. 5 Japan Geoscience Union Meeting, Chiba city, Japan
2015. 5 American Ceramic Society, glass and optical science division, Orlando, USA
2015. 1 Asian Conference on High Pressure Research, Bangkok, Thailand
2014. 8 ISNOG 2014 (International Symposium on Non-Oxide and New Optical Glasses), Jeju, Korea
2013. 12 International Conference on Processing and Manufacturing of Advanced Materials (Thermec2013), Las Vegas, USA
2013. 7 7th International Discussion Meeting on Relaxations in Complex Systems (7th IDMRCS), Barcelona, Spain
2013. 7 International Non Crystalline Materials Conference (NCM12), Riva del Garda, Italy (not Taken)
2013. 7 24th International Conference on High Pressure Science & Technology (AIRAP meeting), Seattle, USA
2012. 8 6th Asian Conference on High Pressure Research, Beijing, China
2012. 5 American Ceramic Society, glass and optical science division, St. Louis, USA
2011. 10 CECAM workshop on "Dynamical Properties of Earth and Planetary Materials" Lausanne, Switzerland
2011. 10 Silicate Melt workshop La Petite Pierre, France
2011. 8 7th International Conference on Borate Glasses, Crystals and Melts, Nova Scotia, Canada
2011. 5 Japanese Geoscience Union Meeting, Chiba, Japan
2010. 12 The Pacifichem 2010 Conference ("Chemistry and Materials Science at High Pressures"), Hawaii, USA
2010. 12 The Pacifichem 2010 Conference ("Solid-State NMR Methods and Applications in Inorganic Materials"), Hawaii, USA

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2010. 10 7th International Conference on Inelastic X-ray Scattering, Grenoble, France
2010. 10 5th Asian Conference on High Pressure Research, Matsue, Japan
2010. 5 Japanese Geoscience Union Meeting, Chiba, Japan
2009. 10 3rd Asia-Pacific NMR Conference, Jeju, Korea
2009. 7 International Union of Crystallography, High Pressure Division, Harbin, China
2009. 7 International Conference on High Pressure Science & Technology (AIRAP meeting), Tokyo, Japan
2009. 5 Workshop on Electronic Excitations studied by Non-Resonant Inelastic X-Ray Scattering at PETRA III. Hamburg, Germany
2008. 11 Ehime University, Geodynamic Research Center, TANDEM Workshop, Japan.
2008. 8 The XXI General Assembly of the International Union of Crystallography, August, Osaka, Japan
2007. 10 French-Korean Joint Workshop on Solid-state NMR, Tae-Gu, Korea
2007. 4 Study of Matter at Extreme Conditions (SMEC) Conference, Orlando, USA
2004. 11 American Ceramic Society, glass and optical science division, Orlando, USA
2002. 10 The 104st Annual Conference of American Ceramic Society, Denver, USA
2002. 5 Stanford Graduate Fellowship Symposium, Stanford, USA
2001. 7 43rd Rocky Mountain Conference on Analytical Chemistry, Denver, USA

International Institutions

2023. 11 Carnegie Institution for Science, Earth and Planetary Laboratory, USA
2019. 10 HPstar, Shanghai, China
2016. 12 Aalborg University, Department of Chemistry and Bioscience, Denmark
2016. 4 Advanced Photon Source, Argonne National Laboratory, Laboratory, USA
2015. 11 Carnegie Institution of Washington, Geophysical Laboratory, USA
2015. 11 IPGP, France
2014. 8 Wuhan University of Science and Technology, State Key Laboratory of Silicate Materials for Architectures, Wuhan, China
2013. 12 University of Nevada, Las Vegas, Dept. Geology USA
2012. 1 California Institute of Technology, Div. Geological & Planet. Sci. USA
2012. 1 Chapman University, School of Earth & Environ. Sci. USA
2011. 11 University of California, Davis, Dept. Geology, USA
2011. 10 Carnegie Institution of Washington, Geophysical Laboratory, USA

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2011. 5 University of Nevada, Las Vegas, Dept. Physics, USA
2010. 6 National Taiwan University, Dept. Chemistry, Taiwan
2009. 7 Jilin University (State Key Laboratory of Superhard Materials), China
2009. 5 DESY (German Synchrotron Radiation Laboratory). Hamburg, Germany
2008. 2 CNRS-Orleans, France
2004. 6 M.I.T., Dept. Earth. Atmos., & Planetary Sci. USA
2004. 3 University of Wisconsin, Madison, Dept. Geology. & Geophys. Seminar. USA
2004. 3 University of Wisconsin, Madison, Mineralogy/Geochemistry Seminar. USA
2004. 3 Carnegie Institution of Washington, Geophysical Laboratory, USA
2003. 5 California Institute of Technology, Seismological Laboratory, USA
2002. 2 Carnegie Institution of Washington, Geophysical Laboratory, USA
2001. 11 Harvard University, Dept. of Engineering and Applied Sciences. USA

JOURNAL ARTICLES

[1st (or corresponding) author publication by a graduate student and/or postdoctoral scholar in the SKLee lab is underscored.]

ORCID: <https://orcid.org/0000-0002-3149-3421>

- [150] Kim, S., Kim, S.-A., Park, G.-S., Kim, E., Kim, D.-H., Lee, S.-C., Woo, S.-J., Jang, Y., Kweon, J. L., Kang, S., Lee, M., Yun, H. J., Park, S., Shim, H.-J., Kim, J. S., Jang, K.-Y., Sung, M.-J., Park, C.-Y., Chang, S. E., Park, J., Park, J., **Lee, S. K.**, Lee, T.-W., Cold-injection synthesis of highly emissive perovskite nanocrystals. *Nature* (2025) accepted
- [149] Zeng, Q., Zhao, Y., Park, S., Zhou, H., Shim, H.-J., Li, T., Ryu, J., Sung, M.-J., Chua, X. W., Yoon, E., Lewis, B. A. I., Woo, S.-J., Forzatti, M., Kim, M. J., Kim, E. A., Dai, L., Jang, J., Tang, Y., Kweon, J. J., Chen, H., Jang, K. Y., Kim, D.-H., Jeong, W. J., Kim, J. S., Lee, H., Lim, K., Cho, S.-Y., Park, C. B., **Lee, S. K.**, Kim, M., Bolink, H. J., Hu, B., Walsh, A., Stranks, S. D., Lee, T.-W., A hierarchical shell locks and stabilizes perovskite nanocrystals with near-unity quantum yield. *Science* **391** eady1370 (2026)
- [148] **Lee, S. K.**, Kim, J.-W., Professor Soo Jin Kim's scientific legacy in mineralogy. *Korean Journal of Mineralogy and Petrology* **38** 239-242 (2025)
- [147] Kim, Y.-H., **Lee, S. K.**, Structure of amorphous oxides in planetary interiors via Si L_{2,3}-edge X-ray Raman scattering of SiO₂ glasses. *Korean Journal of Mineralogy and Petrology* **38** 345-353 (2025)
- [146] Kweon, J. L., **Lee, S. K.**, Deformation-induced structural changes in corundum (alpha-Al₂O₃). *Korean Journal of Mineralogy and Petrology* **38** 335-343 (2025)
- [145] Jung, H. J., **Lee, S. K.**, Influence of zinc on the structure of aluminosilicate melts a preliminary ²⁷Al NMR result. *Korean Journal of Mineralogy and Petrology* **38** 263-273 (2025)
- [144] Koo, H. J., Cho, H. G., Jin, Y. K., Lee, D. H., Kim, J. H., Rhee, T. S., Hong, J. K., **Lee, S. K.**, Genesis of shallow-water manganese nodules with uniquely high Mn/Fe ratios. *Geoscience Frontiers* **17** 102219 (2026)
- [143] **Lee, S. K.**, El Ghazaoui, Kweon, J. K., Lee, S., Parq, J. Hyperconnected amorphous oxide networks under compression. *Nature Communications* **16** 9930 (2025)
- [142] Li, S., Parq, J.-H., Yi, Y. S., Xiao, Y., Chow, P., Shen, G., **Lee, S. K.**, Electronic configurational transformation of network modifiers in aluminate glass above megabar pressures. *Journal of the American Chemical Society* **147** 32157-32166 (2025)
- [141] Kweon, J. K., Khim, H., Kim, Y.-H., **Lee, S. K.**, Structural transition in crystalline SiO₂ during mechanical amorphization under frictional shear. *Journal of Materials Chemistry A* **13** 22672-22684 (2025)
- [140] Choi, S., Zhang, S., Kim, N.-H., Kweon, J., Tanaka, K., Kubota, K., Lee, Y.-N., Xie, J., Paik, I., **Lee, S. K.**, Thermal maturity and colors of Cretaceous East Asian fossil eggs. *Sedimentary Geology* **106855** (2025)

- [139] [Kim, Y.-H.](#), Kim, J., Lin, J.-H., **Lee, S. K.**, Electronic structures of iron in oxide glasses via 1s_{3p} resonant inelastic X-ray scattering. *Journal of Physical Chemistry Letters* **16** 2627–2635 (2025)
- [138] [Parq, J.](#), Yi Y. S., Lee S. M., Yu J., **Lee S. K.**, Nuclear magnetic resonance properties of silica glass under pressure up to 2 Mbar: A view from *ab-initio* calculations. *Journal of the American Ceramic Society* **104** e20474 (2025)
- [137] [Kim, E. J.](#), **Lee, S. K.**, Formation of structurally bound carbonate in silicate melts on the top of the mantle transition zone. *Geophysical Research Letters* **52** e2024GL113755 (2025)
- [136] [Kim, Y.-H.](#), Chow, P., Xiao, Y., Shen, G., **Lee, S. K.**, Electronic bonding transitions in oxide glass above two megabar pressures. *Physical Review Research* **6** L022051 (2024)
- [135] [Yi, Y. S.](#), **Lee, S. K.**, Pressure-driven evolution in the electronic bonding properties of MgO in the super-Earth interior up to ~4 TPa *via* core-electron excitation spectroscopy: *Ab initio* calculations. *Physical Review B* **110** 035127 (2024)
- [134] Choi G., Chang U., [Lee J.](#), Park K., Kwon H., Lee H., Kim Y., Seo J. H., Park Y.-C., Park I., Kim J., Lee S., Choi J., Yu B., Song J.-H., Shin H., Baek S., **Lee S. K.**, Park H., Jung K., Unraveling and regulating superstructure domain dispersion in lithium-rich layered oxide cathodes for high stability and reversibility. *Energy & Environmental Science* **17** 4634–4645 (2024)
- [133] [Lee, A. C.](#), **Lee, S. K.**, Water-driven evolution of hydrous boron-bearing silicate melts at high pressures up to 8 GPa: Implications for dynamic properties and boron isotope content in hydrous mantle melts. *Geochimica et Cosmochimica Acta* **37** 199–218 (2024)
- [132] [Roh, S.](#), **Lee, S. K.**, Equilibrium fractionation of clumped isotopes in H₂O molecule: Insights from quantum chemical calculations. *Korean Journal of Mineralogy and Petrology* **36** 1–9 (2023)
- [131] Lim, H., Baek, K.-Y., Kim, J. I., Lee, J., Kim, J., Ahn, H., Choi, H., Woo, S.-J., **Lee, S. K.**, Lee, T.-W., [Lee, J.](#), Kang, K., Lee, T., Mechanochemical synthesis and thin-film deposition of zero-dimensional cesium lead mixed halide perovskites for wide-range color-tunable emission. *Chemistry of Materials* **35** 6294–6303 (2023)
- [130] **Lee, S. K.**, Yi, Y., Kim, Y.-H., Kim, H.-I., Chow, P., Xiao, Y., Eng, P., Shen, G., Imaging of the electronic bonding of diamond at pressures up to two million atmospheres. *Science Advances* **9** eadg 4159 (2023)
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TEACHING EXPERIENCE

School of Earth and Environmental Sciences, Seoul National University

Undergraduate course

- Introduction to Earth System Sciences
- Introduction to Geology
- Introduction to Geochemistry
- Earth Materials Science: Mineralogy
- Rock and Minerals

Graduate course

- Introduction to Volcanology
- Introduction to Mineral Physics
- Quantum Chemical Calculations: Applications in Geochemistry
- Experimental Methods in Earth Materials Science: Scattering & Spectroscopy
- Structure and Properties of Silicate Glasses, Melts, & Magmas
- Graduate Seminar in School of Earth and Environmental Sciences

T. A.

- Guest Lecturer, Stanford University, "Soil Chemical Dynamics" (Winter 2002)
- Teaching Assistant, Stanford University, "Introduction to Geochemistry" (Winter 2001)
- Teaching Assistant, Seoul National University, "Lab. of Mineralogy" (Spring, 1997)
- Teaching Assistant, Seoul National University, "History of the Earth" (Fall, 1996)

-Following is the list of classes that I had a great pleasure to take at Stanford and Seoul National University as a graduate student. The insights and knowledge from these classes have provided an essential foundation of our unusual cross-disciplinary quest to reveal hidden simplicity within complex Earth system.

CLASSES (Stanford University)

Total 34 Lecture classes with GPA of 3.92/4.00

Department of Geological and Environmental Sciences and Geophysics

- [1] Physics and chemistry of minerals, melts and mineral surfaces
- [2] Petrologic phase equilibria
- [3] Low temperature aqueous geochemistry (Aquatic chemistry)
- [4] Thermodynamics and disorder in melts and crystals
- [5] Structures and dynamics of silicate melts and glasses (*)
- [6] Environmental geochemistry (*)
- [7] Reservoir geomechanics
- [8] Exploring geosciences using MATLAB
- [9] Education in geosciences (seminar)
- [10] Seminar in planetary geology and the origin of life (seminar)
- [11] Tectonophysics

Department of Chemistry and Chemical Engineering

- [1] Physical chemistry (undergraduate quantum chemistry)
- [2] Advanced physical chemistry I (advanced quantum mechanics I)
- [3] Advanced physical chemistry II (advanced quantum mechanics II: group theory)
- [4] Advanced physical chemistry III (quantum statistical mechanics and kinetic theory)
- [5] Advanced physical chemistry IV (time dependent statistical mechanics)
- [6] Application of NMR spectroscopy
- [7] Statistical mechanics for thermophysical property calculation:
Molecular thermodynamics
- [8] Selected topics in advanced physical chemistry-Molecular motions in fluid
- [9] Quantum simulation in materials I
- [10] Spectroscopy and application of quantum mechanics
- [11] Quantum simulations in materials II
- [12] Colloid and interface sciences
- [13] Ultra-sensitive laser spectroscopy
- [14] Advanced inorganic chemistry: Organometallic chemistry
- [15] Advanced physical chemistry seminar, 2 quarters and Chemical Eng. colloquium

Department of Materials Science and Engineering

- [1] Solid state thermodynamics
- [2] Waves and diffractions of solids
- [3] Electric and magnetic properties of solids
- [4] The electronic structures of surfaces and interfaces
- [5] Rate processes in materials
- [6] Nanoscale science, engineering and technology

Department of Physics and Applied Physics

- [1] Condensed matter theory I
- [2] Mesoscopic physics and nanostructures
- [3] Quantum information

Department of Linguistics and School of Engineering

- [1] Advanced English writing
 - [2] Listening comprehension
 - [3] Public speaking
- * audit

CLASSES (Seoul National University, Graduate School)

Total 8 lecture classes with GPA of 4.00/4.00

Dept. of Geological and Environmental Sciences (4)

- [1] Advanced ore deposits
- [2] Experimental petrology
- [3] X-ray crystallography
- [4] Clay mineralogy

Dept. of Materials Science and Engineering (4)

- [1] Theory of solidification
- [2] Advanced thermodynamics
- [3] Calculation of phase equilibria
- [4] Statistical thermodynamics