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## Sung Keun Lee

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Seoul, 08826 Korea

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### 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

### RESEARCH INTEREST

Physics and Chemistry of Earth 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

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

1<sup>st</sup> author publication by a graduate student in the SKLee lab is underscored.

**Lee, S. K.**, Yi, Y., Kim, Y., Kim, H., 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 GeO<sub>2</sub> 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 MgSiO<sub>3</sub> 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 SiO<sub>2</sub> 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

Kim, H.-I., **Lee, S. K.**, The degree of polymerization and structural disorder in (Mg,Fe)SiO<sub>3</sub> glasses and melts: Insights from high-resolution <sup>29</sup>Si and <sup>17</sup>O solid-state NMR. *Geochimica et Cosmochimica Acta* **250** 268-291 (2019)

**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 Al<sub>2</sub>O<sub>3</sub>. *Journal of Physical Chemistry Letters* **9** 150 (2018)

**Lee, S. K.**, Han, R., Kim, E.J., Jeong, G.Y., Kihm 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 multi-component 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 MgSiO<sub>3</sub> glass at high pressure: Implication for triclustered MgSiO<sub>3</sub> 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 B<sub>2</sub>O<sub>3</sub> 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)

**Lee, S. K.**, Stebbins, J. F., The degree of aluminum avoidance in aluminosilicate glasses. *American Mineralogist* **84** 937-945 (1999)

#### HONORS & AWARDS

- 2024. 8 Plenary Speaker, the 37<sup>th</sup> International Geologic Congress
- 2022. 11 The Korean Academy of Science and Technology (KAST) Fellow
- 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-present
- Peer Referee *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*.  
*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*  
*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*, *Environ. Sci. & Tech.*, *Nanoscale*  
 Research Proposal. U.S. NSF Proposal, HPSTAR institution evaluation report, SSRL synchrotron proposals, etc.

Convenor	<p>“Silicate Melts, Magmas, and Non-crystalline Earth Materials in Earth and Planetary Surfaces and Interior” The 37<sup>th</sup> 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 &amp; 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>4<sup>th</sup> Asian Conference on High Pressure Research, Seoul, Korea 2006 -2008 (<a href="http://hosting03.snu.ac.kr/~sungklee/ahp4.htm">http://hosting03.snu.ac.kr/~sungklee/ahp4.htm</a>)</p> <p>Mineralogical Society of Korea, 2019-2021</p>
Local Organizer	<p>37<sup>th</sup> International Congress of Geology, Busan, Korea, 2020-2024</p> <p>9<sup>th</sup> Asian Conference on High Pressure Research, Seoul, Korea 2019-2021</p>
International Advisory Committee	<p>International Conference on High Pressure Science &amp;Technology (AIRAP meeting) Tokyo, Japan, 2009. 7</p> <p>International Conference on Natural Glasses, Florence, Italia, 2013. 8</p>

## INVITED LECTURES

> 85 invited talks and seminars at the international Conferences and Institutions abroad since 2004.

### *International Conferences*

2024. 12	American Geophysical Union, Fall meeting, Washington, USA
2024. 10	8th International Workshop on Flow and Fracture of Advanced Glasses, Tokyo, Japan

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2024. 8 37<sup>th</sup> 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 division, Las Vegas, USA
2023. 11 International Commission on Glass Annual Meeting, Hangzhou, China
2023. 8 The 9<sup>th</sup> 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 14<sup>th</sup> Silicate Melts Workshop, France
2019. 6 The 25<sup>th</sup> 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
2017. 8 International Conference on High Pressure Science & Technology (AIRAP meeting), Shanghai, China
2016. 12 2016 Asian Crystallographic Association Meeting, Hanoi, Vietnam
2016. 11 9<sup>th</sup> 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 6<sup>th</sup> 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

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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 7<sup>th</sup> International Discussion Meeting on Relaxations in Complex Systems (7<sup>th</sup> IDMRCS), Barcelona, Spain
2013. 7 International Non Crystalline Materials Conference (NCM12), Riva del Garda, Italy (not Taken)
2013. 7 24<sup>th</sup> International Conference on High Pressure Science &Technology (AIRAP meeting), Seattle, USA
2012. 8 6<sup>th</sup> 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 7<sup>th</sup> 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
2010. 10 7<sup>th</sup> International Conference on Inelastic X-ray Scattering, Grenoble, France
2010. 10 5<sup>th</sup> Asian Conference on High Pressure Research, Matsue, Japan
2010. 5 Japanese Geoscience Union Meeting, Chiba, Japan
2009. 10 3<sup>rd</sup> 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. 4 Study of Matter at Extreme Conditions (SMEC) Conference, Orlando, USA
2007. 10 French-Korean Joint Workshop on Solid-state NMR, Tae-Gu, Korea

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- 2004. 11 American Ceramic Society, glass and optical science division, Orlando, USA
  - 2002. 10 The 104<sup>st</sup> Annual Conference of American Ceramic Society, Denver, USA
  - 2002. 5 Stanford Graduate Fellowship Symposium, Stanford, USA
  - 2001. 7 43<sup>rd</sup> 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
- 2011. 5 University of Nevada, Las Vegas, Dept. Physics, USA
- 2010. 6 National Taiwan University, Dept. Chemistry, Taiwan
- 2009. 7 Jilim 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

[1<sup>st</sup> (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>

- [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 inelastic x-ray scattering: 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 H<sub>2</sub>O 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., Kim, H., 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)
- [129] Kweon, J. J., Kim, H., **Lee, S. K.**, Ball-milling induced changes in the crystallinity of quartz and wear of milling Media. *Korean Journal of Mineralogy and Petrology* **36**, 95-106 (2023)
- [128] Lee, J., Baek, K., Lee, J., Ahn, H., Kim, Y., Lim, H., Kim, Y., Woo, J., Stranks, S.D., **Lee, S. K.**, Siringhaus, H., Kang K., Lee, T., Bulk Incorporation of molecular dopants into Ruddlesden–Popper organic metal–halide perovskites for charge transfer doping. *Advanced Functional Materials* 2302048 (2023)
- [127] Li, S., Kweon, J. J., Lee, S., Lee, A. C., **Lee, S. K.**, Coordination changes in densified aluminate glass upon compression up to 65 GPa: a view from solid-state nuclear magnetic resonance. *Journal of Physical Chemistry Letters* **14** 2078-2086 (2023)
- [126] Lee, J., **Lee, S. K.**, Probing the Homogeneous distribution of sodium atoms in silicate glasses. *Acta Materialia* **241** 118413 (2022)

- [125] 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)
- [124] 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 GeO<sub>2</sub> glass above megabar pressures. *Journal of the American Chemical Society* **144** 10025-10033 (2022)
- [123] **Lee, S. K.**, Parq, J., Yi, Y. S., Lee, S., Kim, H.-I., Lee, S. M., Yu, J., Structure and disorder in MgSiO<sub>3</sub> glasses above megabar pressures via nuclear magnetic resonance: DFT calculations. *Journal of the American Ceramic Society* **105** 5151-5166 (2022)
- [122] Kweon, J. J., Kim, H.-I., Lee, S. H., Kim, J. Y., **Lee, S. K.**, Quantitative probing of hydrogen environments in quasicrystals by high-resolution NMR spectroscopy. *Acta Materialia* **226** 117657 (2022)
- [121] Lhee, J., Kim, Y.-H., Lee, A. C., Kim, E. J., Lee, S., **Lee, S. K.**, Pressure-load calibration of multi-anvil press at ambient temperature through structural change in cold compressed amorphous pyrope. *Korean Journal of Mineralogy and Petrology* **35** 65-73 (2022)
- [120] Choi, S., Kim, N.-H., Kim, H.-I., Kweon, J. J., **Lee, S. K.**, S. Zhang, D.J, Varricchio., Preservation of aragonite in Late Cretaceous (Campanian) turtle eggshell. *Palaeogeography, Palaeoclimatology, Palaeoecology* **585** 110741 (2022)
- [119] Park, S. Y., **Lee, S. K.**, Effect of composition on isotropic chemical shift of Na silicate and aluminosilicate glasses using solid state NMR. *Journal of the Mineralogical Society of Korea* **32** 41-49 (2021)
- [118] Lee, A. C., **Lee, S. K.**, Effect of composition on structural evolution and NMR parameters of quadrupolar nuclides in sodium borate and aluminoborosilicate glasses: A view from high-resolution <sup>11</sup>B, <sup>27</sup>Al, and <sup>17</sup>O solid-state NMR. *Journal of Non-Crystalline Solids* **555** 120271 (2021)
- [117] Kim, H.-I., **Lee, S. K.**, Probing the transformation paths from aluminum (oxy)hydroxides (boehmite, bayerite, and gibbsite) to metastable alumina: A view from high-resolution <sup>27</sup>Al MAS NMR. *American Mineralogist* **106** 389-403 (2021)
- [116] Lee, J., Lee, W., Kang, K., Lee, T., **Lee, S. K.**, Layer-by-layer structural identification of 2D Ruddlesden-popper Hybrid Lead Iodide perovskites by solid-state NMR Spectroscopy. *Chemistry of Materials* **33** 370-377 (2021)
- [115] **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)
- [114] Lee, S., **Lee, S. K.**, Effect of lead content on atomic structures of Pb-bearing sodium silicate glasses: A view from <sup>29</sup>Si NMR spectroscopy. *Korean Journal of Mineralogy and Petrology* **34** 157-167 (2021)
- [113] Choi, S., Park, Y., Kweon, J. J., Kim, S. Y., Jung, H. M., **Lee, S. K.**, Lee, Y. N., Fossil eggshells of amniotes as a palaeothermometry tool. *Palaeogeography, Palaeoclimatology, Palaeoecology* **571** 110376 (2021)

- [112] Yi, Y. S., Khim, H., Kim, Y.-H., **Lee, S. K.**, Spectral proxies for bonding transitions in SiO<sub>2</sub> and MgSiO<sub>3</sub> polymorphs at high pressure up to 270 GPa by O K-edge X-ray Raman scattering. *Physical Review B* **103** 214109 (2021)
- [111] Yi, Y. S., Han, Y. C., Kwon, K. D., **Lee, S. K.**, Hur, S. D., Molecular mechanism of gas diffusion in ice-Ih. *ACS Earth and Space Chemistry* **5** 3258-3267 (2021)
- [110] Choi, S., **Lee, S. K.**, Kim, N., Kim, S., Lee, Y., Raman spectroscopy detects amorphous carbon in an enigmatic egg from the upper Cretaceous Wido volcanics of south Korea. *Frontiers in Earth Science, Paleontology* **7** 349 (2020)
- [109] Kim, H.-I., **Lee, S. K.**, Extent of disorder in iron-bearing albite and anorthite melts: Insights from multi-nuclear (<sup>29</sup>Si, <sup>27</sup>Al, and <sup>17</sup>O) solid-state NMR study of iron-bearing NaAlSi<sub>3</sub>O<sub>8</sub> and CaAl<sub>2</sub>Si<sub>2</sub>O<sub>8</sub> glasses. *Chemical Geology* **531** 119498 (2020)
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- [3] **Lee, S. K.**, Stebbins, J. F., The degree of aluminum avoidance in aluminosilicate glasses. *American Mineralogist* **84** 937-945 (1999)
- [2] **Lee, S. K.**, Kim, S. J., Calculation of interaction parameters in mixed layer minerals and their applications. *Journal of the Mineralogical Society of Korea* **10** 97-104 (1997)
- [1] Kim, S. J., Hyun, S. P., **Lee, S. K.**, Wollastonite from Susan and its dissolution behavior. *Journal of the Mineralogical Society of Korea* **9** 1-10 (1996)

## 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 a 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