

# JANGMI HAN

Department of Earth and Atmospheric Sciences, University of Houston  
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## EDUCATION:

**Ph.D.** Earth and Planetary Sciences, The University of New Mexico, USA, 2014

Dissertation: Microstructural constraints on the formational and thermal histories of refractory inclusions in CO<sub>3</sub> chondrites (Advisor: Prof. Adrian J. Brearley)

**M.S.** Science in Education, Seoul National University, South Korea, 2009

Thesis: Metamorphic temperatures of equilibrated ordinary chondrites (Advisor: Prof. Byeon-Gak Choi)

**B.S.** Science, Seoul National University, South Korea, 2007

Thesis: Comparison of meteorites found in Antarctica, deserts, and the other places on the Earth (Advisor: Prof. Byeon-Gak Choi)

- Graduated with honors (Cum Laude)

- Certificated in Earth Science Teaching for secondary school students, issued by the Ministry of Education, Science, and Technology, South Korea

## RESEARCH ACTIVITY:

- **Coordinated mineralogical, chemical, and isotopic microanalyses of primitive meteorite samples in the context of the formation and early evolution of our Solar System:**

Research interest: (1) The formation history of refractory inclusions (Ca-Al-rich inclusions and amoeboid olivine aggregates) in carbonaceous chondrites; (2) Crystal structure and chemistry of ultrarefractory phases and their non-stoichiometry (hibonite, spinel, perovskite, Ca,Al-oxides, and Sc-,Zr-,Y-rich phases); and (3) The roles of fluids on the mineralogical and chemical evolution of the asteroidal bodies.

- Analytical methods: Transmission electron microscopy, focused ion beam technique, scanning electron microscopy, electron probe microanalysis, secondary ion mass spectrometry, and nanoscale secondary ion mass spectrometry.

- **Initial Analysis team member on the JAXA Hayabusa 2 Mission**

## RESEARCH EXPERIENCE:

**Research Scientist**, Department of Earth and Atmospheric Sciences, University of Houston, 1/2021-present

**Visiting Scientist**, Lunar and Planetary Institute / NASA Johnson Space Center, 5/2017-12/2020

**Postdoctoral Fellow**, Lunar and Planetary Institute / NASA Johnson Space Center, 5/2014-5/2017

**Research Assistant**, Department of Earth and Planetary Sciences, University of New Mexico, 8/2009-5/2014

**Research Assistant**, Department of Science Education, Seoul National University, 3/2006-8/2009

RESEARCH GRANT:

- **Co-Investigator** on NASA Emerging Worlds proposal “Isotopic Evolution of the Protoplanetary Disk Recorded by Refractory Inclusions and Chondrules in CH and CB Chondrites (PI: Sasha Krot)”, 2022-2025
- **Principle Investigator** on NASA Emerging Worlds proposal “Coordinated Microanalyses of Refractory Inclusions and Insights into Their Condensation Origin”, 2021-2024
- **Co-Investigator** on NASA Laboratory Analysis of Returned Samples proposal “Development of a Next-Generation Scanning-Transmission Electron Microscope and Associated Techniques: Preparing for the Coordinated Analysis of OSIRIS-REx, Hayabusa2, and MMX Samples (PI: Dr. Lindsay Keller)”, 2021-2023
- **Co-Investigator** on NASA Emerging Worlds proposal “Coordinated Analyses of Presolar and Early Solar System Materials (PI: Dr. Lindsay Keller)”, 2018-2020
- **Co-Investigator** on NASA Emerging Worlds proposal “Coordinated Analyses of Early Solar System Materials (PI: Dr. Lindsay Keller)”, 2015-2017

PEER-REVIEWED PUBLICATIONS:

12. Nakamura T., --- **Han J.**, ---, and Tsuda Y. (2022) Formation and evolution of carbonaceous asteroid Ryugu: Direct evidence from returned Samples. *Science*, accepted.
11. **Han J.**, Ohnishi I., Yasuhara A., and Keller L. P. (2022) Atomic-scale structure and non-stoichiometry of meteoritic hibonite: A transmission electron microscope study. *American Mineralogist* **107**, 873-884.
10. **Han J.**, Park C., and Brearley A. J. (2022) A record of low-temperature asteroidal processes of amoeboid olivine aggregates from the Kainsaz CO3.2 chondrite. *Geochimica et Cosmochimica Acta* **322**, 109-128.
9. **Han J.**, Keller L. P., Liu M.-C., Needham A. W., Messenger S., and Simon J. I. (2020) A coordinated microstructural and isotopic study of a Wark-Lovering rim on a Vigarano CAI. *Geochimica et Cosmochimica Acta* **269**, 639-660.
8. **Han J.**, Jacobsen B., Liu M.-C., Brearley A. J., Matzel J. E., and Keller L. P. (2019) Origin of <sup>16</sup>O-rich fine-grained Ca-Al-rich inclusions of different mineralogy and texture. *Geochemistry* **79**, 125543.
7. Liu M.-C., **Han J.**, Brearley A. J., and Hertwig A. T. (2019) Aluminum-26 chronology of dust coagulation and early Solar System evolution. *Science Advances* **5**, eaaw3350.
6. **Han J.** and Brearley A. J. (2017) Microstructures and formation history of melilite-rich calcium-aluminum-rich inclusions from the ALHA77307 CO3.0 chondrite. *Geochimica et Cosmochimica Acta* **201**, 136-154.
5. Needham A. W., Messenger S., **Han J.**, and Keller L. P. (2017) Corundum-hibonite inclusions and the environments of high temperature processing in the early Solar System. *Geochimica et Cosmochimica Acta* **196**, 18-35.
4. **Han J.** and Brearley A. J. (2016) Microstructural constraints on complex thermal histories of refractory CAI-like objects in an amoeboid olivine aggregate from the ALHA77307 CO3.0

- chondrite. *Geochimica et Cosmochimica Acta* **183**, 176-197.
3. **Han J.**, Brearley A. J., and Keller L. P. (2015) Microstructural evidence for a disequilibrium condensation origin for hibonite-spinel inclusions in the ALHA77307 CO3.0 chondrite. *Meteoritics & Planetary Science* **50**, 2121-2136.
  2. **Han J.** and Brearley A. J. (2015) Microstructural evidence for complex formation histories of amoeboid olivine aggregates from the ALHA77307 CO3.0 chondrite. *Meteoritics & Planetary Science* **50**, 904-925.
  1. **Han J.** and Choi B.-G. (2009) Metamorphic temperature of equilibrated ordinary chondrites recovered by the 1st and 2nd Korea Expedition for Antarctic Meteorites. *Journal of the Geological Society of Korea* **45**, 157-171 (written in Korean).

#### ABSTRACTS:

67. **Han J.**, Park C., and Keller L. P. (2022) A record of nebular and parent body processes of grossite-bearing, fine-grained refractory inclusions from reduced CV3 chondrites. *85th Annual Meeting of the Meteoritical Society*, #6480.
66. Nakamura T. and Hayabusa 2 Initial Analysis Stone team (2022) Analysis of “Stone” samples from C-type asteroid Ryugu. *85th Annual Meeting of the Meteoritical Society*, #6190.
65. Zolensky M., Dolocan A., Bodnar R., Gearba I., Martinez J., **Han J.**, Nakamura T., Tsuchiyama A., Matsuno J., Sun M., Matsumoto M., Fujioka Y., Enokido Y., Uesugi K., Takeuchi A., Yasutake M., Miyake A., Okumura S., Mitsukawa I., Takigawa A., Mikouchi T., Enju S., Morita T., Kikuri M., Amano K., Yurimoto H., Noguchi T., Okazaki R., Yabuta H., Naraoka H., Sakamoto K., Tachibana S., Watanabe S., and Tsuda Y. (2022) Update on measurement of the composition of Ryugu fluid inclusions. *85th Annual Meeting of the Meteoritical Society*, #6011.
64. **Han J.**, Park C., and Brearley A. J. (2022) Thermal history of amoeboid olivine aggregates from the Kainsaz CO3.2 chondrite. *Goldschmidt 2022*, #13206.
63. Nakamura T. and Hayabusa 2 Initial Analysis Stone team (2022) Analysis of samples from asteroid Ryugu returned by Hayabusa2. COSPAR 2022 – 44<sup>th</sup> Scientific Assembly.
62. **Han J.** and Keller L. P. (2022) Compositional clues to the origin of refractory metal nuggets, perovskite, and Zr-rich oxides in hibonite from the Paris CM chondrite. *53rd Lunar and Planetary Science Conference*, #2712.
61. **Han J.**, Zolensky M., Martinez J., Brearley A. J., Nakamura T., Morita T., Kikuri M., Amano K., Kagawa E., Yurimoto H., Noguchi T., Okazaki R., Yabuta H., Naraoka H., Sakamoto K., Tachibana S., Watanabe S., and Tsuda Y. (2022) A FIB/TEM study of particle C0076-FO004 returned from the asteroid Ryugu, with a focus on the structures and compositions of sulfide grains. *53rd Lunar and Planetary Science Conference*, #1838.
60. Nakamura T. and Hayabusa 2 Initial Analysis Stone team (2022) Early history of Ryugu’s parent asteroid: Evidence from return sample. *53rd Lunar and Planetary Science Conference*, #1753.
59. Keller L. P. and **Han J.** (2022) A FIB/TEM study of the matrix mineralogy of CV3-reduced

- group meteorites. *53rd Lunar and Planetary Science Conference*, #1584.
58. Zolensky M., Dolocan A., Bodnar R., Gearba I., Martinez J., **Han J.**, Nakamura T., Tsuchiyama A., Matsuno J., Sun M., Matsumoto M., Fujioka Y., Enokido Y., Uesugi K., Takeuchi A., Yasutake M., Miyake A., Okumura S., Mitsukawa I., Takigawa A., Mikouchi T., Enju S., Morita T., Kikuri M., Amano K., Yurimoto H., Noguchi T., Okazaki R., Yabuta H., Naraoka H., Sakamoto K., Tachibana S., Watanabe S., and Tsuda Y. (2022) Direct measurement of the composition of aqueous fluids from the parent body of asteroid 162173 Ryugu. *53rd Lunar and Planetary Science Conference*, #1451.
57. **Han J.**, Keller L. P., Ohnishi I., and Yasuhara A. (2021) Atomic-scale structure and non-stoichiometry of meteoritic hibonite: Understanding the formation of the first solar system solids. *Annual Meeting of Geological Society of Korea*.
56. **Han J.**, Liu M.-C., Matsuda N., Park C., and Keller L. P. (2021) Mineralogical and Al-Mg isotopic study of fine-grained Ca-Al-rich inclusions. *84th Annual Meeting of the Meteoritical Society*, #6267.
55. **Han J.** and Keller L. P. (2021) Hibonite and its associated ultrarefractory phases from the Paris CM chondrite. *52nd Lunar and Planetary Science Conference*, #2587.
54. Lee S., Keller L. P., Morris R. V., **Han J.**, Rahman Z., and Christoffersen R. (2020) Thermal metamorphism of the Murchison CM2 carbonaceous chondrite to simulate space weathering of primitive asteroids. *Microscopy & Microanalysis meeting*.
53. **Han J.**, Keller L. P., Krot A. N., and Nagashima K. (2020) Microstructural investigations of igneous rims on CB CAIs. *Goldschmidt 2020*, #941.
52. **Han J.**, Liu M.-C., Matsuda N., Park C., and Keller L. P. (2020) Mg isotopic compositions of fine-grained Ca-Al-rich inclusions from the reduced CV3 chondrites and implications on the timescale of nebular condensation. *51st Lunar and Planetary Science Conference*, #2895.
51. Lee S., Keller L. P., Morris R. V., **Han J.**, and Rahman Z. (2020) Thermal decomposition of the Murchison CM2 carbonaceous chondrite: Implications of space weathering processes for sample return missions. *51th Lunar and Planetary Science Conference*, #2535.
50. Anderkin C. J., **Han J.**, Park C., and Keller L. P. (2020) Mineralogy and petrology of fine-grained calcium-aluminum-rich inclusions from the reduced CV3 chondrite Thiel Mountains 07007. *51th Lunar and Planetary Science Conference*, #2224.
49. **Han J.**, Keller L. P., Liu M.-C., Needham A. W., and Simon J. I. (2020) Microstructural and isotopic constraints on WL rim formation. *Solar-System symposium in Sapporo 2020*.
48. **Han J.** and Keller L. P. (2019) Atomic structure and non-stoichiometry of defect-structured hibonite in meteorites. *Annual Meeting of the Geological Society of America*, #339341.
47. **Han J.**, Ohnishi I., and Keller L. P. (2019) Complex intergrowths of non-stoichiometric defect-structured hibonite and Al-rich spinel in an Allende Ca-Al-rich inclusion. *82nd Annual Meeting of the Meteoritical Society*, #6487.
46. **Han J.**, Park C., and Keller L. P. (2019) Microstructural record of evolving condensation processes in fine-grained Ca-Al-rich inclusions from the reduced CV3 chondrites. *82nd*

- Annual Meeting of the Meteoritical Society*, #6435.
45. Liu M.-C., **Han J.**, Brearley A. J., and Hertwig A. T. (2019) Aluminum-26 chronology of dust coagulation and early solar system evolution. *82nd Annual Meeting of the Meteoritical Society*, #6182.
  44. **Han J.** and Keller L. P. (2019) Fine-grained, spinel-rich Ca-Al-rich inclusions from the reduced CV3 chondrite Efremovka: A genetic link to Wark-Lovering rims? *50th Lunar and Planetary Science Conference*, #2902.
  43. Warren P. H., Keller L. P., and **Han J.** (2018) Eucrite-like secondary metasomatism in Apollo 14 mare basalt 14072. *81st Annual Meeting of the Meteoritical Society*, #6305.
  42. Crow C. A., **Han J.**, Keller L. P., and Moser D. E. (2018) TEM analyses of lunar zircon shock microstructures. *Goldschmidt 2018*.
  41. **Han J.** and Keller L. P. (2018) Understanding the formation of defect-structured hibonite in chondritic meteorites: A FIB/TEM study. *Microscopy & Microanalysis meeting*, #0161\_0238\_001213.
  40. Liu M.-C., **Han J.**, and Brearley A. J. (2018) The Al-26 distribution in the initial condensation stage. *15th Annual Meeting of Asia Oceania Geosciences Society*, #PS12-A006.
  39. **Han J.**, Brearley A. J., and Keller L. P. (2018) A record of nebular vs. asteroidal processes in amoeboid olivine aggregates from Kainsaz (CO3.2). *49th Lunar and Planetary Science Conference*, #2863.
  38. Keller L. P., Yasuhara A., **Han J.**, and Keller E. L. (2018) The crystal chemistry of defect-structured meteoritic hibonite: Atomic resolution imaging and x-ray mapping. *49th Lunar and Planetary Science Conference*, #2392.
  37. **Han J.**, Liu M.-C., Kööp L., Keller L. P., and Davis A. M. (2017) Correlations among microstructure, morphology, chemistry, and isotopic systematics of hibonite in CM chondrites. *80th Annual Meeting of the Meteoritical Society*, #6380.
  36. Keller L. P. and **Han J.** (2017) Metastable phase relations in the system CaO-Al<sub>2</sub>O<sub>3</sub>-MgO-TiO<sub>2</sub>: Application to Ca- and Al-rich inclusions. *80th Annual Meeting of the Meteoritical Society*, #6374.
  35. Liu M.-C., **Han J.**, and A. Brearley (2017) The boron isotopic ratios of a fine-grained inclusion from ALHA77307 (CO3.0). *80th Annual Meeting of the Meteoritical Society*, #6291.
  34. **Han J.**, Kööp L., Keller L. P., and Davis A. M. (2017) Microstructural constraints on the formation history of hibonite in refractory inclusions. *48th Lunar and Planetary Science Conference*, #2895.
  33. Hashiguchi M., Nakamura T., Tsuchiyama A., Tomioka N., Uesugi M., **Han J.**, Nakato A., Yada T., Yoshitake M., Kumagai K., Nishimura M., Matsumoto T., Sakamoto K., Kawasaki N., Nakano Y., Matsui S., Okada T., Abe M., and Yurimoto H. (2016) Current status of consortium study for silica-containing Hayabusa-returned particle. *Hayabusa 2016: 4th Symposium of Solar System Materials*.
  32. **Han J.**, Keller L. P., and Danielson L. R. (2016) Experimental insights into the origin of defect-structured hibonites found in meteorites. *79th Annual Meeting of the Meteoritical Society*,

- #6534.
31. **Han J.**, Keller L. P., Needham A. W., Messenger S., and Simon J. I. (2016) Constraints on the origin of a Type B CAI from the Vigarano CV3red chondrite. *Goldschmidt*, #1040.
  30. Chan Q. H. S., **Han J.**, and Zolensky M. (2016) Microstructural investigations of magnetite plaquettes in Orgueil. *Goldschmidt*, #399.
  29. **Han J.**, Keller L. P., Brearley A. J., and Danielson L. R. (2016) Stacking defects in synthetic and meteoritic hibonites: implications for high-temperature processes in the solar nebula. *47th Lunar and Planetary Science Conference*, #2848.
  28. **Han J.**, Keller L. P., Needham A. W., Messenger S., and Simon J. I. (2015) Microstructural investigation of a Wark-Lovering rim on a Vigarano CAI. *78th Annual Meeting of the Meteoritical Society*, #5243.
  27. Mishra R. K., Simon J. I., Messenger S., Marhas K. K., Ross D. K., Needham A. W., and **Han J.** (2015) Oxygen isotopes in perovskites and associated mineral assemblages in a hibonite-bearing Allende CAI. *78th Annual Meeting of the Meteoritical Society*, #5133.
  26. Needham A. W., Messenger S., Keller L. P., Simon J. I., **Han J.**, Mishra R. K., and Marhas K. K. (2015) Aluminum-magnesium isotope systematics in Wark-Lovering rims. *78th Annual Meeting of the Meteoritical Society*, #5014.
  25. Christoffersen R., Keller L. P., **Han J.**, Rahman Z., and Berger E. L. (2015) Characterization of meteorites by focused ion beam sectioning: Recent applications to CAIs and primitive meteorite matrices. *AGU Spring meeting*, #P21A-02.
  24. Mishra R. K., Simon J. I., Ross D. K., Needham A. W., Messenger S., Keller L. P., **Han J.**, and Marhas K. K. (2015) Na, K-rich rim around a chondrule in unequilibrated ordinary chondrite LEW 86018 (L3.1). *46th Lunar and Planetary Science Conference*, #2994.
  23. Needham A. W., Messenger S., Keller L. P., Simon J. I., **Han J.**, and Mishra R. K. (2015) Systematic oxygen isotope variations within a single Vigarano CAI surrounded by a uniformly  $^{16}\text{O}$ -rich Wark-Lovering rim. *46th Lunar and Planetary Science Conference*, #2865.
  22. **Han J.**, Keller L. P., Needham A. W., Messenger S., and Simon J. I. (2015) Microstructures and origins of two corundum-hibonite inclusions from ALHA77307 (CO3.0). *46th Lunar and Planetary Science Conference*, #2702.
  21. **Han J.**, Keller L. P., and Brearley A. J. (2015) Microstructural evidence for the condensation origin of hibonite-spinel inclusions from ALHA77307 (CO3.0). *46th Lunar and Planetary Science Conference*, #2214.
  20. **Han J.**, Brearley A. J., and Keller L. P. (2014) Microstructures of hibonite from an ALHA77307 (CO3.0) CAI: Evidence for evaporative loss of calcium. *77th Annual Meeting of the Meteoritical Society*, #5440.
  19. Jacobsen B., **Han J.**, Matzel J. E., Brearley A. J., and Hutcheon I. D. (2014) Oxygen isotope variation in fine-grained CAIs in ALHA77307: Mixing and transport in diverse nebular environments. *77th Annual Meeting of the Meteoritical Society*, #5414.
  18. Jacobsen B., **Han J.**, Matzel J. E., Brearley A. J., and Hutcheon I. D. (2014) Oxygen isotopes

- in fine-grained spinel-pyroxene and melilite-rich CAIs in the ALHA77307 CO3.0 carbonaceous chondrite. *45th Lunar and Planetary Science Conference*, #2789.
17. **Han J.** and Brearley A. J. (2014) Hibonite-spinel inclusions from the ALHA77307 CO3.0 chondrite: A FIB/TEM approach. *45th Lunar and Planetary Science Conference*, #2125.
  16. **Han J.** and Brearley A. J. (2013) Fe-rich nanoparticles in amoeboid olivine aggregates from Kainsaz (CO3.2): A record of low-temperature metamorphic processes. *Meteoritics & Planetary Science* **S48**, #5155.
  15. **Han J.** and Brearley A. J. (2013) A FIB/TEM study of refractory inclusions from the ALHA77307 CO3.0 carbonaceous chondrite: Microstructural observations from melilite-rich inclusions. *44th Lunar and Planetary Science Conference*, #2682.
  14. **Han J.** and Brearley A. J. (2012) A FIB/TEM study of Ca-Al-rich inclusions from the ALHA77307 CO3.0 carbonaceous chondrite: Microstructural constraints on complex formational and thermal histories of CAIs. *Annual Meeting of Geological Society of Korea*.
  13. **Han J.** and Brearley A. J. (2012) Microstructural observations of spinel-pyroxene refractory inclusions from the ALHA77307 CO3.0 carbonaceous chondrite: Comparison with CAI-like objects in an amoeboid olivine aggregate. *43rd Lunar and Planetary Science Conference*, #1324.
  12. **Han J.** and Brearley A. J. (2012) The microstructure and microchemistry of amoeboid olivine aggregates from the ALHA77307 CO3.0 carbonaceous chondrite: Constraints on formation and thermal histories. *43rd Lunar and Planetary Science Conference*, #1323.
  11. **Han J.** and Brearley A. J. (2011) Complex thermal histories of CAI-like objects in amoeboid olivine aggregates from the ALHA77307 CO3.0 chondrite: Constraints from microstructural studies by TEM. *Workshop on Formation of the First Solids in the Solar System*, #9084.
  10. **Han J.** and Brearley A. J. (2011) Evidence for formation of Al-Ti pyroxene by reaction between perovskite and melilite in a CAI-like object from an AOA in the ALHA77307 CO3.0 chondrite. *Meteoritics & Planetary Science* **S46**, #5388.
  9. **Han J.** and Brearley A. J. (2011) Formation of TiO<sub>2</sub> nanoparticles in a CAI-like object from an AOA in the ALHA77307 CO3.0 carbonaceous chondrite. *Meteoritics & Planetary Science* **S46**, #5190.
  8. Choi B.-G., Kim H., Choi J.-E., and **Han J.** (2011) Petrological characteristics of TIL 07007, a highly deformed CV3 chondrite. *Japan Geological Union International Symposium*, #PPS004-10.
  7. **Han J.** and Brearley A. J. (2011) Amoeboid olivine aggregates from the ALHA77307 CO3.0 chondrite: Microstructural constraints on the origin of refractory components. *42nd Lunar and Planetary Science Conference*, #1673.
  6. **Han J.** and Brearley A. J. (2010) Microstructural constraints on the origin of AOAs in the ALHA77307 CO3.0 carbonaceous chondrites. *Meteoritics & Planetary Science* **S45**, #5158.
  5. Kim H., Choi J., **Han J.**, and Choi B.-G. (2009) Analysis of eccentricity and preferential

- orientation of chondrules in chondrites. *Proceedings of the Annual Joint Conference: Mineralogical Society of Korea and Petrological Society of Korea*, pp.161-164.
4. **Han J.**, Choi H., and Choi B.-G. (2008) Metamorphic temperatures of equilibrated ordinary chondrites recovered by the Korea Expedition for Antarctic meteorites. *Workshop on Antarctic Meteorites: Search, Recovery, and Classification*, #4029.
  3. Choi B.-G., Lee J. I., Ahn I., **Han J.**, and Kusakabe M. (2007) Antarctic meteorites recovered from Thiel Mountains, west Antarctica by the first Korea Expedition for Antarctic meteorites. *Meteoritics & Planetary Science* **S42**, #5173.
  2. Choi B.-G., Lee J. I., Ahn I., **Han J.**, and Kusakabe M. (2007) Classification and petrography of Antarctic meteorites from the first Korea Expedition for Antarctic meteorites. *Proceedings of the Annual Joint Conference: Mineralogical Society of Korea and Petrological Society of Korea*, pp.84-86.
  1. **Han J.** and Choi B.-G. (2007) Comparison of meteorites found in Antarctica, deserts and the other places on the Earth. *Proceedings of the Annual Joint Conference: Mineralogical Society of Korea and Petrological Society of Korea*, pp.72-74.



TEACHING EXPERIENCE:

**Guest Lecturer**, Institute of Science-Gifted Education, Seoul National University, 1/2008; 8/2009

- Field geology classes for middle to high school students.

**Teaching Assistant**, Department of Science Education, Seoul National University, 3/2007-6/2009

- Undergraduate courses:

- (1) Solid earth science laboratory (Spring 2009),
- (2) Meteorites and the Solar System (Fall 2018),
- (3) Field works in earth science laboratory (Fall 2008),
- (4) Earth science laboratory (Spring 2007-Spring 2008).

MENTORING EXPERIENCE:

**LPI Summer Intern Program in Planetary Science**, Lunar and Planetary Institute, 6-8/2019

- Advisor for undergraduate student Christian Anderkin (University of Florida)

Research project: A petrologic and mineralogical study of refractory Ca-Al-rich inclusions in the reduced CV3 carbonaceous chondrites.

INVITED PRESENTATIONS:

- Physical Research Laboratory, Platinum Planetary seminar; 2/2022
- Lunar and Planetary Institute, seminar, 12/2013; 4/2019
- Yonsei University, seminar, 9/2017
- Korea Polar Research Institute, seminar, 4/2015; 3/2017
- Department of Earth Science Education, Seoul National University, lecture, 4/2015

PROFESSIONAL SERVICE:

- NASA grant review panel and external reviewer, 2018; 2019; 2022
- Lunar and Planetary Science Conference program committee, 2018; 2019; 2020
- Stephen E. Dworkin award judge, 2017
- LPI career development award science panel committee, 2015; 2017
- Peer Reviewer for journals, including Nature Communications, Geochimica et Cosmochimica Acta, Meteoritics & Planetary Science, American Mineralogist, and The Astrophysical Journal, since 2014

AWARDS AND SCHOLARSHIPS:

- USRA Performance award, 2017-2020
- The University of New Mexico Research assistantship, 8/2009-4/2014
- The University of New Mexico Rodney C. Rhodes Memorial scholarship, 2013
- 76th Annual meeting of the Meteoritical Society travel grant: NASA Cosmochemistry program, 2013
- The University of New Mexico EPS Alumni International scholarship, 2012; 2013
- Workshop on the Formation of the First Solids in the Solar System travel grant: NASA

Cosmochemistry & Origin of Solar Systems program, 2011

- 74th Annual meeting of the Meteoritical Society travel grant: Barringer Crater Company, 2011
- 73th Annual meeting of the Meteoritical Society travel grant: NASA Cosmochemistry program, 2010
- Seoul National University Research assistantship, 3/2006-8/2009
- Seoul National University Teaching assistantship, 3/2007-6/2009
- Workshop on Antarctic Meteorites travel grant: SOKENDAI support, 2008
- Seoul National University Superior Academic Performance scholarship, 2003-2006

PROFESSIONAL MEMBERSHIPS:

- Meteoritical Society
- Geochemical Society
- Microanalysis Society

(Updated 9/2/2022)