SHAN-HU LEE

Department of Atmospheric and Earth Science
University of Alabama in Huntsville
NSSTC Room 4208
320 Sparkman Drive, Huntsville, AL 35805
256 961 7734
shanhu.lee@uah.edu
https://sites.google.com/uah.edu/shanhulee

PROFESSIONAL PREPARATION

Beijing University of Chemical Technology, China
B.S. Chemistry, Analytical Chemistry 1985 – 1989

University of Tokyo, Japan
M.S. Physical Chemistry (Advisor, Prof. Ken-Ichi Tanaka) 1992 -1994
Thesis: Adsorption and desorption of NO on well-defined single crystal Pt_3CO (100) surfaces

University of Tokyo, Japan
Ph.D. Physical/Atmospheric Chemistry (Advisor, Prof. Hajime Akimoto) 1994 -1997
Dissertation: Development of laser ionization mass spectrometry for tropospheric low NO concentrations

APPOINTMENTS

University of Alabama in Huntsville, Department of Atmospheric Sciences
Professor 2022 – present
Associate Professor 2015 – 2022

University of Alabama in Huntsville, Department of Chemistry
Affiliated Faculty 2021 – present

Kent State University, Department of Environmental Health Sciences and Department of Chemistry
Professor 2012 – 2015
Associate Professor 2009 – 2012
Assistant Professor 2005 – 2009

University of Denver, Department of Engineering
Senior Research Scientist 2001 – 2005

NOAA, Boulder, Colorado
Postdoctoral Fellow 1999 – 2001
(Advisor: Fred Fehsenfeld)

MIT, Cambridge, Massachusetts
Postdoctoral Fellow 1998 – 1999
(Advisor: Mario Molina)

University of Tokyo, Tokyo, Japan 1996-1997
Japan Society for Promotion of Sciences (JSPS) Young Scientist Fellow

DISTINCTIONS

2012	National Center for Atmospheric Research (NCAR) Advanced Study Program (ASP) Visiting Faculty
2008-2011	Co-director of Choose Ohio First Scholarship
2007	NSF CAREER Award
2006-2011	Co-director of NSF S-STEM Scholarship
2006-2009	KSU Academic Year and Summer Research and Creativity Activity Awards
2002	NASA CRYSTAL-FACE Science Team Award
1996-1997	Japan Society for Promotion of Sciences (JSPS) Young Scientist Fellow

PUBLICATIONS

Research ID F-9913-2014
Peer-reviewed journal publications = 55
Current and former students and postdocs
Google Scholar H-index = 34
12 papers were cited more than 100 times.
My publications were cited more than 100 times in Nature, Science, and PNAS.

55. Watson, Z., L. Tiszenkel, A. Pour Biazar, K. Knupp, and **S.-H. Lee***, Effects of boundary layer dynamics and meteorology on ultrafine particle formation and growth, Atmos. Environ., 309, 119952, (2023).

54. Tiszenkel, L and **S.-H. Lee***, Synergetic effects of isoprene and HOx on biogenic new particle formation, Geophys. Res. Lett., 50, e2023GL103545, https://doi.org/10.1029/2023GL103545 (2023).

53. Kanawade, V. P.,* Y. Zhang*, **S.-H. Lee***, Editorial: Atmospheric aerosol particle formation and growth, Front. Environ. Sci., doi:10.3389/fenvs.2022.1034285 (2022).

52. Laltrllo, S., A. Amiri, and **S.-H. Lee***, Indoor Particulate Matters Measured in Residential Homes in the Southeastern United States: Effects of Pandemic Lockdown and Holiday Cooking*, Aerosol Air Qual. Res.,* Doi: 10.4209/aaqr.210302 (2022).

51. **Lee, S.-H.,** Perspective on Recent Measurements of Reduced Nitrogen Compounds in the Atmosphere, *Front. Environ. Sci.,* Doi:10.3389/fenvs.2022.868534 (2022).

50. Xu, J., J. Chen, N. Zhao, G. Wang, G. Yu, H. Li, J. Huo, Y. Lin, Q. Fu, H. Guo, C. Deng, **S.-H. Lee,** J. Chen, K. Huang, Importance of gas-particle partitioning of ammonia in haze formation in the rural agricultural environment, Atmos. Chem. Phys., 20, 7259-7269 (2020).

49. Xu, J., J. Chen, Y. Shi, N. Zhao, X. Qin, G. Yu, J. Liu, Y. Lin, Q. Fu, R. J. Weber, **S.-H. Lee,** C. Deng, K. Huang*, First continuous measurement of gaseous and particulate formic acid in a suburban area of East China: Seasonality and gas-particle partitioning, *ACS Earth Space Chem*., 4, 157–167 (2019).

48. Tiszenekel, L., C. Stangl, J. Krasnomowitz, Q. Ouyang, H. Yu, M. J. Apsokardu, M. V. Johnston, **S.-H. Lee*,** Temperature effects on sulfuric acid aerosol nucleation and growth: Initial results from the TANGENT study, *Atmos. Chem. Phys.,* 19, 8915–8929 (2019).

47. **Lee, S.-H.,*,** H. Gordon, H. Yu, K. Lehtipalo, R. Haley, Y. Li, and R. Zhang,, New particle formation in the atmosphere: From molecular clusters to global climate, *J. Geophys. Res.,*124, Doi:10.1029/2018JD029356 (2019).

46. H. Yu*, L. Ren, X. Huang, M. Xie, J. He, **S.-H. Lee** and H. Xiao, Iodine speciation and size distribution in ambient aerosols at a coastal new particle formation hotspot in China, *Atmos. Chem. Phys.,* 19, 4025–4039 (2019).

45. Stangl, C. M., J. M. Krasnomowitz, M. J. Apsokardu, L. Tiszenekel, Q. Ouyang, **S-H. Lee**, M. V. Johnston*, Sulfur dioxide modifies aerosol particle growth by monoterpene ozonolysis, *J. Geophys. Res.,* 124, Doi:10.1029/ 2018JD030064 (2019).

44. Krasnomowitz, J. M., M. J. Apsokardu, C. M. Stangl, L. Tiszenekel, Q. Ouyang, **S-H. Lee**, M. V. Johnston*, Growth of Aitken mode ammonium sulfate particles by a-pinene ozonolysis, *Aerosol Sci. Technol.,* 53, 406-418, Doi:10.1080/02786826.2019.1568381 (2019).

43. Dai, L., H. Wang, L. Zhou, J. An*, L. Tang, C. Lu, W. Yan, R. Liu, S. Kong, M. Chen, **S.-H. Lee** and H. Yu*, Regional and local new particle formation events observed in the Yangtze River Delta region, China, *J. Geophys. Res.,* Doi:10.1002/2016JD026030 (2017).

42. Kontkanen, J.*, K. Lehtipalo, L. Ahonen, J. Kangasluoma, H. E. Manninen, J. Hakala, C. Rose, K. Sellegri, S. Xiao, L. Wang, X. Qi, W. Nie, A. Ding, H. Yu, **S.-H. Lee**, V.-M. Kerminen, T. Petaja, and M. Kulmala, Global view on atmospheric concentrations of sub-3 nm particles measured with the Particle Size Magnifier, *Atmos. Chem. Phys.,* Doi:10.5194/acp-2016-847 (2017).

41. Yu, H.*, L. Dai, V. P. Kanawade, S. N. Tripathi, X. Ge, M. Chen, and **S-H. Lee**,* Temperature and RH dependence of aerosol nucleation and growth rates of sub-3 nm particles, *J. Geophys. Res.,* Doi:10.1029/2016JD025619 (2017).

40. **Lee, S.-H**.*, J. Uin, A. B. Guenther, J. A. de Gouwd, F. Yu, A. B. Nadykto, J. Herb, N. L. Ng, A. Koss, W. H. Brune, K. Baumann, V. P. Kanawade, F. N. Keutsch, A. Nenes, K. Olsen, A. Goldstein, and Q. Ouyang, Isoprene suppression of new particle formation: Potential mechanisms and implications, *J. Geophys. Res.,* 121, Doi:10.1029/2016JD024844 (2016).

39. Hallar, A. G.*, A., R. Petersen, I. B. McCubbin, D. Lowenthal, **S.-H. Lee**, E. Andrews, and F. Yu, Climatology of New Particle Formation and Corresponding Precursors at Storm Peak Laboratory, *Aerosol Air Qual. Res.,* 16, 816–826 (2016).

38. Yu, F.*, G. Luo, S. C. Pryor, P. R. Pillai, **S. H. Lee**, J. Ortega, J. J. Schwab, A. G. Hallar, W. R. Leaitch, V. P. Aneja, J. N. Smith, J. T. Walker, O. Hogrefe, and K. L. Demerjian: 2015, Spring and summer contrast in new particle formation over nine forest areas in North America, *Atmos. Chem. Phys.,* 15, 13993–14003 (2015).

37. Guo, H.*, L. Xu, A. Bougiatioti, K. M. Cerully, S. L. Capps, J. R. Hite Jr., A. G. Carlton, **S.-H. Lee,** M. H. Bergin, N. L. Ng, A. Nenes, and R. J. Weber, Fine-particle water and pH in the southeastern United States, *Atmos. Chem. Phys.,* 15, 5211-5228 (2015).

36. Xu, L., H. Guo, C. Boyd, M. Kleinc, A. Bougiatioti, K. Cerully, J. Hiteb, G. Isaacman, C. Knote, K. Olson, A. Koss, A. Goldstein, J. de Gouw, K. Baumann, **S.-H. Lee**, A. Nenes, R. Weber, N. L. Ng*, Effects of anthropogenic emissions on aerosol formation from isoprene and monoterpenes in the Southeastern United States, *Proc. Nat. Acad. Sci. USA*, Doi:10.1073/pnas.1417609112 (2014).

35. Yu, H.*, J. Ortega, J. N. Smith, A. B. Guenther, V. P. Kanawade, Y. You, Y. Liu, K. Hosman, T. Karl, R. Seco, S. G. Pallardy, L. Gu, J. Mikkilä and **S.-H. Lee*,** New particle formation and growth in an isoprene-dominated Ozark forest: From sub-5 nm to CCN-Active sizes, *Aerosol Sci. Technol.,* 48, 1285-1298 (2014).

34. You, Y., V. P. Kanawade, J. A. de Gouw, A. B. Guenther, S. Madronich, M. R. Sierra-Hernandez, M. Lawler, J. N. Smith, S. Takahama, G. Ruggeri, A. Koss, K. Olson, K. Baumann, R. J. Webter, A. Nenes, H. Guo, E. S. Edgerton, L. Porcelli, W. H. Brune, A. H. Goldstein and **S.-H. Lee*,** Atmospheric amines and ammonia measured with a chemical ionization mass spectrometer (CIMS), *Atmos. Chem. Phys.,* 14, 12181-12194 (2014).

33. Kameel, F. R., **S.-H. Lee**, M. R. Hoffmann, and A. J. Colussi*, Polarity and oxidation level of visible absorbers in model organic aerosol, *Chem. Phys. Lett.,* 603, 57-61 (2014).

32. Chon, N. L., **S.-H. Lee*** and H. Lin*, A theoretical study of temperature dependence of cluster formation from sulfuric acid and ammonia, Chem. Phys., 433, 60-66 (2014).

31. Yu, H., A. G. Haller, Y. You, A. Sedlacek, S. Springston, V. P. Kanawade, Y.-N. Lee, J. Wang, C. Kuang, R. L. McGraw, I. McCubbin, J. Mikkala, and **S.-H. Lee***, Sub-3 nm particles observed at the coastal and continental sites in the United States*, J. Geophys. Res.,* 119, Doi:10.1029/2013JD020841 (2014).

30. Young, L.-H.*, **S.-H. Lee**, V. Kanawade, T.-C. Hsiao, Y. L. Lee, B.-F. Huang, Y.-J. Liou, H.-T. Hsu, and P.-J. Tsai, New particle growth and shrinkage observed in subtropical environments, *Atmos. Chem. Phys.,* 13, 547-564 (2013).

29. **Lee, S.-H.,*** S. Murkherjee, B. Brewer, R. Ryan, H. Yu and M. Gangoda, A Laboratory experiment to measure Henry's law constants of volatile organic compounds with a bubble column and GC-FID, *J. Chem. Edu.*, 90, 495-499, Doi:10.1021/ed200303x (2013).

28. Kanawade, V., D. R. Benson, **S.-H. Lee*,** Statistical analysis of 4-year observations of aerosol sizes in a semi-rural continental environment, *Atmos. Environ.,* 59, 30-38 (2012).

27. Yu. H. and **S.-H. Lee*,** Chemical ionization mass spectrometry for the measurement of atmospheric amines, *Environ. Chem.,* 9, 190-210, Doi:10.1071/EN12020 (2012).

26. **Lee, S.-H.*** and H. C. Allen*, Analytical measurements of atmospheric urban aerosol, *Anal. Chem.,* 84, 1196-1201, Doi: 10.1021/ac201338x (2012).

25. Yu, H., R. McGraw, and **S.-H. Lee*,** Effects of amines on formation of atmospheric sub-3 nm particles and their subsequent growth, *Geophys. Res. Lett.,* 39, L02807, Doi: 10.1021/2011GL050099 (2012).

24. Kanawade, V. P.*, B. T. Jobson, A. B. Guenther, M. E. Erupe, S. N. Pressely, T. Tripathi, and **Lee, S.-H.,** Isoprene suppression of new particle formation in a mixed deciduous forest, *Atmos. Chem. Phys.,* 11, 6013-6027 (2011).

23. Erupe, M. E., A. A. Viggiano, and **S.-H. Lee*,** The effect of trimethylamine in atmospheric nucleation involving H_2SO_4, *Atmos. Chem. Phys.,* 11, 4767-4775 (2011).

22. Benson, D. R., H. Yu, A. Markovich, **S.-H. Lee*,** Ternary homogeneous nucleation of H_2SO_4, NH_3, and H_2O under conditions relevant to the lower troposphere, *Atmos. Chem. Phys.,* 11, 4755-4766 (2011).

21. Erupe, M. E., D. R. Benson, J. Li, L.-H. Young, B. Verheggen, M. Al-Refai, O. Tahboub, V. Cunningham, F. Frimpong, A. A. Viggiano and **S.-H. Lee*,** Correlation of aerosol nucleation rate with sulfuric acid and ammonia in Kent Ohio: An atmospheric observation, *J. Geophys. Res.,* 115, D23216, Doi:10.1029/2010JD013942 (2010).

20. Benson, D. R., M. Al-Refai, A. Markovich, and **S.-H. Lee*,** Chemical ionization mass spectrometry for ambient measurements of ammonia, *Atmos. Meas. Tech.,* 3, 1075–1087 (2010).

19. Benson, D. R., M. E. Erupe, and **S.-H. Lee*,** Laboratory-measured H_2SO_4-H_2O-NH_3 ternary homogeneous nucleation rates: Initial observations, *Geophys. Res. Lett.*, 36, L15818, Doi:10.1029/2009GL038728 (2009).

18. Wilson, J. C.*, **S.-H. Lee**, J. M. Reeves, C. A. Brock, H. H. Jonsson, B. G. Lafleur, M. Loewenstein, J. Podolske, E. Atlas, S. Wofsy, K. Boering, G. Toon, D. Fahey, K. K. Kelly, P. Bui, G. Diskin, G. Sachse, The establishment of steady-state aerosol distributions in the extra-tropical, lower stratosphere and the processes that maintain them, *Atmos. Chem. Phys.,* 8, 6617-6626 (2008).

17. Young, L.-H., D. R. Benson, F. R. Kameel, J. R. Pierce, H. Juninnen, M. Kulmala, **S.-H. Lee*,** Laboratory studies of sulfuric acid and water binary homogeneous nucleation: Evaluation of the laboratory setup and the preliminary results, *Atmos. Chem. Phys*., 8, 1-20 (2008).

16. Junninen, H.*, M. Hulkkonen, I. Riipinen, T. Nieminen, A. Hirsikko, T. Suni, M. Boy, **S.-H. Lee**, M. Vana, H. Tammet, M. Kulmala, Observations on nighttime growth of atmospheric clusters, *Tellus*, 60B, 365-371 (2008).

15. Benson, D. R., L.-H. Young, **S.-H. Lee*,** T. Campos, J. Jenson, The effects of air mass history in new particle formation in the free troposphere, *Atmos. Chem. Phys*., 8, 3015-3024 (2008).

14. Benson, D. R., L.-H. Young, F. R. Kameel, **S.-H. Lee*,** Laboratory-measured sulfuric acid and water homogeneous nucleation rates from the SO_2 + OH Reaction, *Geophys. Res. Lett.*, 35, L11801, Doi:10.1029/2008GL033387 (2008).

13. **Lee, S.-H.*,** L.-H. Young, D. R. Benson, M. Kulmala, H. Junninen, T. Suni, T. L. Campos, D. C. Rogers, J. Jensen, Observations of nighttime new particle formation in the troposphere, *J. Geophys. Res.*, 112, D10210, Doi: 10.1029/2007jd009351 (2008).

12. Young, L.-H., D. R. Benson, W. M. Montanaro, **S.-H. Lee*,** L. L. Pan, D. C. Rogers, J. Jensen, J. L. Stith, C. A. Davis, T. L. Campos, K. P. Bowman, W. A. Cooper, Enhanced new particle formation observed in the northern midlatitude tropopause region, *J. Geophys. Res.*, 112, D10218, Doi:10.1029/2006JD008109 (2007).

11. Hunton, D. E.*, A. A. Viggiano, T. M. Miller, J. O. Ballenthin, J. M. Reeves, J. C. Wilson, **S.-H. Lee**, B. E. Anderson, W. H. Brune, H. Harder, J. B. Simpas, and N. Oskarsson, In-situ aircraft observations of the 2000 Mt. Hekla volcanic cloud: Composition and chemical evolution in the Arctic lower stratosphere, *J. Volcanol. Geotherm. Res*., 145, 23-34 (2005).

10. **Lee, S.-H.*,** J. C. Wilson, D. Baumgardner, R. L. Herman, E. M. Weinstock, B. G. LaFleur, G. Kok, B. Anderson, P. Lawson, B. Baker, A. Strawa, J. V. Pittman, J. M. Reeves, and T. P. Bui, New

particle formation observed in the tropical/subtropical cirrus clouds, *J. Geophys. Res*., 109, Doi:10.1029/2004JD005033 (2004).

9. **Lee, S.-H.*,** J. M. Reeves, J. C. Wilson, D. E. Hunton, A. A. Viggiano, T. M. Miller, J. O. Ballenthin, and L. R. Lait, Particle formation by ion nucleation in the upper troposphere and lower stratosphere, *Science,* 301, 1886-1889 (2003).

8. **Lee, S.-H.*,** D. M. Murphy, D. S. Thomson, and A. M. Middlebrook, Nitrate and oxidized organics in single particle mass spectra during the 1999 Atlanta Supersites project, *J. Geophys. Res*., 108, Doi:10.1029/2001JD001455 (2003).

7. Middlebrook, A. M.*, D. M. Murphy, **S.-H. Lee,** D. S. Thomson, K. A. Prather, R. J. Wenzel, D.-Y. Liu, D. J. Phares, K. Rhoads, A. S. Wexler, M. V. Johnston, J. L. Jimenez, J. T. Jayne, D. R. Worsnop, I. Yourshaw, J. H. Seinfeld, and R. C. Flagan, A comparison of particle mass spectrometers during the 1999 Atlanta SuperSite Experiments, *J. Geophys. Res*., 108, Doi:10.1029/JD2001000660 (2003).

6. **Lee, S.-H.*,** D. M. Murphy, D. S. Thomson, and A. M. Middlebrook, Chemical components of single particles measured using particles analysis by laser mass spectrometer (PALMS) during the 1999 Atlanta SuperSite Experiment: focus on organic/sulfate, Pb, soot, and mineral particles*, J. Geophys. Res*., 107, Doi:10.1029/2001JD000011 (2002).

5. **Lee, S.-H.*,** Y. Kajii, and H. Akimoto, Improvement of the new NO detection method using laser induced two photon ionization with a mass spectrometer, *Environ. Sci. Technol*., 34, 4434-4438 (2000).

4. **Lee, S.-H.*,** D. C. Leard, R. Zhang, L. T. Molina, and M. J. Molina, The HCl + $ClONO_2$ reaction rate on various water ice surfaces, *Chem. Phys. Lett*., 315, 7-11 (1999).

3. **Lee, S.-H.*,** H. Akimoto, H. Nakane, S. Kurnosenko, and Y. Kinjo, Lower tropospheric ozone trend observed in 1989-1997, *Geophys. Res. Lett*., 25, 1637-1640 (1998).

2. **Lee, S.-H.*,** J. Hirokawa, Y. Kajii, and H. Akimoto, New method for measuring low NO concentrations using laser induced two photon ionization, *Rev. Sci. Instrum.,* 68, 2891-2897 (1997).

1. **Lee, S.-H.*,** and Y. Okawa, Changes of the $Pt_3Co(100)$ surface stoichiometry with NO adsorption, *Surf. Sci. Lett.,* 338, 833-838, 1995.

BOOK CHAPTER

P. Hamill, C. Brogniex, L. Thomason, T. Deshler, L. C. Antuna, D. Baumgardner, R. Bevilacqua, C. A. Brock, C. David, M. Fromm, D. Fussen, M. Hervig, C. A. Hostettler, **S.-H. Lee**, J. Mrenethaler, M. T. Osborn, G. B. Roga, J. M. Reeves, J. Rosen, J. C. Wilson, Chapter 3: Instrument Description, in *Stratospheric Processes and Their Role in Global Climate (SPARC)*, *A Project of WMO/ICSU/IOC World Climate Research Program: Assessment of Stratospheric Aerosol Properties (ASAP)*, Eds. L. Thomason, Th. Peter, SPARC Scientific Steering Group, February 2006.