

Curriculum Vitae

Jaron C. Hansen

*Chair and Professor
Department of Chemistry and Biochemistry
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- Education**
- B.S. Chemistry, 1997, Utah State University, Logan, Utah
 - Ph.D. Analytical Chemistry, May 2002, Purdue University, West Lafayette, Indiana
 - Postdoctoral Scholar, June 2002- July 2005, California Institute of Technology/Jet Propulsion Laboratory, Pasadena, California
- Awards**
- Karl G. Maeser Excellence in Teaching Award (BYU 2018)
 - Technology Transfer Award (BYU 2017)
 - Class of 1949 Young Faculty Award (BYU 2015)
 - Winner, Emerging Venture Competition, Energy Commercialization Center (2013)
 - Chosen as partner in US State Department sponsored EcoPartnership Program with China (2011)
 - Finalist, Clean Technology and Energy Category, Utah Innovation Awards (2010)
 - Runner Up, Concept to Company Competition, Grow Utah Ventures (2009)
 - Young Professional Best Paper Award, Air and Waste Management Association (2008)
 - Awarded Participation in Atmospheric Chemistry Colloquium for Emerging Senior Scientist (ACCESS VII) 2003
 - Marjorie H. Gardner Teaching Award, 1997
 - American Institute of Chemist Foundation Undergraduate Award, 1997
- Professional Experience**
- Department Chair Chemistry and Biochemistry**
Brigham Young University/Provo, UT July 2022-Present
- Professor of Chemistry and Biochemistry**
Brigham Young University/Provo, UT, Aug. 2016-Present
- Associate Professor of Chemistry and Biochemistry**
Brigham Young University/Provo, UT, Sept. 2011-July 2016
- Co-founder and Research Scientist**
Verde LLC, Springville, UT, Dec. 2017-Present
- Co-founder and Research Scientist**

Anaerobic Digestion Technologies, Springville, UT, Oct. 2009-2018

Assistant Professor of Chemistry and Biochemistry

Brigham Young University/Provo, UT, July 2005-Aug. 2011

Postdoctoral Scholar

California Institute of Technology/Jet Propulsion Laboratory, Pasadena, CA,

June 2002-July 2005

Modified an existing Resonance Fluorescence/Discharge Flow Mass Spectrometer.

Conducted experimental work probing a number of OH radical-molecule reactions.

Theoretical studies probing the thermodynamics and products of the experimental studies were performed. Theoretical studies were also performed on a number of novel radical-molecule complexes, and their atmospheric significance was investigated.

Designed a cooling and trapping system capable of trapping and purifying molecules with low freezing points.

Aided in the design and testing of a sensor for OCIO radical in a project sponsored by the US Government Technical Support Working Group. The sensor is designed to be used during the decontamination of an anthrax-contaminated area.

Graduate Research Assistant

Purdue University, West Lafayette, IN, Aug. 1997-May 2002

Constructed numerous analytical instruments including: Laser Induced Fluorescence, Chemiluminescence, and Relative Rate Laser Photolysis/FTIR. Conducted numerous experimental studies probing the kinetics and spectroscopy of important atmospheric radicals and molecules. Verified the experimental results with theoretical studies probing the thermo-chemical, kinetic and spectroscopic properties using *ab initio* calculations.

Visiting Graduate Research Assistant

Scientific Research Lab Ford Motor Company, Dearborn, MI, May-Aug. 1998

Conducted radical-molecule kinetics experiments utilizing Laser photolysis/UV-Time Resolved Spectroscopy as well as Laser Photolysis/IR (high resolution Pb-salt diode) experiments.

Visiting Graduate Research Assistant

University of Illinois Urbana/Champaign, Aug. 1997-May 1998

Conducted radical-molecule kinetic and product studies utilizing Resonance Fluorescence/Discharge Flow Mass Spectrometry.

Analytical Chemistry Internship

Morton International Safety Products, Ogden, UT, June-Oct. 1996

Utilized a variety of analytical techniques to probe potential new air bag propellants.

These include: Near Infrared Spectroscopy, Thermal Analytical Techniques, High Performance Liquid Chromatography, Ion Chromatography, X-Ray Fluorescence and Capillary Electrophoresis.

Teaching Experience**Full/Associate/Assistant Professor**

Brigham Young University, Provo, UT, July 2005-present

Courses included: Chemistry 105 (General Chemistry), Chemistry 111 (Honors General Chemistry), Chemistry 464 (Physical Chemistry Laboratory), Chemistry 569 (Graduate Level Atmospheric Chemistry), Chemistry 227 (Quantitative Analysis), Chemistry 729R (Graduate Level Environmental Chemistry), Chemistry 694 (Graduate Level Scientific Writing and Ethics)

Graduate Teaching Assistant

Purdue University, West Lafayette, IN, Aug. 1997-2002

Courses included: Chemistry 111 (General Chemistry), Chemistry 112 (General Chemistry), Chemistry 115 (General Chemistry), Chemistry 116 (General Chemistry), Chemistry 424 (Analytical Chemistry) and Chemistry 627 (Advanced Analytical Chemistry).

Course Supervisor

Purdue University, West Lafayette, IN, Jan.-May 2001

Responsibilities included: preparing exams and quizzes, developing grading cribs and supervising the activities of 25 graduate teaching assistants.

Teaching Assistant

Utah State University, Logan, UT, Sept. 1996-May 1997

Was a teaching assistant for general chemistry, organic chemistry, and physical chemistry.

Publications

1. Hansen, Jaron C.; Li, Yumin; Francisco, Joseph S.; Li, Zhuangjie, "On the Mechanism of the $\text{BrO} + \text{CH}_2\text{O}$ Reaction" *Journal of Physical Chemistry, A*, 1999, 103, 8543-8546.
2. Good, David A.; Hansen, Jaron; Francisco, Joseph S.; Li, Zhuangjie; Jeong, Gill-Ran, "Kinetics and Reaction Mechanism of Hydroxyl Radical Reaction with Methyl Formate," *Journal of Physical Chemistry, A*, 1999, 103, 10893-10898.
3. Hansen, Jaron C.; Li, Yumin; Li, Zhuangjie; Francisco, Joseph S., "On the Mechanism of the $\text{BrO} + \text{HBr}$ Reaction," *Chemical Physics Letters*, 1999, 314, 341-346.
4. Good, David A.; Hansen, Jaron; Kamboures, Mike; Santiono, Randy; Francisco, Joseph S., "An Experimental and Computational Study of the Kinetics and Mechanism of the Reaction of Methyl Formate with Cl Atoms," *Journal of Physical Chemistry, A*, 2000, 104, 1505-1511.
5. Li, Zhuangjie; Tao, Ahining; Naik, Vaishali; Good, David A.; Hansen, Jaron C.; Jeong, Gill-Ran; Francisco, Joseph S.; Atul K.; Wuebbles, Donald J., "Global Warming Potential Assessment for $\text{CF}_3\text{OCF}=\text{CF}_2$," *Journal of Geophysical Research*, 2000, 105, 4019-4029.
6. Hansen, Jaron C.; Li, Yumin; Francisco, Joseph S.; Szenté, Joseph J.; Maricq, M. Matti, "An Experimental and Computational Study of the Methyl Formate Radical Ultraviolet Spectrum," *Journal of Chemical Physics*, 2000, 113, 6465-6468.
7. Li, Z.; Jeong, G.-R.; Hansen, J.C.; Good, D.A.; Francisco, J.S., "Rate constant for the reactions of $\text{CF}_3\text{OCHFCF}_3$ with OH and Cl." *Chemical Physics Letters*, 2000, 320, 70-76.
8. Jain, Atul K.; Li, Zhuangjie; Naik, Vaishali; Wuebbles, Donald J.; Good, David A.; Hansen, Jaron C.; Francisco, Joseph S., "Evaluation of the Atmospheric Lifetime and Radiative Forcing on Climate for 1,2,2,2-Tetrafluoroethyl Trifluoromethyl Ether ($\text{CF}_3\text{CHFOCF}_3$)," *Journal of Geophysical*

Research, 2001, 106, 12615-12618.

9. Kamboures, Mike; Hansen, Jaron C.; Francisco, Joseph S., "A Study of the Kinetics and Mechanism Involved in the Atmospheric Degradation of Bromoform by Atomic Chlorine," *Chemical Physics Letters*, 2002, 353, 335-344.

10. Hansen, Jaron C.; Francisco, J.S.; Szente, Joseph J.; Maricq, M. Matti, "An Experimental Study of the Mechanism and Branching Ratio for the Reaction between Methyl Formate and Chlorine Atoms," *Chemical Physics Letters*, 2002, 365, 267-278.

11. Xu, Dadong; Huang, Jianhua; Francisco, Joseph S.; Hansen, Jaron C.; Jackson, William M., "Photodissociation of carbonic dibromide at 267nm: observation of three-body dissociation and molecular elimination of Br₂," *Journal of Chemical Physics*, 2002, 117, 7483-7490.

12. Hansen, Jaron C. and Francisco, Joseph S., "Radical-molecule complexes: changing our perspective on the molecular mechanisms of radical-molecule reactions and their impact on atmospheric chemistry," *ChemPhysChem*, 2002, 3, 833-840.

13. Hansen, Jaron C.; Li, Yumin; Rosado-Reyes, Claudette M.; Francisco, Joseph S.; Szente, Joseph J.; Maricq, M. Matti, "Theoretical and Experimental Investigation of the UV Cross Section and Kinetics of the Methyl Formate Peroxy Radical," *Journal of Physical Chemistry*, 2003, 107, 5306-5316.

14. Christensen, Lance E.; Okumura, Mitchio; Hansen, Jaron C.; Sander, Stanley P.; Francisco, Joseph S., "Experimental and ab Initio Study of the HO₂-CH₃OH Complex: Thermodynamics and Kinetics of Formation," *Journal of Physical Chemistry A*, 2006, 110, 6948-6959.

15. Hansen, Jaron C.; Flowers, Bradley A.; Stanton, John F., "Computational study of the vibrational and electronic spectroscopy of a HO₂-H₂O₂ complex," *Journal of Molecular Structure: THEOCHEM*, 2006, 768, 111-118.

16. Pope, Francis D.; Hansen, Jaron C.; Bayes, Kyle D.; Friedl, Randall R.; Sander, Stanley P., "Ultraviolet Absorption Spectrum of Chlorine Peroxide, ClOOCl," *Journal of Physical Chemistry A*, 2007, 111, 4322-4332.

17. Clark, Jared; English, Alecia M.; Francisco, Joseph S.; Hansen, Jaron C., "Computational Study of the Existence of Organic Peroxy Radical-Water Complexes (RO₂-H₂O)," *Journal of Physical Chemistry A*, 2008, 112, 1587-1595.

18. English, Alecia J.; Szente, Joseph J.; Maricq, Matti M.; Hansen, Jaron C., "The Effects of Water Vapor on the CH₃O₂ Self-Reaction and Reaction with HO₂," *Journal of Physical Chemistry A*, 2008, 112, 9220-9228.

19. Hansen, Jaron C.; Friedl, Randall R.; Sander, Stanley P., "Kinetics of the OH + ClOOCl and OH + Cl₂O Reactions: Experiment and Theory," *Journal of Physical Chemistry A*, 2008, 112, 9229-9237.

20. Hansen, Jaron C.; Woolwine III, Woods R.; Bates, Brittney L.; Clark, Jared M.; Kuprov, Roman Y.; Mukherjee, Puspak; Murray, Jacolin A.; Simmons, Michael A.; Waite, Mark F.; Eatough, Norman L.; Eatough, Delbert J.; Long, Russell; Grove, Brett D., "Semi-Continuous PM_{2.5} and PM₁₀ Mass and Composition Measurements in Lindon, Utah During Winter 2007," *Journal of the Air and Waste Management Association*, 2010, 60, 346-355.

21. Clark, Jared; Call, Seth T.; Austin, Daniel; Hansen, Jaron C., "Computational Study of Isoprene

Hydroxyalkyl Peroxy Radical-Water Complexes ($C_5H_8(OH)O_2 \cdot H_2O$)," *Journal of Physical Chemistry A*, 2010, 114, 6534-6541.

22. Hansen, Clifford W.; Hansen, Lee D.; Nicholson, Allen D.; Thomas, Nathan; Clark, Jared; Chilton, Marie C.; Hansen, Jaron C.; "Correction for Instrument Time Constant in Determination of Reaction Kinetics" *International Journal of Chemical Kinetics*, 2010, 43, 53-60.

23. Cline, Taylor; Thomas, Nathan; Shumway, Logan; Yeung, Irene; Hansen, Conly L.; Hansen, Lee D.; Hansen, Jaron C. "Method for Evaluating Anaerobic Digester Performance," *Bioresource Technology*, 2010, 101, 8623-8626.

24. Riffault, Veronique; Hansen, Jaron C.; Clark, Jared; Ravishankara, A.R.; Burkholder, James B. "Temperature-Dependent Rate Coefficients and Theoretical Calculations for the $OH + Cl_2O$ Reaction" *ChemPhysChem*, 2010, 11, 4060-4068.

25. Kuprov, Roman; Buck, David; Eatough, Delbert J.; Hansen, Jaron C.; "Design and Characterization of a Two-stage Human Subject Exposure Chamber," *Journal of the Air and Waste Management Association*, 2011, 61(8), 864-871.

26. Mayo, MacKenzie H.; Nicholson, Allen D.; Hansen, Lee D.; Hansen, Jaron C. "Chemical Treatment of Algae to Facilitate Biogas Production by Anaerobic Digestion," *American Society of Agricultural and Biological Engineers*, 2011, 54, 1547-1550.

27. Pope, Arden C. III; Hansen, Jaron C.; Kuprov, Roman; Sanders, Matthew D.; Anderson, Michael N.; Eatough, Delbert J. "Vascular Function and Short-Term Exposure to Fine Particulate Air Pollution", *Journal of the Air and Waste Management Association*, 2011, 61(8), 858-863.

28. Burrell, Emily; Clark, Jared M.; Snow, Mathew; Dumais, Heidi; Lee, Seong-Cheol; Nielson, Brad J.; Osborne, Derek; Cardona-Salamanca, Lucia; Zemp, Logan; DaBell, Ryan S.; Hansen, Jaron C. "Computational Study of Hexanal Peroxy Radical-Water Complexes" *International Journal of Quantum Chemistry*, 2011, 112, 1936-1944.

29. Clark, Jared; Kumbhani, Sambhav; Francisco, Joseph S.; Hansen, Jaron C. " HNO_3-NH_x , $H_2SO_4-NH_x$, $CH(O)OH-NH_x$, and $CH_3C(O)OH-NH_x$ complexes and their role in the formation of condensation nuclei", *The Journal of Chemical Physics*, 2011, 135, 244305.

30. Cropper, Paul M.; Hansen, Jaron C.; Eatough, Delbert J. "Measurement of Scattering in an Urban Area Using a Nephelometer and PM2.5 FDMS TEOM Monitor: Accounting for the Effect of Water", *Journal of the Air and Waste Management Association*, 2013, 63(9), 1004-1011

31. Kuprov, Roman; Eatough, Delbert J.; Cruickshank, Tyler; Olson, Neal; Cropper, Paul; Hansen, Jaron C. "Composition and Secondary Formation of Fine Particulate Material in the Salt Lake Valley: Winter 2009", *Journal of the Air and Waste Management Association*, 2014, 64(8), 957-969.

32. Khan, M.A.H.; Cooke, M.C.; Utembe, S.R.; Archibald, A.T.; Derwent, R.G.; Jenkin, M.E.; Morris, W.C.; South, N.; Hansen, J.C.; Francisco, J.S.; Percival, C.J.; Shallcross, D.E. "Global Analysis of Peroxy Radicals and Peroxy Radical-Water Complexation using STOCHEM-CRI Global Chemistry and Transport Model", *Atmospheric Environment*, 2015, 106, 278-287.

33. Kumbhani, Sambhav; Cline, Taylor S.; Killian, Marie C.; Clark, Jared; Hansen, Lee D.; Shirts,

Randall B.; Robichaud, David J.; Hansen, Jaron C. "Water Vapor Enhancement of Peroxy Radical Reactions", *International Journal of Chemical Kinetics*, 2015, 47(6), 395-409

34. Cropper, Paul; Goates, Steve R.; Hansen, Jaron C. "A Compact Gas Chromatograph and Pre-Column Concentration System for Enhanced In-field Separation of Levoglucosan and other Polar Organic Compounds", *Journal of Chromatography A*, 2015, 1417, 73-78

35. Kumbhani, Sambhav ; Cline, Taylor S.; Killian, Marie C.; Clark, Jared; Keeton, William; Hansen, Lee D.; Shirts, Randall B.; Robichaud, David J.; Hansen, Jaron C. "Response to the Comment on Paper" Water vapor Enhancement of Rates of Peroxy Radical Reactions", *International Journal of Chemical Kinetics*, 2015, 48(7), 399-401

36. Cropper, Paul M.; Cary, Robert; Eatough, Delbert; Hansen, Jaron C. "Development of the GC-MS Organic Aerosol Monitor (OAM) for In-field Detection of Particulate Organic Compounds", *Atmospheric Environment*, 2017, 169, 258-266

37. Cropper, Paul M.; Eatough, Delbert J.; Overson, Devon K.; Caka, Fern; Cary, Robert A.; Hansen, Jaron C. "Use of a GC-MS Organic Aerosol Monitor for In-Field Detection of Fine Particulate Organic Compounds in Source Apportionment", *Journal of the Air and Waste Management Association*, 2018, 68(5), 390-402

38. Shirts, Randall B.; Kumbhani, Sambhav R.; Burrell, Emily; Hansen, Jaron C. "An Improved Model to Calculate Equilibrium Constants for Formation of Peroxy Radical-Water Complexes", *Theoretical Chemistry Accounts*, 2018, 137:96

39. Kumar, Manoj; Burrell, Emily; Hansen, Jaron C.; Francisco, Joseph S. "Molecular Insights into Organic Particulate Formation", *Communications Chemistry*, 2019, 2, 87

40. Burrell, Emily; Kar, Tapas; Hansen, Jaron C. "Computational Study of the Thermodynamics of New Particle Formation Initiated by Complexes of $\text{H}_2\text{SO}_4\text{-H}_2\text{O-NH}_x$, $\text{CH}_3\text{SO}_3\text{H-H}_2\text{O-NH}_x$, and $\text{HO}_2\text{-H}_2\text{O-NH}_x$ ", *ACS Earth and Space Chemistry*, 2019, 3, 1415-1425

41. Cropper, Paul M.; Bhardwaj, Nitish; Overson, Devon K.; Hansen, Jaron C.; Eatough, Delbert J.; Cary, Robert A.; Kuprov, Roman; Baasandorj, Munkhbayer "Source Apportionment Analysis of Winter 2016 Neil Armstrong Academy Data (West Valley City, Utah)", *Atmospheric Environment*, 2019, 219, 116971

42. Eatough, Delbert, J.; Cropper, Paul; Burrell, Emily; Keeton, William; Hansen, Jaron C.; Farber, Robert; Zach, John; Cary, Robert A.; Hopke, Phillip K. "Apportionment of $\text{PM}_{2.5}$ Adjacent to the I-710 Harbor Freeway in Long Beach, CA", *Journal of the Air and Waste Management Association*, 2020, 70, 260-282

43. Bhardwaj, Nitish; Kelsch, Ariel; Eatough, Delbert J.; Thalman, Ryan; Daher, Nancy; Kelly, Kerry; Jaramillo, Cristina; Hansen, Jaron C. "Sources of Formaldehyde in Bountiful, Utah", *Atmosphere*, 2021, 12, 375-396

44. Hansen, Jaron C.; Aanderud, Zachary T.; Reid, Lindsey E.; Bateman, Carson; Hansen, Conly L.; Rogers, L. Scott; Hansen, Lee D. "Enhancing Waste Degradation and Biogas Production by Pre-digestion with a Hyperthermophilic Anaerobic Bacterium", *Biofuel Research Journal*, 2021, 31,1433-1443

45. Eatough, Delbert J.; Bhardwaj, Nitish; Cropper, Paul M.; Cary, Robert A.; Hansen, Jaron C. "Formation of Secondary Organic Material from Gaseous Precursors in Wood Smoke", *Journal of the Air and Waste Management Association*, 2022, 72:11, 1231-1240

46. Thalman, Ryan; Bhardwaj, Nitish; Flowerday, Callum; Hansen, Jaron C., "Detection of Sulfur Dioxide by Broadband Cavity-Enhanced Absorption Spectroscopy (BBCEAS)" *Sensors*, 2022, 22, 2626-2640

47. Bhardwaj, Nitish; Flowerday, Callum E.; Thalman, Ryan; Asplund, Matthew C.; Sevy, Eric T.; Hansen, Jaron C. "Absorption Cross-sections for the 5th and 6th Vibrational Overtones in a Series of Short Chained Alcohols Using Incoherent Broadband Cavity- Enhanced Absorption Spectroscopy (IBBCEAS), *Journal of Molecular Spectroscopy*, 2023, 392, 111746

48. Flowerday, Callum E.; Thalman, Ryan; Hansen, Jaron C. "20-Year Review of Outdoor Air Quality in Utah, USA", *Atmosphere*, 2023, 14, 1496

49. Flowerday, Callum; Thalman, Ryan; Hansen, Jaron C. "Local and Regional Contributions to Tropospheric Ozone Concentrations", *Atmosphere*, 2023, 14, 8, 1262

50. Flowerday, Callum E.; Lundrigan, Philip; Kitras, Christopher; Nguyen, Tu; Hansen, Jaron C. "Utilizing Low-Cost Sensors to Monitor Indoor Air Quality in Mongolian Gers", *Sensors*, 2023, 23, 7721

51. Flowerday, Callum E.; Thalman, Ryan; Asplund, Matthew C.; Hansen, Jaron C. "Broadband Cavity-Enhanced Absorption Spectroscopy (BBCEAS) Coupled with an Interferometer for On-Band and Off-Band Detection of Glyoxal", *Toxics*, 2024, 12, 26

52. Flowerday, Callum E.; Stanley, Rebekah S; Lawson, John R.; Snow, Gregory L.; Brewster, Kaitlyn; Goates, Steven R.; Paxton, Walter F.; Hansen, Jaron C. "A Ten-Year Historical Analysis of Urban PM10 and Exceedance Filters Along the Northern Wasatch Front, UT, USA", *Science of the Total Environment*, 2025, 959, 178202

53. Flowerday, Callum E.; Thalman, Ryan; Asplund, Matthew; Cook, Adam; Badstubner, Samuel; Lundrigan, Phillip; Hansen, Jaron C. "Open Path Spectroscopic Detection of Hydroxyl Radical: A Comparison Between Broadband Cavity-Enhanced Absorption Spectroscopy (BBCEAS) and BBCEAS coupled with a Fabry-Perot Interferometer (BBCEAS-FP)", *Analytical Chemistry*, 2025, 97, 11831-11838

54. Harper, Alexis P.; Flowerday, Callum E.; Giauque, Zachary; Brewster, Kaitlyn; Thalman, Ryan; Hansen, Jaron C. "High-purity nitrous acid (HONO) generation and quantification using broadband cavity-enhanced absorption spectroscopy (BBCEAS)", *Atmospheric Measurement Techniques*, 2025, 18, 7221-7230

55. Flowerday, Callum E.; Thalman, Ryan; Hansen, Jaron C. "Fabrication, Calibration, and Deployment of a Custom-Built Radiometer", 2026, In review

56. Flowerday, Callum E.; Hansen, Jaron C. "Peroxyacetyl Nitrate (PAN) in the Atmosphere: A Comprehensive Review of Chemistry, Measurements, and Chemical-Transport Implications", *RSC Environment Science: Atmospheres*, 2026, DOI: 10.1039/D6EA00017G

57. Flowerday, Callum E.; Thalman, Ryan; Sevy, Eric T.; Asplund, Matthew, C.; Sorensen, Jason J.; Hansen, Jaron C. "Refinement and Application of the Absorption Cross-Section of Molecular Bromine with Relevance to Atmospheric Chemistry", *ACS Environmental Au*, 2026, April 14, 2026 doi.org/10.1021/acsenvironau.6c00050

58. Chen, Jun Han; Riggs, Jonah; Maruri, Carmen N.; Sandall, Zane; Tracy, Christophere M.;

Hansen, Jaron C.; Harrison, Roger G. "Targeted Spatiotemporal of Per- and Polyfluoroalkyl Substances (PFAS) in the Utah Provo River and Reservoirs through High Resolution Mass Spectrometry, *Environmental Monitoring and Assessment*, 2026, in review

59. Flowerday, Callum E.; Sudweeks, Isaac; Snow, Gregory L.; Adams, Bradley; Hansen, Jaron C. "An Observational Framework for Constructing Ozone Isopleths from Long-Term Monitoring Data: Demonstration in Salt Lake City, Utah", 2026, In review

Patents

1. Hansen, J.C., Hansen, L.D. Method for Pretreatment of Cellulosic and Lignocellulosic Materials for Conversion into Bioenergy, Patent US8449773 (issued May 28, 2013)
2. Hansen, J.C., Hansen, L.D. Off Gas Purification, Patent US8414690 B2 (issued April 9, 2013)
3. Hansen, J.C., Hansen, L.D. Self-contained Portable System for Treatment of Human Waste and Energy Production, Patent, US8927265 B2 (issued Jan. 6, 2015)
4. Hansen, J.C., Cropper, Paul, Eatough, Delbert, Cary, Robert, Lin, Lin, Hansen, L.D. Autonomous Ambient Air Sampling System for Monitoring Semi-Volatile/Non-Volatile Organic Compounds, Patent US10775354 B2 (issued Sept. 15, 2020)
5. Hansen, J.C., Hansen, L.D., Aanderud, Z.T., Hansen, C.L. Conversion of Lignocellulosic Biomass into Biogas, Patent US11365433B2 (issued, June 21, 2022)
6. Hansen, C.L., Collins, L.A, Hansen, J.C. Induced Sludge Bed Anaerobic Reactor System, Patent US11802065 B2 (issued, Oct. 31, 2023)
7. Hansen, J.C., Hansen, L.D, Aanderud, Z.T., Hansen, L.L, Hansen, C.L. Anaerobic Reactor System, patent filed Sept. 21, 2023
8. Hansen, J.C., Hansen, L.D, Aanderud, Z.T., Hansen, L.L, Hansen, C.L. Conversion of Feedstocks into Biogas, Continuation-in-part of Patent US11365433B2 (filed Nov. 23, 2024)
9. Hansen, J.C., Hansen, L.D, Aanderud, Z.T., Hansen, L.L, Hansen, C.L. Optimized Lignocellulosic Feedstock Digestion, patent filed Dec. 17, 2024
10. Hansen, J.C., Thalman, Ryan, Flowerday, Callum Fabrication of a Custom-Built Radiometer, patent filed March 6, 2026

Recent Funding

1. T.R.A.C. Air: Traffic-camera Real-time Analysis for Clean Air, IDR Special Topic: Environmental Stewardship Research Award, BYU, \$10,000, Sept. 1, 2025-Sept. 30, 2026
2. Unmasking the Hazards of Great Salt Lake Dust: Source Attribution, Toxicology, and Contaminant Analysis, Wasatch Front Water Quality Council, \$10,000, Aug 1, 2025-July 1, 2026
3. Collaborative Research: Verification of Atmospheric Mercury Redox Rates, NSF, \$178,063, Sept. 1, 2023-Aug. 31, 2026
4. Biological Pretreatment of Waste Biomass for Increased Renewable Energy Production (II), Aqua Environmental Services, \$20,005, Jan. 1, 2023-June 30, 2024
5. Biological Pretreatment of Waste Biomass for Increased Renewable Energy Production (I), Aqua

Environmental Services, \$19,957, Dec. 31, 2021-July 1, 2023

6. Ambient Level OH Radical Detection Using Broadband Cavity Enhanced Absorption Spectroscopy (BBCEAS) with a Fabry-Perot Etalon in an Open Path Configuration, Woolley Innovation in Research Award (BYU), \$38,326, June 15, 2021
7. Ambient Level OH Radical Detection Using Broadband Cavity Enhanced Absorption Spectroscopy (BBCEAS) in an Open-Path Configuration, NSF, \$398,641, July 1, 2021-June 30, 2024
8. Thermophilic Bacterial Pretreatment of Lignocellulosic and Wet Waste for Increased Biogas Production, Aqua Environmental Services, \$29,475, Nov. 2019-May 2021
9. Biological Pretreatment of Biomass for Enhanced Biogas Production, Verde LLC., \$102,000, June 2017-May 2021
10. Wasatch Front Ammonia and Chloride Observations (WaFACOs), State of Utah, \$10,000, Sept. 2018-Dec. 2019
11. Bountiful City Dichloromethane and Source Apportionment Study, State of Utah, \$38,809, Sept. 2018-April 2020
12. GC-MS Organic Aerosol Monitor: Air Quality Impacts of the Oil and Gas Industry, In-field Testing, and Software Development, Energy Research Triangle, State of Utah, \$125,000, June 2017-May 2018
13. West Valley High Time Resolution Air Toxics Monitoring Campaign, EPA, \$355,000, Oct. 2015-Sept. 2017
14. Sustainable Bioenergy from Produced Water, Energy Research Triangle, State of Utah, \$125,000, Sept. 2015-Aug. 2016
15. Gas Absorber Characterization, Maxim Integrated, \$15,000, Nov. 2014-June 2015
16. The Role of Radical-Water Complexes in the Atmosphere, National Science Foundation, \$547,782, Aug. 2013-Aug. 2016
17. A Semi-Continuous Monitor for the 1-hr Determination of Organic Matter Compounds, Sunset Laboratories, \$63,556, Sept. 2013-Sept. 2015
18. Adapting the SAPRC Chemistry Mechanism for Low Temperature Conditions, Utah Department of Air Quality, \$25,000, July 2014-June 2015
19. Identification of Sources of PM_{2.5} in the Los Angeles Basin Using Semi-Continuous Monitoring, Southern California Edison, \$59,949, Aug. 2012-Sep. 2013
20. CRIF:MU – Tunable UV-Vis and IR Laser System for Spectroscopy and Chemical Dynamics Research, National Science Foundation, \$250,000, Sept. 2009-Aug. 2012
21. Kinetics of Atmospherically Important Radical-Molecule Complexes, National Science Foundation, \$260,000, Oct. 2009-Sept 2012
22. A Quantitative Assessment of Mercury Influx to the Great Salt Lake, US-EPA, \$200,000, April 2010-March 2012

23. Identification of Sources of PM_{2.5} in Utah County, Utah Using Semi-Continuous Monitoring, Southern California Edison, \$20,000, Nov. 2011-Sept. 2012
24. Semi-continuous monitoring and the source apportionment of PM_{2.5} mass and its components, Southern California Edison, \$25,000, Nov. 2009-Aug. 2010
25. Water Vapor Dependence on the Kinetics of the HO₂ + CH₃O₂ and CH₃O₂ + CH₃O₂ Reactions and K_p Determination for the CH₃O₂-H₂O Complex, National Science Foundation, \$249,000, Jan. 2006-Dec. 2009
26. Air Quality Sampling Campaign in the Salt Lake Valley: Winter 2009, Utah Department of Air Quality, \$23,439, Jan. 2009-March 2009
27. Rate Enhanced Decomposition and Disinfection of Human Waste, Field Sanitation, \$68,000, Sept. 2007-March 2008