

Ryan D. Davis

Trinity University • Department of Chemistry
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Professional Appointments

- Trinity University** • San Antonio, Texas
Assistant Professor, Department of Chemistry 2018-present
- Lawrence Berkeley National Laboratory** • Berkeley, California
Postdoctoral Fellow, Chemical Sciences Division 2016-2018
Host: Dr. Kevin R. Wilson

Education

- University of Colorado - Boulder** • Boulder, Colorado
Ph.D. in Analytical and Environmental Chemistry 2016
[Thesis](#): Phase Transformations of Optically Levitated Microparticles of Atmospheric Relevance
Research advisor: Prof. Margaret A. Tolbert
- University of California - San Diego** • La Jolla, California
M.S. in Physical Chemistry 2010
Project: Isotopic Fractionation Processes Relevant to the Atmosphere and Solar Nebula
Research advisor: Prof. Mark H. Thiemens
- Colorado State University** • Ft. Collins, Colorado
B.S. in Chemistry, ACS Certified 2008
Honors thesis project: Design and Characterization of Polymer-Encapsulated Reverse Micelles
Research advisor: Prof. Nancy E. Levinger

Publications

External lists: [Google Scholar profile](#), [ORCID profile](#) (ID 0000-0002-4434-1320)

Works in progress

[11] Richards DS*, Trobaugh KL*, Hajek-Herrera J*, **Davis RD**[†] (2019) Dual-Balance Electrodynamic Trap as a Micro-Analytical Tool for Identifying Gel Transitions and Viscous Properties of Levitated Aerosol Particles. *In review* – manuscript available upon request.

*Peer-Reviewed Articles: (*Trinity student, †RDD corresponding author)*

- [10] Jacobs MI, **Davis RD**, Rapf RJ, Wilson KR (2018) Studying Chemistry in Micro-Compartments by Separating Droplet Generation from Ionization. *Journal of the American Society of Mass Spectrometry*. DOI: [10.1007/s13361-018-2091-y](https://doi.org/10.1007/s13361-018-2091-y).
- [9] Ushijima SB, **Davis RD**, Tolbert MA (2018) Immersion and Contact Efflorescence Induced by Mineral Dust Particles. *The Journal of Physical Chemistry A*. DOI: [10.1021/acs.jpca.7b12075](https://doi.org/10.1021/acs.jpca.7b12075).
- [8] **Davis RD**, Jacobs MI, Houle FA, Wilson KR (2017) Colliding-droplet microreactor: rapid on-demand inertial mixing and metal-catalyzed aqueous-phase oxidation processes. *Analytical Chemistry* 89(22): 12494-12501. DOI: [10.1021/acs.analchem.7b03601](https://doi.org/10.1021/acs.analchem.7b03601).
Highlighted in *Chemical and Engineering News*, 95(46): 16-18 (Nov. 20, 2017 issue).

[7] Jacobs MI, Davies JF, Lee L, **Davis RD**, Houle FA, Wilson KR (2017) Exploring chemistry in microcompartments using guided droplet collisions in a branched quadrupole trap coupled to a single droplet, paper spray mass spectrometer. *Analytical Chemistry* 89(22): 12511-12519. DOI: [10.1021/acs.analchem.7b03704](https://doi.org/10.1021/acs.analchem.7b03704).

Highlighted in *Chemical and Engineering News*, 95(46): 16-18 (Nov. 20, 2017 issue).

[6] **Davis RD**, Tolbert MA (2017) Crystal nucleation initiated by transient ion-surface interactions at aerosol interfaces. *Science Advances* 3(7):e1700425, DOI: 10.1126/sciadv. 1700425, advances.sciencemag.org/content/3/7/e1700425.

[5] **Davis RD**, Lance S, Gordon JA, Ushijima SB, Tolbert MA (2015) Contact efflorescence as a pathway for crystallization of atmospherically relevant particles. *Proceedings of the National Academy of Science* 112(52):15815-15820, DOI: [10.1073/pnas.1522860113](https://doi.org/10.1073/pnas.1522860113).

[4] **Davis RD**, Lance S, Gordon JA, Tolbert MA (2015) Long working-distance optical trap for in situ analysis of contact-induced phase transformations. *Analytical Chemistry* 87:6186-6194, DOI: [10.1021/acs.analchem.5b00809](https://doi.org/10.1021/acs.analchem.5b00809).

[3] Nuding DL, **Davis RD**, Gough RV, Tolbert MA (2015) The aqueous stability of a Mars salt analog: Instant Mars. *Journal of Geophysical Research - Planets* 120:588-598, DOI: [10.1002/2014JE004722](https://doi.org/10.1002/2014JE004722).

[2] Nuding DL, Rivera-Valentin EG, **Davis RD**, Gough RV, Chevrier VF, Tolbert MA (2014) Deliquescence and efflorescence of Ca(ClO₄)₂: An investigation of stable aqueous solutions relevant to Mars. *Icarus* 243:420-428, DOI: [10.1016/j.icarus.2014.08.036](https://doi.org/10.1016/j.icarus.2014.08.036).

[1] Chakraborty S, **Davis RD**, Ahmed M, Jackson TL, Thiemens MH (2012) Oxygen isotope fractionation in the vacuum ultraviolet photodissociation of carbon monoxide: Wavelength, pressure and temperature dependency. *The Journal of Chemical Physics* 137:024309, DOI: [10.1063/1.4730911](https://doi.org/10.1063/1.4730911).

Honors and Awards

CIRES Graduate Student Fellowship (proposal based)	2016
Project title: "Laboratory studies of contact efflorescence"	
Best Paper Award, Analytical/Environmental Chemistry Division, University of Colorado	2016
Awarded for publication in <i>Proc. Natl. Acad. Sci.</i> (10.1073/pnas.1522860113)	
NASA Earth and Space Science Fellowship (proposal based)	2013-2016
Project title: "Amorphous phase states of atmospheric particles studied in an optical trap: implications for global climate and air quality"	
Undergraduate Research Institute Award	2007
Hach Memorial Scholarship, Colorado State University	2005-2008

Funding

Funded

NSF, "Collaborative Research: Exploring the role of organics in atmospheric contact nucleation" (\$127,533), PI: Ryan Davis (Trinity site), Collaborator: Margaret Tolbert, University of Colorado. August 15, 2019 – July 31, 2022, AGS-1925208.

Under Consideration

ACS Petroleum Research Fund New Investigator Award, "Interfacial Reactivity of Micro-Compartmentalized Petroleum Byproducts and Petrochemically-Derived Organics in the Presence of Reactive Oxygen Species" (\$55,000 requested), PI: Ryan Davis.

National Conference Presentations

As presenting author: Trinity-affiliated work (indicates Trinity student coauthor)*

Davis RD, Richards DS*, Trobaugh KL*. Exploring Gelation in Model Marine Aerosol Particles: Micro-Rheological Observations of Ternary Water-Monosaccharide-Calcium Ion Microdroplets. (oral). American Association for Aerosol Research annual meeting, Portland, OR, October 15, 2019.

Davis RD, Richards DS*, Trobaugh KL*. Gel formation from low molecular-mass organic gelators in model marine aerosols: Synergistic role of water, organic, and inorganic components (oral). American Chemical Society National Meeting, San Diego, CA, August 28, 2019.

Davis Research Group student as presenting author (indicates Trinity student)*

Richards DS*, Trobaugh KL*, **Davis RD**. Probing the rheology of model sea spray aerosol particles using a dual-balance linear quadrupole trap as a micro-analytical tool (poster). American Chemical Society National Meeting, San Diego, CA, August 26, 2019.

As presenting author: Pre-Trinity

Davis RD, Wilson KR. Metal-catalyzed aqueous oxidation processes in merged microdroplets (oral). American Geophysical Union Fall Meeting, New Orleans, LA, Dec 15, 2017.

Davis RD, Tolbert MA. Imaging the effects of transient aerosol interfaces (oral). Pacific Conference on Spectroscopy and Dynamics, Asilomar, CA, January 21, 2017.

Davis RD, Tolbert MA. The influence of interfacial composition of mixed organic-inorganic microparticles (oral). Toward a Molecular Level Understanding of Atmospheric Aerosols Conference, Santa Cruz, CA, August 31, 2016.

Davis RD, Tolbert MA. Contact efflorescence: early results and future directions (poster). Toward a Molecular Level Understanding of Atmospheric Aerosols Conference, Santa Cruz, CA, August 31, 2016.

Davis RD, Tolbert MA. Contact-induced efflorescence of amorphous inorganic microparticles (oral). American Chemical Society National Meeting, Denver, CO, March 22, 2015.

Davis RD, Lance S, Gordon JA, Tolbert MA. Contact efflorescence on-demand: a new approach to studying contact nucleation (poster). American Geophysical Union Fall Meeting, San Francisco, CA, Dec 15, 2014.

Davis RD, Kremer J, Elliot CM, Levinger NE. Nanopools in polymer films (poster). Gordon Research Conference, Chemistry and Physics of Liquids, Holderness, NH, July 31, 2007.

As abstract coauthor

Tolbert MA, **Davis RD**, Ushijima S. Going through a phase: Particulate water in atmospheric aerosol. American Chemical Society National Meeting, San Diego, CA, August 28, 2019.

Jacobs MI, Davies JF, **Davis RD**, Lee L, Houle FA, Wilson KR. Understanding the Role of the Interface in Enhancing Reaction Rates in Microdroplets. 10th International Aerosol Conference, St. Louis, MO, Sep 2-7, 2018.

Jacobs MI, Davies JF, **Davis RD**, Lee L, Houle FA, Wilson KR. Understanding the Role of the Interface in Enhancing Reaction Rates in Microdroplets. Gordon Research Seminar, Molecular Interactions and Dynamics, Stonehill College, Easton, MA, July 7, 2018.

Ushijima S, **Davis RD**, Lance S, Gordon J, Tolbert MA. Heterogeneous efflorescence of atmospherically relevant salts by mineral dust particles. Abstracts of Papers of the American Chemical Society, 251, 2016.

Chakraborty S, **Davis RD**, Ahmed M, Jackson TL, Thiemens MH. Anomalous Isotope Effect in VUV Photodissociation of Hydrogen Sulfide: Implications for Chondrite and Chondrule Isotopic Data. Lunar and Planetary Science Conference 42, 2011.

Chakraborty S, **Davis RD**, Ahmed M, Jackson TL, Thiemens MH. Temperature and Wavelength Dependent Oxygen Isotopic Fractionation in the VUV Photodissociation of CO: Implications for the Solar Nebula. Lunar and Planetary Science Conference 42, 2011.

Chakraborty S, **Davis RD**, Ahmed M, Jackson TL, Thiemens MH. Oxygen Isotope Effect Dominated by VUV Photodissociation Dynamics of CO: Implications for Nebular CO Photolysis. Meteoritics and Planetary Science Conference, 2011.

Chakraborty S, **Davis RD**, Ahmed M, Jackson TL, Thiemens MH. Wavelength Dependent Oxygen Isotopic Fractionation in the VUV Photodissociation of CO: An Early Solar System Perspective. Lunar and Planetary Science Conference 41, 2010.

Levinger NE, Swafford LA, Bullock GR, **Davis RD**. Exploring the water pool of reverse micelles using fluorescent optical probes. Abstracts of Papers of the American Chemical Society, 235, 2008.

Teaching (as assistant professor)

Trinity University

Fall 2019	Analytical Chemistry Lecture and Lab CHEM-3432-1 (4 credits) – 7 students Analytical Chemistry Lecture and Lab CHEM-3432-2 (4 credits) – 7 students Independent Research CHEM-3190 – 4 students
Spring 2019	General Chemistry Laboratory CHEM 1118 (1 credit) – 34 students Advanced Analytical Techniques CHEM 4242 (2 credits) – 9 students Independent Research CHEM-3190 – 2 students
Fall 2018	Analytical Chemistry Lecture and Lab CHEM-3432-1 (4 credits) – 10 students Analytical Chemistry Lecture and Lab CHEM-3432-2 (4 credits) – 9 students Independent Research CHEM-3190 – 1 student

Guest Lectures

Physical Chemistry I, Trinity University, one lecture, Fall 2018

Service

Service to the Profession

Manuscript reviewer for: *Aerosol Science and Technology* (1), *Analytica Chimica Acta* (3), *Applied Science* (1), *Atmosphere* (1), *Atmospheric Chemistry and Physics* (1), *Crystals* (4), *Environmental Science: Processes and Impacts* (1), *The Journal of Physical Chemistry A/B/C* (4), *Physical Chemistry Chemical Physics* (6), *Physical Review E/X* (2).

- Reviewer profile (valid for reviews 2018 – present): publons.com/a/1548085
- Total manuscripts reviewed: 24

Grant reviewer for: NSF, Chemistry Division

Service to the Department and University

- Maintenance and repair of various instrumentation used for teaching laboratories (2018 – present).
- Instrumentation inventory for the chemistry department (2019 – present).
- Chem Club faculty advisor (2019 – present).
- Diversity and Inclusion Committee (2019 – present).

Service to the Public (Public Outreach and Broader Impact Activities)

For additional details on some of my outreach activities, see sites.trinity.edu/davis-lab/outreach.

- Visited local Colorado schools to present chemistry-related activities to local Colorado elementary and pre-kindergarten schools (2014 – 2016).
- Designed and presented a portable optical bench for hands-on optics activities for students at local Colorado schools (2014 – 2016).
- Designed and presented activities to demonstrate important weather-related phenomena to young students at Colorado schools (2014 – 2016).
- Coauthored proposals to obtain seed funding for developing safer treatments for pediatric epilepsy (2013).

Student Research Mentoring as PI

Erik Huyhn '22 (2019 – present)

Eric Grace '20 (2019 – present)

Josefina Hajek-Herrera '22 (2019 – present)

Kristin Trobaugh '20 (2019 – present)

David Richards '20 (2018 – present)

Workshops and Other Education/Training

Cottrell Scholars Collaborative / American Chemical Society New Faculty Workshop, August 2-4, 2018, Washington DC.

Professional Affiliations

American Chemical Society (ACS)

American Geophysical Union (AGU)

American Association for Aerosol Research (AAAR)