



Ronald Hanson

Clarence J. and Patricia R. Woodard Professor of Mechanical Engineering

CONTACT INFORMATION

- **Administrative Contact**

Mary Hanrahan - Thermosciences Group Administrator

Email frog@stanford.edu

Tel (650) 725-2012

Bio

BIO

Professor Hanson has been an international leader in the development of laser-based diagnostic methods for combustion and propulsion, and in the development of modern shock tube methods for accurate determination of chemical reaction rate parameters needed for modeling combustion and propulsion systems. He and his students have made several pioneering contributions that have impacted the pace of propulsion research and development worldwide. During his career at Stanford, Professor Hanson has successfully managed over 100 research contracts and grants, with a total value well over \$50 million. He and his students have authored over 1300 publications.

Professor Hanson is a fellow of American Society of Mechanical Engineers, American Institute of Aeronautics and Astronautics, and the Optical Society of America. He has received the Egerton Gold Medal and is an Inaugural Fellow of the Combustion Institute, and has been elected to the National Academy of Engineering. He is also an Inaugural Distinguished Fellow of the International Shock Wave Institute and the winner of the R. Soloukhin Medal from the Institute for Dynamics of Explosions and Reactive Systems. He is, perhaps, most happy about the recognition that his students have received for their publications, including Best Paper Awards from the AIAA Ground Test Conference, AIAA Propellant and Combustion Section, and the Combustion Institute Silver Medal.

Professor Hanson has graduated over 115 Ph.D. candidates and supervised over 20 postdoctoral scholars and research associates. Thirty-four of his students have gone on to become professors including: Varghese (University of Texas at Austin), Louge (Cornell University), Kirby (Cornell University), Wooldridge (University of Michigan), Mertens (Trinity College), Song (Yonsei University), Rossmann (Lafayette College), Sanders (University of Wisconsin-Madison), Ben-Yakar (University of Texas at Austin), Webber (University of Texas at Austin), Oehlschlaeger (Rensselaer Polytechnic Institute), Ma (University of Virginia), Koch (Trine University), Lee (University of Illinois Urbana-Champaign), Rothamer (University of Wisconsin-Madison), Petersen (Texas A&M), Seitzman (Georgia Tech), Linne (University of Edinburgh), Yoo (SUNY Buffalo), Porter (Colorado School of Mines), Liu (University of Washington), Vasu (University of Central Florida), Ren (Chinese University of Hong Kong), Rieker (University of Colorado Boulder), Farooq (KAUST), Goldenstein (Purdue University), Spearrin (University of California at Los Angeles), Sun (Tongji University), Chao (Tsinghua University), Wang (Peking University), and Shao (Beijing Institute of Technology). He is currently supervising approximately 20 M.S. and Ph.D. graduate students.

ACADEMIC APPOINTMENTS

- Professor, Mechanical Engineering
- Affiliate, Precourt Institute for Energy

HONORS AND AWARDS

- Inaugural Distinguished Fellow, International Shock Wave Institute (2021)
- 100th Beacon Distinguished Lecture, Tsinghua University (2020)
- Distinguished Lecture Award, Pratt and Whitney (2019)
- Inaugural Fellow, The Combustion Institute (2018)
- Energy Systems Award, American Institute of Aeronautics and Astronautics (2016)
- Hue-Shen Tsien Professorship, China Academy of Science, Inst. of Mechanics (2016)
- David Goodwin Memorial Lecture, California Institute of Technology (2015)
- Milton Van Dyke Award, American Physical Society (2015)
- Honorary Professorship, Northwestern Polytechnic University, China (2014)
- Honorary Professorship, Xi'an Jiaotong University, China (2014)
- Arch T. Colwell Award, Society of Automotive Engineers (2013)
- Outstanding Paper of 2013, Journal of Measurement, Science and Technology (2013)
- Most-cited Paper Award, Combustion and Flame (2012)
- Top 20 Most Published Author (Past 50 years), Applied Optics (2012)
- Best Paper in Propellants and Combustion, American Institute of Aeronautics and Astronautics (2011)
- Crocco Lecture, Princeton (2011)
- Fowler Lecture, Texas A&M (2011)
- R.I. Soloukhin Award, Institute for the Dynamics of Explosions and Reactive Systems (2011)
- A. Hottel Memorial Lecture, 33rd International Combustion Symposium (2010)
- Senior Scientist Award, Alexander von Humboldt Foundation (2010)
- Alfred Egerton Gold Medal of the Combustion Institute, Combustion Institute (2008)
- Propellants and Combustion Award, American Institute of Aeronautics and Astronautics (2005)
- Fellow, American Society of Mechanical Engineers (2004)
- Elected to National Academy of Engineering, National Academy of Engineering (2002)
- Silver Medal, Combustion Institute (2002)
- Best Paper of 2000, Journal of Measurement Science and Technology (2000)
- Best Paper Award, Ground Test Conference (AIAA) (1997)
- Fellow, American Institute of Aeronautics and Astronautics (1997)
- Aerodynamic Measurement Technology Award, American Institute of Aeronautics and Astronautics (1996)
- Clarence and Patricia Woodard Professor of Mechanical Engineering, Stanford University (1994)
- Fellow, Optical Society of America (1990)

BOARDS, ADVISORY COMMITTEES, PROFESSIONAL ORGANIZATIONS

- Inaugural Fellow, The Combustion Institute (2018 - present)
- Fellow, American Society of Mechanical Engineers (2004 - present)

- Elected Member, National Academy of Engineering (2002 - present)
- Fellow, American Institute of Aeronautics and Astronautics (1997 - present)
- Fellow, Optical Society of America (1990 - present)

PROFESSIONAL EDUCATION

- M.Sc., Arizona State University , Mechanical Engineering (1965)
- B.S., Oregon State University , Mechanical Engineering (1961)
- Ph.D., Stanford University , Aeronautics and Astronautics (1968)

LINKS

- <http://hanson.stanford.edu/>; <http://hanson.stanford.edu/>

Research & Scholarship

CURRENT RESEARCH AND SCHOLARLY INTERESTS

Professor Hanson has been an international leader in the development of laser-based diagnostic methods for combustion and propulsion, and in the development of modern shock tube methods for accurate determination of chemical reaction rate parameters needed for modeling combustion and propulsion systems. He and his students have made several pioneering contributions that have impacted the pace of propulsion research and development worldwide. During his career at Stanford, Professor Hanson has successfully managed over 100 research contracts and grants, with a total value well over \$50 million. He and his students have authored over 1200 publications.

Teaching

COURSES

2022-23

- Nonequilibrium Processes in High-Temperature Gases: ME 362B (Win)
- Optical Diagnostics and Spectroscopy Laboratory: ME 367 (Spr)
- Thermofluids, Energy, and Propulsion Research Seminar: ME 390A (Aut)

2021-22

- Optical Diagnostics and Spectroscopy: ME 364 (Win)
- Optical Diagnostics and Spectroscopy Laboratory: ME 367 (Spr)

2020-21

- Nonequilibrium Processes in High-Temperature Gases: ME 362B (Win)

2019-20

- Optical Diagnostics and Spectroscopy: ME 364 (Win)

STANFORD ADVISEES

Doctoral Dissertation Reader (AC)

Jessica Sniatowsky, Yue Zhang

Postdoctoral Faculty Sponsor

Miguel Figueroa Labastida, Chuyu Wei

Doctoral Dissertation Advisor (AC)

Vivek Boddapati Venkata, Efaine Chang, Sean Clees, Peter Finch, Ajay Krish, Navneeth Krishna M, Alka Panda, Joana Santos, Tal Schwartz, Wey-Wey Su, Josh Vandervort, Luke Zaczek

Master's Program Advisor

Yutian Cai, Blair Huang, Aditi Marathe, Anwar Mhish, Subhechchha Paul, Samantha Wu

Doctoral (Program)

Pujan Biswas, Gibson Clark, Zev Granowitz, Andrew Klingberg, Taylor Rault, Jesse Rodriguez, Alexis Thoeny, Jackie Zheng

Publications

PUBLICATIONS

- **Multiwavelength Speciation in Pyrolysis of n-Pentane and Experimental Determination of the Rate Coefficient of $nC_5H_{12} = nC_3H_7 + C_2H_5$ in a Shock Tube.** *The journal of physical chemistry. A*
Biswas, P., Choudhary, R., Hanson, R. K.
2023
- **Shock-Tube Measurements of Atomic Nitrogen Collisional Excitation in 8000-12000 K Partially Ionized Nitrogen-Argon Mixtures.** *The journal of physical chemistry. A*
Finch, P. M., Granowitz, Z. N., Streicher, J. W., Krish, A., Strand, C. L., Hanson, R. K.
2023
- **Measurements of T5 Shock Tunnel Freestream Temperature, Velocity, and Composition** *AIAA JOURNAL*
Finch, P. M., Girard, J. J., Schwartz, T., Strand, C. L., Hanson, R. K., Yu, W. M., Austin, J. M., Hornung, H. G.
2023
- **Application of Reflected Shock Wave Configuration to Validate Nonequilibrium Models of Reacting Air** *JOURNAL OF THERMOPHYSICS AND HEAT TRANSFER*
Gimelshein, S. F., Streicher, J. W., Krish, A., Hanson, R. K., Wysong, I. J.
2022
- **Logistic-Regression-Based Meta-Analysis of Factors Affecting Flame Stability in a Shock Tube** *COMBUSTION SCIENCE AND TECHNOLOGY*
Susa, A. J., Ferris, A. M., Zheng, L., Hanson, R. K.
2022
- **High-temperature vibrational relaxation and decomposition of shock-heated nitric oxide. I. Argon dilution from 2200 to 8700 K** *PHYSICS OF FLUIDS*
Streicher, J. W., Krish, A., Hanson, R. K.
2022; 34 (11)
- **Line mixing study of carbon monoxide near 4.7 μ m broadened by nitrogen, helium, and hydrogen** *JOURNAL OF MOLECULAR SPECTROSCOPY*
Su, W., Ding, Y., Strand, C. L., Hanson, R. K.
2022; 390
- **A mid-IR laser absorption diagnostic for measuring formaldehyde at high pressures and its demonstration in shock tubes** *COMBUSTION AND FLAME*
Biswas, P., Choudhary, R., Panda, A., Davidson, D. F., Hanson, R. K.
2022; 245
- **High-temperature vibrational relaxation and decomposition of shock-heated nitric oxide: II. Nitrogen dilution from 1900 to 8200 K** *PHYSICS OF FLUIDS*
Streicher, J. W., Krish, A., Hanson, R. K.
2022; 34 (11)
- **Shock Tube/Laser Absorption Measurements of Cyclopentadiene Pyrolysis.** *The journal of physical chemistry. A*
Johnson, S. E., Davidson, D. F., Hanson, R. K.
2022
- **Collisional broadening and pressure shift of the potassium resonance doublets by nitrogen, helium, and hydrogen at high temperatures** *JOURNAL OF QUANTITATIVE SPECTROSCOPY & RADIATIVE TRANSFER*
Ding, Y., Vandervort, J. A., Freedman, R. S., Strand, C. L., Marley, M. S., Hanson, R. K.

2022; 283

- **Methodology of designing compact schlieren systems using off-axis parabolic mirrors** *APPLIED OPTICS*
Zheng, L., Susa, A. J., Hanson, R. K.
2022; 61 (16): 4857-4864
- **Spectrally-resolved ultraviolet absorption measurements of shock-heated NO from 2000 K to 6000 K for the development of a two-color rotational temperature diagnostic** *JOURNAL OF QUANTITATIVE SPECTROSCOPY & RADIATIVE TRANSFER*
Krish, A., Streicher, J. W., Hanson, R. K.
2022; 280
- **Shock tube/laser absorption measurements of the isomerization rates of allene and propyne** *COMBUSTION AND FLAME*
Johnson, S. E., Ding, Y., Davidson, D. F., Hanson, R. K.
2022; 238
- **Distortion of expanding n-heptane flames at high unburned-gas temperatures behind reflected shocks** *COMBUSTION AND FLAME*
Susa, A. J., Hanson, R. K.
2022; 237
- **Investigating Arcjet Mixing and Enthalpy Loss Using Atomic Oxygen Laser Absorption Spectroscopy** *AIAA JOURNAL*
Salazar, D., Strand, C. L., Hanson, R. K., MacDonald, M. E.
2022; 60 (2): 976-984
- **Line mixing study on the fundamental rovibrational band of nitric oxide near 5.3 μm** *JOURNAL OF QUANTITATIVE SPECTROSCOPY & RADIATIVE TRANSFER*
Su, W., Boulet, C., Almodovar, C. A., Ding, Y., Strand, C. L., Hanson, R. K.
2022; 278
- **Flame image velocimetry: seedless characterization of post-reflected-shock velocities in a shock-tube** *EXPERIMENTS IN FLUIDS*
Susa, A. J., Hanson, R. K.
2022; 63 (1)
- **Measurements of Reflected Shock Tunnel Freestream Nitric Oxide Temperatures and Partial Pressure** *AIAA JOURNAL*
Girard, J. J., Finch, P. M., Strand, C. L., Hanson, R. K., Yu, W. M., Austin, J. M., Hornung, H. G.
2021; 59 (12): 5266-5275
- **Thermometry and speciation for high-temperature and -pressure methane pyrolysis using shock tubes and dual-comb spectroscopy** *MEASUREMENT SCIENCE AND TECHNOLOGY*
Pinkowski, N. H., Biswas, P., Shao, J., Strand, C. L., Hanson, R. K.
2021; 32 (12)
- **Line mixing in the nitric oxide R-branch near 5.2 μm at high pressures and temperatures: Measurements and empirical modeling using energy gap fitting** *JOURNAL OF QUANTITATIVE SPECTROSCOPY & RADIATIVE TRANSFER*
Almodovar, C. A., Su, W., Choudhary, R., Shao, J., Strand, C. L., Hanson, R. K.
2021; 276
- **Shock tube measurements of high-temperature argon broadening and shift parameters for the potassium D1 and D2 resonance transitions** *JOURNAL OF QUANTITATIVE SPECTROSCOPY & RADIATIVE TRANSFER*
Ding, Y., Vandervort, J. A., Strand, C. L., Hanson, R. K.
2021; 275
- **Shock tube study of ethanol pyrolysis I: Multi-species time-history measurements** *COMBUSTION AND FLAME*
Choudhary, R., Boddapati, V., Clees, S., Girard, J. J., Peng, Y., Shao, J., Davidson, D. F., Hanson, R. K.
2021; 233
- **Shock tube study of ethanol pyrolysis II: Rate constant measurements and modeling** *COMBUSTION AND FLAME*
Choudhary, R., Boddapati, V., Clees, S., Girard, J. J., Peng, Y., Shao, J., Davidson, D. F., Hanson, R. K.
2021; 233
- **Spectrally-resolved absorption cross-section measurements of shock-heated O-2 for the development of a vibrational temperature diagnostic** *JOURNAL OF QUANTITATIVE SPECTROSCOPY & RADIATIVE TRANSFER*

- Krish, A., Streicher, J. W., Hanson, R. K.
2021; 270
- **Experimental and modeling of autoignition of gaseous hydrocarbon fuels in the presence of H₂ and C₂H₄** *FUEL*
Gokulakrishnan, P., Fuller, C., Klassen, M., Davidson, D., Hanson, R.
2021; 296
 - **Collisional excitation kinetics for O(3s S-5(o)) and O(3p P-5(3)) states using laser absorption spectroscopy in shock-heated weakly ionized O-2-Ar mixture** *PHYSICAL REVIEW E*
Li, Y., Wang, Y., Davidson, D. F., Hanson, R. K.
2021; 103 (6)
 - **Collisional excitation kinetics for O(3s⁵S^o) and O(3p⁵P₃) states using laser absorption spectroscopy in shock-heated weakly ionized O₂-Ar mixture.** *Physical review. E*
Li, Y., Wang, Y., Davidson, D. F., Hanson, R. K.
2021; 103 (6-1): 063211
 - **Coupled vibration-dissociation time-histories and rate measurements in shock-heated, nondilute O-2 and O-2-Ar mixtures from 6000 to 14000K** *PHYSICS OF FLUIDS*
Streicher, J. W., Krish, A., Hanson, R. K.
2021; 33 (5)
 - **Quantum-cascade-laser-based dual-comb thermometry and speciation at high temperatures** *MEASUREMENT SCIENCE AND TECHNOLOGY*
Pinkowski, N. H., Cassady, S. J., Strand, C. L., Hanson, R. K.
2021; 32 (3)
 - **Development of a Stark shift measurement technique using excited-state oxygen atoms to determine electron number density in shock heated O-2/Ar above 10 000 K** *PLASMA SOURCES SCIENCE & TECHNOLOGY*
Li, Y., Wang, S., Strand, C. L., Hanson, R. K.
2021; 30 (2)
 - **Thermal-pyrolysis induced over-driven flame and its potential role in the negative-temperature dependence of iso-octane flame speed at elevated temperatures** *COMBUSTION AND FLAME*
Yang, Q., Chen, Z., Susa, A. J., Hanson, R. K., Zhao, P.
2021; 223: 65–76
 - **Studies of the dynamics of autoignition assisted outwardly propagating spherical cool and double flames under shock-tube conditions** *PROCEEDINGS OF THE COMBUSTION INSTITUTE*
Zhang, T., Susa, A. J., Hanson, R. K., Ju, Y.
2021; 38 (2): 2275-2283
 - **An In Situ Laser-Absorption Sensor for Crank Angle-Resolved Temperature, Pressure, and Humidity in Intake-Runner Flows** *SAE INTERNATIONAL JOURNAL OF ENGINES*
Cassady, S. J., Cha, D. H., Pinkowski, N. H., Strand, C. L., Hanson, R. K., Ferlet, X., French, B., Mernone, B. J., Gilmour, A., Stitt, J. M.
2021; 14 (4): 551-568
 - **Time-resolved, single-ended laser absorption thermometry and H₂O, CO₂, and CO speciation in a H-2/C₂H₄-fueled rotating detonation engine** *PROCEEDINGS OF THE COMBUSTION INSTITUTE*
Cassady, S. J., Peng, W., Strand, C. L., Dausen, D. F., Codoni, J. R., Brophy, C. M., Hanson, R. K.
2021; 38 (1): 1719-1727
 - **High-speed imaging of n-heptane ignition in a high-pressure shock tube** *PROCEEDINGS OF THE COMBUSTION INSTITUTE*
Shao, J., Choudhary, R., Susa, A. J., Davidson, D. F., Hanson, R. K.
2021; 38 (1): 911-918
 - **Measurement of time histories of stable intermediates during first stage ignition of n-heptane and its two isomers in a shock tube** *PROCEEDINGS OF THE COMBUSTION INSTITUTE*
Choudhary, R., Girard, J. J., Clees, S., Johnson, S. E., Shao, J., Davidson, D. F., Hanson, R. K., Aradi, A. A.
2021; 38 (1): 957-965
 - **Temperature-dependent absorption cross section measurements for propene, 1-butene, cis-/trans-2-butene, isobutene and 1,3-butadiene in the spectral region 8.4-11.7 μm** *JOURNAL OF QUANTITATIVE SPECTROSCOPY & RADIATIVE TRANSFER*

- Ding, Y., Su, W., Johnson, S. E., Strand, C. L., Hanson, R. K.
2020; 255
- **Shock-induced ignition and pyrolysis of high-pressure methane and natural gas mixtures** *COMBUSTION AND FLAME*
Shao, J., Ferris, A. M., Choudhary, R., Cassady, S. J., Davidson, D. F., Hanson, R. K.
2020; 221: 364–70
 - **A physics-based approach to modeling real-fuel combustion chemistry - VI. Predictive kinetic models of gasoline fuels** *COMBUSTION AND FLAME*
Xu, R., Saggese, C., Lawson, R., Movaghar, A., Parise, T., Shao, J., Choudhary, R., Park, J., Lu, T., Hanson, R. K., Davidson, D. F., Egolfopoulos, F. N., Aradi, et al
2020; 220: 475–87
 - **Vibrational relaxation time measurements in shock-heated oxygen and air from 2000 K to 9000 K using ultraviolet laser absorption** *PHYSICS OF FLUIDS*
Streicher, J. W., Krish, A., Hanson, R. K.
2020; 32 (8)
 - **Shock-tube measurements of coupled vibration-dissociation time-histories and rate parameters in oxygen and argon mixtures from 5000 K to 10 000 K** *PHYSICS OF FLUIDS*
Streicher, J. W., Krish, A., Hanson, R. K., Hanquist, K. M., Chaudhry, R. S., Boyd, I. D.
2020; 32 (7)
 - **The pyrolysis of propane** *INTERNATIONAL JOURNAL OF CHEMICAL KINETICS*
Cassady, S. J., Choudhary, R., Boddapati, V., Pinkowski, N. H., Davidson, D. F., Hanson, R. K.
2020
 - **Shock tube/laser absorption measurements of the pyrolysis of JP-10 fuel** *COMBUSTION AND FLAME*
Johnson, S. E., Davidson, D. F., Hanson, R. K.
2020; 216: 161–73
 - **Spectroscopic inference of alkane, alkene, and aromatic formation during high-temperature JP8, JP5, and Jet-A pyrolysis** *FUEL*
Pinkowski, N. H., Cassady, S. J., Davidson, D. F., Hanson, R. K.
2020; 269
 - **Quantitative measurements of broad-band mid-infrared absorption spectra of formaldehyde, acetaldehyde, and acetone at combustion-relevant temperatures near 5.7 μ m** *JOURNAL OF QUANTITATIVE SPECTROSCOPY & RADIATIVE TRANSFER*
Ding, Y., Peng, W. Y., Strand, C. L., Hanson, R. K.
2020; 248
 - **Ultraviolet absorption cross-section measurements of shock-heated O-2 from 2,000-8,400 K using a tunable laser** *JOURNAL OF QUANTITATIVE SPECTROSCOPY & RADIATIVE TRANSFER*
Krish, A., Streicher, J. W., Hanson, R. K.
2020; 247
 - **Two-color frequency-multiplexed IMS technique for gas thermometry at elevated pressures** *APPLIED PHYSICS B-LASERS AND OPTICS*
Wei, W., Peng, W., Wang, Y., Shao, J., Strand, C. L., Hanson, R. K.
2020; 126 (3)
 - **Collisional broadening and shift of five OH A(2) Σ (+)-X(2) Π (0-0) transitions in the Q(1)-branch, by H₂O, O-2, CO₂, N-2 and Ar, at 1220K** *JOURNAL OF QUANTITATIVE SPECTROSCOPY & RADIATIVE TRANSFER*
Girard, J. J., Clees, S., Hanson, R. K.
2020; 240
 - **Two-temperature Collisional-radiative Modeling of Partially Ionized O₂-Ar Mixtures over 8000-10,000 K Behind Reflected Shock Waves.** *The journal of physical chemistry. A*
Li, Y. n., Wang, S. n., Strand, C. L., Hanson, R. K.
2020
 - **A new strategy of characterizing hydrocarbon fuels using FTIR spectra and generalized linear model with grouped-Lasso regularization** *Fuel*
Wang, Y., Wei, W., Zhang, Y., Hanson, R. K.
2020: 119419

- **Determination of the JP10 + OH # Product Reaction Rate with Measured Fuel Concentrations in Shock Tube Experiments.** *The journal of physical chemistry. A*
Zaczek, L. T., Davidson, D. F., Hanson, R. K.
2020
- **The Thermal Decomposition of Ethane** *Fuel*
Cassady, S. J., Choudhary, R., Pinkowski, N. H., Shao, J., Davidson, D. F., Hanson, R. K.
2020
- **Dual-comb Spectroscopy for High-temperature Reaction Kinetics** *Measurement Science and Technology*
Pinkowski, N. H., Ding, Y., Strand, C. L., Horvath, R., Geiser, M.
2020
- **Analysis of laser absorption gas sensors employing scanned-wavelength modulation spectroscopy with 1f-phase detection** *APPLIED PHYSICS B-LASERS AND OPTICS*
Peng, W., Strand, C. L., Hanson, R. K.
2020; 126 (1)
- **R-branch line intensities and temperature-dependent line broadening and shift coefficients of the nitric oxide fundamental rovibrational band** *JOURNAL OF QUANTITATIVE SPECTROSCOPY & RADIATIVE TRANSFER*
Almodovar, C. A., Su, W., Strand, C. L., Hanson, R. K.
2019; 239
- **Tunable laser-based detection of benzene using spectrally narrow absorption features** *APPLIED PHYSICS B-LASERS AND OPTICS*
Sur, R., Ding, Y., Jackson, R. B., Hanson, R. K.
2019; 125 (11)
- **Shock Tube Measurement of the CH₃ + C₂H₆ CH₄ + C₂H₅ Rate Constant.** *The journal of physical chemistry. A*
Shao, J., Wei, W., Choudhary, R., Davidson, D. F., Hanson, R. K.
2019
- **Experimental Observation of Negative Temperature Dependence in iso-Octane Burning Velocities**
Susa, A. J., Ferris, A. M., Davidson, D. E., Hanson, R. K.
AMER INST AERONAUTICS ASTRONAUTICS.2019: 4476–81
- **Gravity-current-induced test gas stratification and its prevention in constrained reaction volume shock-tube experiments** *SHOCK WAVES*
Susa, A. J., Davidson, D. F., Hanson, R. K.
2019; 29 (7): 969–84
- **High-temperature laminar flame speed measurements in a shock tube** *COMBUSTION AND FLAME*
Ferris, A. M., Susa, A. J., Davidson, D. F., Hanson, R. K.
2019; 205: 241–52
- **High-pressure, high-temperature optical cell for mid-infrared spectroscopy** *JOURNAL OF QUANTITATIVE SPECTROSCOPY & RADIATIVE TRANSFER*
Almodovar, C. A., Su, W., Strand, C. L., Sur, R., Hanson, R. K.
2019; 231: 69–78
- **Multi-wavelength speciation of high-temperature 1-butene pyrolysis** *FUEL*
Pinkowski, N. H., Cassady, S. J., Davidson, D. F., Hanson, R. K.
2019; 244: 269–81
- **A shock tube study of n-heptane, iso-octane, n-dodecane and iso-octane/n-dodecane blends oxidation at elevated pressures and intermediate temperatures** *FUEL*
Shao, J., Choudhary, R., Peng, Y., Davidson, D. F., Hanson, R. K.
2019; 243: 541–53
- **Measurement of the reaction rate of H + O₂ + M -> HO₂ + M, for M=Ar, N₂, CO₂, at high temperature with a sensitive OH absorption diagnostic** *COMBUSTION AND FLAME*
Choudhary, R., Girard, J. J., Peng, Y., Shao, J., Davidson, D. F., Hanson, R. K.
2019; 203: 265–78

- **A new method of estimating derived cetane number for hydrocarbon fuels** *FUEL*
Wang, Y., Cao, Y., Wei, W., Davidson, D. F., Hanson, R. K.
2019; 241: 319–26
- **A two-wavelength ethylene-absorption temperature diagnostic** *MEASUREMENT SCIENCE AND TECHNOLOGY*
Cassady, S. J., Susa, A. J., Ferris, A. M., Strand, C. L., Hanson, R. K.
2019; 30 (3)
- **A multi-wavelength speciation framework for high-temperature hydrocarbon pyrolysis** *JOURNAL OF QUANTITATIVE SPECTROSCOPY & RADIATIVE TRANSFER*
Pinkowski, N. H., Ding, Y., Johnson, S. E., Wang, Y., Parise, T. C., Davidson, D. F., Hanson, R. K.
2019; 225: 180–205
- **High-temperature mid-infrared absorption spectra of methanol (CH₃OH) and ethanol (C₂H₅OH) between 930 and 1170 cm⁻¹** *JOURNAL OF QUANTITATIVE SPECTROSCOPY & RADIATIVE TRANSFER*
Ding, Y., Strand, C. L., Hanson, R. K.
2019; 224: 396–402
- **Quantitative 2-D OH thermometry using spectrally resolved planar laser-induced fluorescence** *OPTICS LETTERS*
Wang, S., Hanson, R. K.
2019; 44 (3): 578–81
- **Shock Tube Measurement of the C₂H₄ + H double left right arrow C₂H₃ + H-2 Rate Constant** *JOURNAL OF PHYSICAL CHEMISTRY A*
Shao, J., Choudhary, R., Peng, Y., Davidson, D. F., Hanson, R. K.
2019; 123 (1): 15–20
- **Shock tube study of the rate constants for H + O-2 + M -> HO2 +M (M = Ar, H₂O, CO₂, N-2) at elevated pressures** *PROCEEDINGS OF THE COMBUSTION INSTITUTE*
Shao, J., Choudhary, R., Susa, A., Davidson, D. F., Hanson, R. K.
2019; 37 (1): 145–52
- **On estimating physical and chemical properties of hydrocarbon fuels using mid-infrared FTIR spectra and regularized linear models** *Fuel*
Wang, Y., Ding, Y., Wei, W., Cao, Y., Davidson, D. F., Hanson, R. K.
2019; 255: 115715
- **Sensitive and Interference-Immune Formaldehyde Diagnostic for High-Temperature Reacting Gases Using Two-Color Laser Absorption Near 5.6 Microns** *Combustion and Flame*
Ding, Y., Wang, S., Hanson, R. K.
2019
- **High-Temperature Laminar Burning Velocity Experiments in a Shock Tube: LBV, Temperature and Species Measurements** *European Workshop on Flame Speed Measurements*
Ferris, A. M., Susa, A. J., Girard, J. J., Davidson, D. F., Hanson, R. K.
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- **Measurement of Non-uniform Temperature Distributions Using Line-of-sight Absorption Spectroscopy** *44th AIAA Aerospace Sciences Meeting and Exhibit*
Liu, X., Jeffries, J. B., Hanson, R. K.
2012
- **Combustion characteristics of an inlet/supersonic combustor model** *50th AIAA Aerospace Sciences Meeting including the New Horizons Forum and Aerospace Exposition*
Gamba, M., Miller, V., Mungal, G. M., Hanson, R. K.
2012
- **Cinematographic PLIF imaging of Toluene using CW excitation** *16th International Symposium on Applications of Laser Techniques to Fluid Mechanics*
Gamba, M., Hanson, R. K.
2012
- **OH PLIF imaging of the reaction zone in combusting transverse jets in supersonic crossflow** *16th International Symposium on Applications of Laser Techniques to Fluid Mechanics*
Gamba, M., Mungal, M. G., Hanson, R. K.
2012
- **Toluene PLIF Thermometry in Supersonic Flows** *42nd AIAA Fluid Dynamics Conference and Exhibit*
Miller, V., Gamba, M., Mungal, M. G., Hanson, R. K.
2012
- **Experimental Database for Development of a HiFiRE JP-7 Surrogate Fuel Mechanism** *50th AIAA Aerospace Sciences Meeting including the New Horizons Forum and Aerospace Exposition*
Davidson, D. F., Ren, W., Hanson, R. K.
2012
- **Hypervelocity Testing of a Dual-mode Scramjet** *50th AIAA Aerospace Sciences Meeting Including the New Horizons Forum and Aerospace Exposition*
Smayda, M. G., Vogel, P. D., Schultz, I. A., Hanson, R. K., Foelsche, R., Tsai, C. Y., Cresci, D., Goynes, C. P.
2012
- **A Second-Generation Aerosol Shock Tube and Its Use in Studying Ignition Delay Times of Large Biodiesel Surrogates** *28th International Symposium on Shock Waves*
Campbell, M. F., Davidson, D. F., Hanson, R. K.
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- **TDL Absorption Sensor for Temperature Measurements in High-Pressure and High-Temperature Gases** *50th AIAA Aerospace Sciences Meeting including the New Horizons Forum and Aerospace Exposition*
Goldenstein, C. S., Schultz, I. A., Jeffries, J. B., Hanson, R. K.
2012
- **TDL Absorption Sensor for In Situ Determination of Combustion Progress in Scramjet Ground Testing** *28th Aerodynamic Measurement Technology, Ground Testing, and Flight Testing Conference*
Schultz, I. A., Goldenstein, C. S., Jeffries, J. B., Hanson, R. K., Rockwell Jr., R. D., Goynes, C. P.
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Gamba, M., Mungal, M. G., Hanson, R. K.
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- **Multi-species Measurements of n-Butanol Pyrolysis Behind Reflected Shock Waves** *28th International Symposium on Shock Waves*
Cook, R. D., Davidson, D. F., Hanson, R. K.
2012: 451–56
- **Experimental Database for Development of a Hi Fire JP-7 Surrogate Fuel Mechanism** *50th AIAA Aerospace Sciences Meeting including the New Horizons Forum and Aerospace Exposition*
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- **Two-camera Dual-band Collection Toluene PLIF Thermometry in Supersonic Flows** *16th International Symposium on Applications of Laser Techniques to Fluid Mechanics*
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MacDonald, M. E., Ren, W., Davidson, D. F., Hanson, R. K.
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- **Tunable Diode Laser Absorption Sensor for Measurements of Temperature and Water Concentration in Supersonic Flows** *49th AIAA Aerospace Sciences Meeting including the New Horizons Forum and Aerospace Exposition*
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Strand, C. L., Hanson, R. K.

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Davidson, D. F., MacDonald, M. E., Hanson, R. K.
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Sun, K., Sur, R., Chao, X., Jeffries, J. B., Hanson, R. K., Pummill, R. J., Wagner, D. A., Whitty, K. J., Steele, R. C.
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Ren, W., Li, S., Davidson, D. F., Hanson, R. K.
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Gamba, M., Mungal, M. G., Hanson, R. K.
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2011
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2011
- **Shock Tube/Laser Absorption Measurements of JP-8 Ignition Delay Times and Multi-species Time-histories** *JANNAF Meeting*
Davidson, D. F., Li, S., Lam, K. Y., Stranic, I., Hanson, R. K.
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- **Multi-Species Measurements of n-Butanol Pyrolysis behind Reflected Shock Waves** *7th International Conference on Chemical Kinetics*
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2011
- **Tunable Diode Laser Absorption Diagnostic for Scramjet Combustion Flows** *7th U.S. National Combustion Meeting*

- Schultz, I. A., Goldenstein, C. S., Jeffries, J. B., Hanson, R. K.
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 - **Shock tube ignition delay time measurements in propane/O-2/argon mixtures at near-constant-volume conditions** *PROCEEDINGS OF THE COMBUSTION INSTITUTE*
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 - **Temperature and pressure imaging using infrared planar laser-induced fluorescence** *APPLIED OPTICS*
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- **Boundary Layer Entrainment and Combustion in a Transverse Jet in Supersonic Crossflow** *62nd Annual Meeting of the APS Division of Fluid Dynamics*
Heltsley, W. N., Gamba, M., Mungal, M. G., Hanson, R. K.
2009
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Heltsley, W. N., Do, H., Snyder, J. A., Mungal, M. G., Hanson, R. K.
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- **Tunable Diode Laser Sensing in Harsh Environments: Applications to Propulsion and Combustion** *invited plenary at 6th U.S. National Meeting on Combustion*
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Vasu, S. S., Davidson, D. F., Hanson, R. K.
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- **Simultaneous Measurement of Flow Fluctuations and Near-Field Pressure in a Subsonic Jet** *15th AIAA/CEAS Aeroacoustics Conference (30th AIAA Aeroacoustics Conference)*
Kastner, J., Cuppoletti, D., Gutmark, E., Fahrland, A., Jeffries, J. B., Hanson, R. K.,
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- **Measurements of high-pressure CO₂ absorption near 2.0 μ m and implications on tunable diode laser sensor design** *APPLIED PHYSICS B-LASERS AND OPTICS*
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- **Experimental study and modeling of shock tube ignition delay times for hydrogen-oxygen-argon mixtures at low temperatures** *PROCEEDINGS OF THE COMBUSTION INSTITUTE*
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- **Application of an aerosol shock tube to the measurement of diesel ignition delay times** *PROCEEDINGS OF THE COMBUSTION INSTITUTE*
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- **Shock tube measurements of ignition delay times and OH time-histories in dimethyl ether oxidation** *PROCEEDINGS OF THE COMBUSTION INSTITUTE*
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- **Temperature- and composition-dependent mid-infrared absorption spectrum of gas-phase gasoline: Model and measurements** *FUEL*
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Jackson, D. E., Davidson, D. F., Hanson, R. K.
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- **Aerosol Shock Tube Measurements of the Decomposition Rate Measurements of RP-1, RP-2, n-dodecane, and RP-1 with Fuel Stabilizers** *44th AIAA/ASME/SAE/ASEE Joint Propulsion Conference & Exhibit*
MacDonald, M. E., Davidson, D. F., Hanson, R. K.

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- **2.3 μm Tunable Diode Laser Absorption Measurement of CO in Combustion Gases** *WIP poster at 32nd Symp (Int.) on Combustion*
Chao, X., Jeffries, J. B., Hanson, R. K.
2008
- **Hypersonic mass-flux sensing with fiber-coupled tunable diode lasers for ground test applications and flight evaluation** *NASA ARMD Hypersonics NRA Review November*
Hanson, Ronald, K., Jeffries, Jay, B., Chang, L.
2008
- **Shock Tube Studies of n-Alkane Oxidation and Pyrolysis: Development of a Fundamental Kinetic Database for Jet Fuels and Surrogates** *JANNAF 4th Liquid Propulsion Joint Meeting*
Davidson, D. F., Hanson, R. K.
2008
- **OH Time-History Absorption Measurements at High Pressures and Temperatures behind Reflected Shocks during Methylcyclohexane Oxidation** *Western States Section of the Combustion Institute-Spring Meeting*
Vasu, S. S., Davidson, D. F., Hanson, R. K.
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- **Destruction of Bacterial Spore-Laden Aqueous Aerosols in Shock-heated Flows** *Laser Applications to Chemical, Security and Environmental Analysis*
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- **Shock Tube Study of Soot Formation in Rich Heptane/Oxygen Mixtures with DME/Acetone/Butanol/3-Pentanone Additives** *32nd International Symposium on Combustion*
Hong, Z., Davidson, D. F., Vasu, S. S., Hanson, R. K.
2008
- **Mapping the Combustion Stability Regimes of Hydrogen and Hydrocarbon Jets in Supersonic Crossflow with OH-PLIF** *14th International Symposium on Applications of Laser Techniques to Fluid Mechanics*
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- **Mid-IR Gas Sensing for Combustion Applications** *Laser Applications to Chemical, Security and Environmental Analysis*
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- **Time-Resolved N-decane Vapor Concentration Measurement of CO in a Shock-Heated Evaporating Aerosol** *WIP poster at 32nd Symp (Int.) on Combustion*
Porter, J. M., Pilla, G. L., Jeffries, J. B., Hanson, R. K.
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- **Investigation of the High Temperature Thermal Stability of Kerosenes using Shock Tubes** *JANNAF 4th Liquid Propulsion Joint Meeting*
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- **Laser-based Measurements of OH, Temperature, and Water Vapor Concentration in a Hydrocarbon-fueled Scramjet** *44th AIAA/ASME/SAE/ASEE Joint Propulsion Conference & Exhibit*
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- **Dispersion, Activation and Destruction of Airborne Biological Threats: Laboratory Studies of the Interaction of Spore-Laden Aerosols with Shock/Blast Waves** *poster #146 at Chemical and Biological Defense Physical Science and Technology Conference*

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- **Diode laser measurements of temperature-dependent collisional-narrowing and broadening parameters of Ar-perturbed H₂O transitions at 1391.7 and 1397.8 nm** *JOURNAL OF QUANTITATIVE SPECTROSCOPY & RADIATIVE TRANSFER*
Li, H., Farooq, A., Jeffries, J. B., Hanson, R. K.
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- **Shock tube study of the reaction of CH with N₂: Overall rate and branching ratio** *JOURNAL OF PHYSICAL CHEMISTRY A*
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- **Temperature-dependent mid-IR absorption spectra of gaseous hydrocarbons** *JOURNAL OF QUANTITATIVE SPECTROSCOPY & RADIATIVE TRANSFER*
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Lyle, K. H., Jeffries, J. B., Hanson, R. K., Winter, M.
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- **A diode laser sensor for rapid, sensitive measurements of gas temperature and water vapour concentration at high temperatures and pressures** *MEASUREMENT SCIENCE & TECHNOLOGY*
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- **Experimental study of H₂O spectroscopic parameters in the near-IR (6940-7440cm⁻¹) for gas sensing applications at elevated temperature** *JOURNAL OF QUANTITATIVE SPECTROSCOPY & RADIATIVE TRANSFER*

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- **Wavelength-scanned tunable diode laser temperature measurements in a model gas turbine combustor** *AIAA JOURNAL*
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 - **Measurement of nonuniform temperature distributions using line-of-sight absorption spectroscopy** *AIAA 44th Aerospace Sciences Meeting and Exhibit*
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 - **Sensing and control of combustion instabilities in swirl-stabilized combustors using diode-laser absorption** *AIAA/ASME/SAE/ASEE 42nd Joint Propulsion Conference*
Li, H., Zhou, X., Jeffries, J. B., Hanson, R. K.
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 - **Thermal decomposition of toluene: Overall rate and branching ratio** *PROCEEDINGS OF THE COMBUSTION INSTITUTE*
Oehlschlaeger, M. A., Davidson, D. F., Hanson, R. K.
2007; 31: 211-219
 - **Simultaneous Mid-IR Measurement of Equivalence Ratio and Temperature in a JP-10-Fueled Pulsed Detonation Engine** *45th AIAA Aerospace Sciences Meeting and Exhibit*
Barbour, E. A., Hanson, R. K., Hutcheson, P., Brophy, C., Sinibaldi, J. O.
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 - **Combustion Stability Regimes of Hydrogen Jets in Supersonic Crossflow** *43rd AIAA/ASME/SAE/ASEE Joint Propulsion Conference & Exhibit*
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 - **Transient Plasma Ignition for Delay Reduction in Pulse Detonation Engines** *45th AIAA Aerospace Sciences Meeting and Exhibit*
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 - **Measurements of CO₂ and H₂O Near 2.7 μm Using Tunable Diode Laser Absorption** *43rd AIAA/ASME/SAE/ASEE Joint Propulsion Conference & Exhibit*
Farooq, A., Li, H., Jeffries, J. B., Hanson, R. K.
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 - **Jet Fuel Ignition Delay Times and Modeling: Studies at High Pressures and Low Temperatures in a Shock Tube** *43rd AIAA/ASME/SAE/ASEE Joint Propulsion Conference & Exhibit*
Vasu, S. S., Davidson, D. F., Hanson, R. K.
2007
 - **Pressure-Sensitive Paint Measurements of Sonic Jet Injection into Supersonic Crossflow** *43rd AIAA/ASME/SAE/ASEE Joint Propulsion Conference & Exhibit*
Snyder, J. A., Chang, L. S., Nakakita, K., Heltsley, W. N., Mungal, M. G., Hanson, R. K.
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 - **Shock Tube Studies of Soot Formation in Rich Heptane/Oxygen Mixtures with DME/Acetone/Butanal Additives** *WSS/CI Fall Meeting*
Hong, Z., Davidson, D. F., Hanson, R. K.
2007
 - **Facilities for the Validation of Line-of-Sight Combustion Gas Monitors for Coal-Fire Boilers** *17th Annual Joint ISA POWID/EPRI Controls and Instrumentation Conference and 50th Annual ISA POWID Symposium*

- Hanson, R. K., Haswell, J., Himes, R., Jeffries, J. B., Muncy, J., Padgett, E., Sorge, J. N.
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- **Combustion Stability Regimes of Hydrogen Jets in Supersonic Crossflow** *43rd AIAA/ASME/SAE/ASE Joint Propulsion Conference*
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2007
 - **Two-wavelength mid-IR Absorption Sensor for Simultaneous Temperature and n-Heptane Concentration Experiments** *5th U.S. Combustion Meeting*
Klingbeil, A. E., Porter, J. M., Jeffries, J. B., Hanson, R. K.
2007
 - **Methylcyclohexane Oxidation: Shock Tube Experiments and Modeling Over a Wide Range of Conditions** *5th U.S. National Combustion Meeting*
Vasu, S. S., Parikh, N. N., Davidson, D. F., Hanson, R. K.
2007
 - **Jet Fuel Ignition Delay Times: Shock Tube Investigations at High Pressures** *21st Int. Colloquium on the Dynamics of Explosions and Reactive Systems*
Vasu, S. S., Davidson, D. F., Hanson, R. K.
2007
 - **Shock Tube Ignition Delay Times and Modeling of Jet Fuel Mixtures** *42nd AIAA/ASME/SAE/ASEE Joint Propulsion Conference & Exhibit*
Vasu, S. S., Davidson, D. F., Hanson, R. K.
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 - **Shock Tube Ignition Delay Times for Hydrogen-Oxygen-Argon Mixtures at Low Temperatures and Elevated Pressures** *WSS/CI Fall Meeting*
Pang, G. A., Davidson, D. F., Hanson, R. K.
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 - **Detection of Trace NO Conditions using 1-D NO-LIF Imaging** *5th U.S. Combustion Meeting*
Yoo, J. H., Lee, T., Jeffries, J. B., Hanson, R. K.
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 - **A Diode-Laser Absorption Sensor for Temperature and Water Vapor in a Shock Tube** *26th Int. Symp. On Shock Waves*
Li, H., Farooq, A., Cook, R. C., Davidson, D. F., Jeffries, J. B., Hanson, R. K.
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 - **Optimized Two-Line Tracer PLIF Measurements of Temperature and Composition in an IC engine** *WSS/CI Fall Meeting*
Rothamer, D. A., Snyder, J. A., Steeper, R. R., Hanson, R. K.
2007
 - **Comparison of Wavelength Modulation and Direct Absorption Spectroscopy for Measurements of Gas Temperature in a Scramjet Combustor** *5th U.S. Combustion Meeting*
Rieker, G. B., Jeffries, J. B., Hanson, R. K.
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 - **Experimental evaluation of strategies for quantitative laser-induced-fluorescence imaging of nitric oxide in high-pressure flames (1-60 bar)** *PROCEEDINGS OF THE COMBUSTION INSTITUTE*
Lee, T., Jeffries, J. B., Hanson, R. K.
2007; 31: 757-764
 - **High-temperature measurements of the rates of the reactions $\text{CH}_2\text{O} + \text{Ar} \rightarrow \text{Products}$ and $\text{CH}_2\text{O} + \text{O}_2 \rightarrow \text{Products}$** *PROCEEDINGS OF THE COMBUSTION INSTITUTE*
Vasudevan, V., Davidson, D. F., Hanson, R. K., Bowman, C. T., Golden, D. M.
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 - **Tunable mid-IR laser absorption sensor for time-resolved hydrocarbon fuel measurements** *PROCEEDINGS OF THE COMBUSTION INSTITUTE*
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 - **In-cylinder gas temperature and water concentration measurements in HCCI engines using a multiplexed-wavelength diode-laser system: Sensor development and initial demonstration** *PROCEEDINGS OF THE COMBUSTION INSTITUTE*
Mattison, D. W., Jeffries, J. B., Hanson, R. K., Steeper, R. R., De Zilwa, S., Dec, J. E., Sjoberg, M., Hwang, W.

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- **Rapid measurements of temperature and H₂O concentration in IC engines with a spark plug-mounted diode laser sensor** *PROCEEDINGS OF THE COMBUSTION INSTITUTE*
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2007; 31: 3041-3049
- **Methyl concentration time-histories during iso-octane and n-heptane oxidation and pyrolysis** *PROCEEDINGS OF THE COMBUSTION INSTITUTE*
Davidson, D. F., Oehlschlaeger, M. A., Hanson, R. K.
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- **Active control of lean blowout in a swirl-stabilized combustor using a tunable diode laser** *PROCEEDINGS OF THE COMBUSTION INSTITUTE*
Li, H., Zhou, X., Jeffries, J. B., Hanson, R. K.
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- **Investigation of the reaction of toluene with molecular oxygen in shock-heated gases** *COMBUSTION AND FLAME*
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- **Fuel distribution effects on pulse detonation engine operation and performance** *JOURNAL OF PROPULSION AND POWER*
Brophy, C. M., Hanson, R. K.
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- **Measurement of reflected-shock bifurcation over a wide range of gas composition and pressure** *SHOCK WAVES*
Petersen, E. L., Hanson, R. K.
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- **Experimental investigation of toluene plus H → benzyl plus H-2 at high temperatures** *JOURNAL OF PHYSICAL CHEMISTRY A*
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