

Propellants and Combustion

Papers Presented at the AIAA SciTech Forum and Exposition
2025

Orlando, Florida, USA
6 - 10 January 2025

Volume 1 of 2

ISBN: 979-8-3313-1808-6

Printed from e-media with permission by:

Curran Associates, Inc.
57 Morehouse Lane
Red Hook, NY 12571



Some format issues inherent in the e-media version may also appear in this print version.

The contents of this work are copyrighted and additional reproduction in whole or in part are expressly prohibited without the prior written permission of the Publisher or copyright holder. The resale of the entire proceeding as received from CURRAN is permitted.

For reprint permission, please contact AIAA's Business Manager, Technical Papers. Contact by phone at 703-264-7500; fax at 703-264-7551 or by mail at 12700 Sunrise Valley Drive, Suite 200, Reston, VA 20191, USA.

TABLE OF CONTENTS

VOLUME 1

DETONATION FUNDAMENTALS

High Speed Imaging of Gaseous Detonations in Rectangular Curved Channels With Representative Widths for RDEs	1
<i>Regan Hencel, Steven Abbate, Matthew Longer, Kevin Y. Cho</i>	
Design and Analysis of a Dump Tank Release System for Detonation Tube Facility	18
<i>Bryan Suarez, Nicolas Berube, Daniel R. Dyson, Anthony J. Aguilera, Hamil Patel, Subith Vasu</i>	
Interstitial Impacts on Shock-Driven Fuel Droplet Atomization	23
<i>Miguel L. Moran, Steven A. Schroeder, Sheikh Salauddin, Rachel Hytovick, Anthony J. Morales, Kareem A. Ahmed</i>	
Design Considerations in Aluminum Powder Introduction for Detonation Tube Applications	27
<i>Rodrigo I. Yuraszcek, Daniel R. Dyson, Hamil Patel, Alejandro J. Puerta-Alvarado, Subith Vasu, Ryan W. Houim</i>	

MODELING AND SIMULATIONS I

Differential Diffusion Effects on Hydrogen-Enriched Jet Flames in a Crossflow	33
<i>Shuzhi Zhang, Vansh Sharma, Venkatramanan Raman</i>	
Aeronautic Igniter Abilities in Low Pressure Lean Turbulent Mixtures	43
<i>Alessandra Matino, Julien Sotton, Marc Bellenoue, Christophe Viguiere</i>	
Numerical Simulation of OH Radical PLIF Imaging in Hydrogen-Air Combustion	53
<i>Hari Chand, Siba P. Choudhury, Ratan Joarder</i>	
Large-Eddy Simulation of a Solid-Fuel Ramjet Combustor	67
<i>Jean Pecquet, Suresh Menon</i>	
Simulation of Multi-Injector H ₂ -O ₂ Rocket Combustion Instability	78
<i>Yalu Zhu, Feng Liu, William A. Sirignano</i>	
Bi-Fidelity Neural Network Model for Multi-fuel Capable Internal Combustion Engines	101
<i>Pradeep Kumar Pavalavanni, Sai Ranjeet Narayanan, Zongxuan Sun, Suo Yang, Kenneth Kim, Chol-Bum Kweon</i>	

SUSTAINABLE AVIATION FUELS

Detonation Properties of Jet A-1 and Sustainable Aviation Fuel	113
<i>Zhen Wei Teo, Po-Hsiung Chang, Xin Huang, Jee Hann Ng, Jiun-Ming Li, Chiang Juay Teo, Boo Cheong Khoo</i>	
Laminar Flame Speed Measurements of Sustainable Aviation Fuels at High Temperatures and Pressures	123
<i>Upom Louise Costa, Eric L. Petersen</i>	
Investigation on Sustainable Aviation Fuels: Characterization, Testing, and Emissions Measurements in a Turbofan Engine	141
<i>Francesco Di Sabatino, Scott Hutzler, Imad Khalek, James C. Thomas, Brynn Bartholomew, Austin Jones, Griffin Beck</i>	

Large Eddy Simulation of a Model Jet-Engine Swirl-Stabilized Flame Using Sustainable Aviation Fuels	152
<i>Pierre Vauquelin, Bora O. Cakir, David Sanned, Megha Prakash, Jan-Peter Hannappel, Arman A. Subash, Mattias Richter, Xue-Song Bai, Christer Fureby</i>	

Predicting Sustainable Aviation Fuel Mixtures Using Low-Resolution Nuclear Magnetic Resonance	179
<i>Winford Janvrin, Parker Huggins, Austin R. Downey, Sang Hee Won</i>	

COMBUSTION CHEMISTRY

NH ₃ /DME Oxidation and Kinetic Interaction up to 100 atm	184
<i>Bowen Mei, Ziyu Wang, Andy Thawko, Wenbin Xu, Yiguang Ju</i>	

Time-Resolved Speciation of Shock-Heated Hydrogen/NO and Hydrogen/CO ₂ High-Temperature Oxidation	190
<i>Jiabiao Zou, Congjie Hong, Touqeer Anwar Kashif, Janardhanraj Subburaj, Aamir Farooq</i>	

Tabulated Chemistry for the High-Enthalpy Equilibrium Flows Through a Rocket Nozzle	197
<i>Jaeun Kim, Si-Yoon Kang, Bu-Kyeng Sung, JeongYeol Choi</i>	

The Dynamics and Kinetics of Dimethyl-Ether/Ammonia Non-Premixed Cool and Warm Flames at Elevated Pressures	203
<i>Andy Thawko, Wenbin Xu, Bowen Mei, Ziyu Wang, Kaii Ri, Yiguang Ju</i>	

Autoignition Delay Time Measurements of Dimethyl Ether at 110 Bar Inside a Shock Tube	211
<i>Aaron C. Guenther, Zuhayr Pasha Mohammed, Michael Pierro, Justin Urso, Ramees Khaleel Rahman, Subith Vasu</i>	

On the Oxidation Mechanism of n-Dodecane Under Pure Oxygen Conditions From Low to High Temperatures	216
<i>Congjie Hong, Jiabiao Zou, Janardhanraj Subburaj, Aamir Farooq, Yingjia Zhang</i>	

MODELING AND SIMULATIONS II

Numerical Simulations of Non-Ideal Spray Detonations in Jet Fuels With a Shock-Droplet Interaction Model	228
<i>Sai Sandeep Dammati, Alexei Poludnenko, Nikolaos Kateris, Wendi Dong, Hai Wang, Tianfeng Lu</i>	

Overset Gridding to Enable Modular CFD Prediction of Rotation Detonation Engine	245
<i>John A. Boles, Tanner Nielsen, Matthew Goodson, Jeffrey Feaster, Praveen Ramaprabhu, Mesbah Uddin</i>	

Geometry and Fuel Effects on Solid Fuel Combustion in Scramjet Conditions	262
<i>Luca Massa, Henry Pace</i>	

LES of Supersonic Combustion in a Mach 2 Cavity-Based Model Scramjet Combustor With Conjugate Heat Transfer and Radiative Heat Transfer	291
<i>Christer Fureby, David M Peterson, Timothy Ombrello, Dean Eklund</i>	

Investigation of Solid Fuel Ramjets Using Analytical Theory and Computational Fluid Dynamics	307
<i>Gohar T. Khokhar, Joshua McBeth, Kyle M. Hanquist, Parham Oveissi, Ankit Goel</i>	

Data Assimilation Using Dynamically Consistent Inversion for Model Reactive Flow Problems	321
<i>Cai Min Lim, G S. Sidharth</i>	

COMBUSTION THEORY AND MODELLING

A Novel Approach to Scaling Gas-Phase Detonation Overpressures	341
<i>Daniel B. Japhet, James C. Thomas</i>	

Characterization of Ignition Fronts Using Tangential Stretching Rate Analysis	346
<i>Iliana D. Dimitrova, Urbano A. Medina Martinez, Francisco E. Hernandez Perez, Minh Bau Luong, Hong G. Im</i>	
Analysis of Entropy Production Mechanisms in Turbulent Diffusion Flames	359
<i>Guru Charan Ganesh, Naseem Ansari, Stefano Orsino, Yu Xia, Vishal S. Acharya</i>	
Linear Analysis of Compressible Reactive Flows	372
<i>Benjamin J. Turner, G S. Sidharth</i>	
An Elementary Study of Flame Compressibility in Relation to Scramjet Unstart.....	382
<i>Justin D. Sprunger, Erik R. Fernandez, Rachel Hytovick, Kareem A. Ahmed</i>	

POLLUTANT FORMATION

Ethylene-Air Flame Dynamics and Soot Formation in Externally Heated Microreactors at Elevated Pressures	387
<i>Manuel Jimenez, Vinicius Maron Sauer</i>	
Particulate Emission and Optical Measurements in n-Heptane Low-Swirl Non-Premixed Flames at Elevated Pressures	395
<i>Jun Kojima, Francisco J. Guzman, Jennifer Klettlinger</i>	
High Pressure Measurement of Soot Formation Applicable to Energetic Materials Fireballs.....	410
<i>Timothy Loye, Christopher W. Dennis, Anya Ambarish, Justin Urso, Subith Vasu</i>	
Contrail Formation Simulation via FANS-Based Turbulence Modelling Combined With Two-Equation Soot/Ice Particle Transport Modelling	419
<i>Charles Chelem Mayigue, Taye Taddesse, Isaac Jahncke, Clinton Groth, Amitesh Roy, Rajat Sawanni, Omer Gulder, Swetaprovo Chaudhuri, Yash Rajan</i>	
Quantitative Soot Volume Fraction Measurements in Turbulent Non-Premixed Toluene Jet Flames	435
<i>Daniel R. Richardson, Caroline Winters, Sean P. Kearney</i>	

MACHINE LEARNING FOR COMBUSTION

Study of the Driving Mechanism of Nonlinear Pressure Waves in a Rocket Combustor With a Single-Element Injector by Using State Space	440
<i>Fumiya Arai, Hikaru Fukuta, Yudai Kanamori, Shoya Takeshi, Kazuki Iemura, Norio Asaumi, Hikaru Oomori, Atsushi Muneishi, Masanori Saito, Mitsuaki Tanabe</i>	
Machine Learning-Augmented Kinetics for Shock-Tube Ignition Delay Using a Variational Approach	452
<i>Jonathan F. MacArt</i>	
Accelerated Integration of Stiff Reactive Systems Using Gradient-Informed Autoencoder and Neural Ordinary Differential Equation	461
<i>Mert Yakup Baykan, Vijayamanikandan Vijayarangan, Dong-hyuk Shin, Hong G. Im</i>	
Iso-Surface Sampler for Developing High-Dimensional Engine Controllers Using High-Fidelity CFD Models	474
<i>Sai Ranjeet Narayanan, Sathya Aswath Govind Raju, Zongxuan Sun, Suo Yang, Kenneth Kim, Chol-Bum Kweon</i>	
Local-Transfer Gaussian Process (LTGP) Learning for Multi-Fuel Capable Engines	486
<i>Sai Ranjeet Narayanan, Zongxuan Sun, Suo Yang, John J. Miller, Simon Mak, Kenneth Kim, Chol-Bum Kweon</i>	

ROCKET AND AIR-BREATHING PROPULSION

Flame Structure, Spray, and Blowout of a Lean Premixed Prevaporized Combustor With Conventional and Sustainable Jet Fuels	499
<i>Ari Jain, Ijeoma Obi, Yi C. Mazumdar, Victor Salazar, Meenakshi Kodali, Krishna Venkatesan, Adam M. Steinberg</i>	
A Design Trade-Off of Mixture Ratio of Liquid Rocket Engine	513
<i>Maansi Srivastava, Tanisha Singh, Anmish Varma, Debayan Roy, Dhruv Panchal, Yaman Vohra, Ishaan Bakshi, Sanjana Sekharmantri, Shivansh Rana, Nasik Mohammed Marzouq Khan, Raunak Sharma, Meraj Alam, Yash Raj, Tejas S. Kapatkar, Basant K Agarwal, VR Sanal Kumar</i>	
Development of Multi-Measurement Technology for Micro-Rocket Torch Flame.....	528
<i>Yuya Hirayama, Shinichiro Ogawa</i>	
Raman Spectroscopy for Species Concentration Measurements in Rocket Engine Testing Facilities	545
<i>Nikolas Hulliger, Zuhayr Pasha Mohammed, Justin Urso, Subith Vasu, Kevin Harsh, Evan Pilant, Bradley Smith, Karen Keiter</i>	

SHOCK-SPRAY INTERACTION I

Detonation-Droplet Interaction Simulations Utilizing the Lagrangian KHRT Breakup Model	551
<i>Armani Batista, John W. Bennewitz, Jason R. Burr, Mathias Ross, Matthew E. Harvazinski, Eric J. Paulson</i>	
Breakup Characterization of Sub-50 Micron Fuel Droplets in a Hypersonic Shock Tube	566
<i>Steven A. Schroeder, Miguel L. Moran, Sheikh Salauddin, Anthony J. Morales, Rachel Hytovick, Kareem A. Ahmed</i>	
An Heuristic Model for Droplet Evaporation in Supersonic Flows.....	573
<i>Lorenzo Angelilli, Venkatramanan Raman</i>	
Experimentally Driven Characterization of Droplet Dynamics in Liquid Fuel Cloud Detonation.....	582
<i>Khaoula Chougag, Taylor R. Brown, Anthony J. Morales, Sheikh Salauddin, Kareem A. Ahmed</i>	

HIGH PERFORMANCE COMPUTING

Variational Data Assimilation in Shock Tube Flows	589
<i>Eric J. West, Jonathan F. MacArt, Ramakanth Munipalli</i>	
Accelerating Hydrogen Combustion Simulations in Aero-Engines With Advanced CFD and GPGPU Techniques.....	624
<i>Federico Ghioldi, Shashikant M. Aithal, Federico Piscaglia</i>	
GPU Performance Modeling and Assessment of High-Speed Combustion Simulations Using Adaptive Mesh Refinement.....	638
<i>Anthony Carreon, Shuzhi Zhang, Shivank Sharma, Jagmohan Singh, Venkatramanan Raman</i>	
Data-Driven Strategy for Enhanced Subgrid Modeling of Reaction-Rate Using Linear-Eddy Model for Large Eddy Simulation	654
<i>Achyut Panchal, Robert Smith, Reetesh Ranjan, Suresh Menon</i>	
A Parallel Implementation of Reduced-Order Modeling of Large-Scale Systems	666
<i>Ionut Farcas, Rayomand P. Gundevia, Ramakanth Munipalli, Karen E. Willcox</i>	

SHOCK-SPRAY INTERACTION II

Impact of Jet Cross-Flow on Detonation Wave Structure and Propagation Behavior	687
<i>Calle W. Junker, Charlie H. Black, Mark Frederick, Ryan Strelau, Rohan Gejji, Carson D. Slabaugh</i>	
Multiphase Characterization of Liquid Fuel Droplet Atomization Behind Hypersonic Shocks.....	700
<i>Steven A. Schroeder, Miguel L. Moran, Sheikh Salauddin, Paula Becraft, Charles Clark, Max Fortin, Kareem A. Ahmed</i>	
Simulation of Shock-Droplet Interactions at Detonation-Relevant Conditions Using Vapor-Liquid Equilibrium Theory	705
<i>Navneeth Srinivasan, Suo Yang</i>	
Shock-Induced Deformation and Kinematics of Acetone Droplets.....	717
<i>Letice R. Bussiere, Prashant Tarey, Jacob McFarland, Praveen Ramaprabhu</i>	

COMBUSTION DIAGNOSTICS I

sCMOS-Based Raman/Rayleigh Spectroscopy for Quantitative Detection of Temperature, Major Species, and Pressure in Supersonic Combustion	727
<i>Hao Tang, Jonathon H. Miller, Adam M. Steinberg</i>	
10 kHz OH-PLIF Measurements at the Exit of a Full-Annular Small-Scale Combustor.....	736
<i>Nicholas Rock, Mateo Gomez, Christopher Fugger, Brendan Paxton, Aaron W. Skiba, Brent A. Rankin</i>	
Laser Absorption Measurements of HCl in a Shock Tube for Investigating the Chemical Kinetics of Rocket Propellants.....	746
<i>Claire M. Gregoire, Eric L. Petersen</i>	
Concentration and Temperature Measurements in Swirling Hydrogen Flames in a Micromix Based Fuel-Flex Combustor.....	753
<i>Yazdan Naderzadeh Ardebili, Scott Watson, Gilles Bourque, Sandeep Jella, Marc Furi, Swetaprovo Chaudhuri</i>	

DETONATION AND SUPERSONIC COMBUSTION I

Characterization of Premixed Swirl Stabilized Combustion in a Supersonic Underexpanded Jet	770
<i>Adhiraj Bhagat, Jonathon H. Miller, Shawn Wehe, Seunghyun Jo, Adam M. Steinberg</i>	
Characterizing Simulant Mixing and Decomposition in an Explosive Fireball: A Numerical Study	779
<i>Achyut Panchal, Suresh Menon</i>	
Characterization of H ₂ -Air Detonations With High-Speed (2.5 MHz) Rayleigh Scattering and Single-Shot Planar Laser-Induced Fluorescence of Nitric Oxide.....	796
<i>Karl P. Chatelain, Mhedine Ali Cherif, Thibault F. Guiberti, Deanna A. Lacoste</i>	
Comparing Shock-Attached and Lab Frames of Reference for Numerical Simulations of Two-Dimensional Channel Detonations	806
<i>Ramachandran Suryanarayan, Rudram Dushe, Suo Yang</i>	

VOLUME 2

Experimental Analysis of the Physics of Jet in Supersonic Cross Flow	822
<i>Erik R. Fernandez, Justin D. Sprunger, Rachel Hytovick, Kareem A. Ahmed</i>	

COMBUSTION DIAGNOSTICS II

Optical Measurements of Pressurized HTPB Combustion.....	838
<i>Clayton M. Geipel, Brian T. Bojko, Christopher J. Pfützner, Brian T. Fisher, David A. Kessler</i>	
Particle Image Velocimetry Method to Determine Burning Velocity and Particle Burn Time in a Metal Dust Flame	849
<i>Vidhan Malik, Christopher J. Pfützner, Brian T. Fisher</i>	
High Speed, Multi-species, Two-Dimensional Raman Scattering Measurements for Bluff-Body Stabilized Turbulent Flames at High Pressures	860
<i>Manya Subbaramaiah, Hao Tang, Oleksandr Bibik, Adam M. Steinberg</i>	
Laser-Induced Incandescence Measurements in a High-Pressure Swirl-Stabilized Flame	869
<i>Thomas McLean, Keaton C. Koenig, Benjamin K. Murdock, Tristan T. Shahin, Alexander J. Hodge, Rohan Gejji, Carson D. Slabaugh, Robert P. Lucht</i>	
Direct Combustion Noise: Experimental Study on the Pressure - Heat Release Coherence	886
<i>Sungyoung Ha, Tim Lieuwen</i>	

DETONATION AND SUPERSONIC COMBUSTION II

The Structure of Liquid and Gas Jets in a Supersonic Crossflow.....	896
<i>Shivank Sharma, Ral Bielawski, Venkatramanan Raman</i>	
Experimental Exploration of Aerosolized Liquid Fuel Cloud Detonations.....	915
<i>Taylor R. Brown, Rachel Hytovick, Kareem A. Ahmed</i>	
The Influence of Detailed Chemical Kinetics and Radiation on the Post-Detonation Afterburning of TNT	921
<i>Anthony A. Egel, John C. Hewson, Marc C. Welliver, Ryan W. Houim</i>	
Micro-Jetting Dynamics in Channel Detonations of High-Activation Energy Mixtures.....	938
<i>Ramachandran Suryanarayan, Rudram Dushe, Rachel Hytovick, Liliana Berson, Kareem A. Ahmed, Suo Yang</i>	
Characterization of Hydrogen Detonations Using Emission Spectra	957
<i>Alejandro J. Puerta-Alvarado, Daniel R. Dyson, Hamil Patel, Rodrigo Yuraszeck, Subith Vasu, Ryan W. Houim</i>	

ADVANCED COMBUSTION DESIGN

Pattern Factor and Combustion Efficiency Measurements in a Full-Annular Partially Premixed Pre-Vaporized Small-Scale Combustor	964
<i>Brendan T. Paxton, Joshua Sykes, Brent A. Rankin</i>	
Monolithic Tri-Coaxial Methane-Oxygen Rocket Injector Enabled by Additive-Manufacturing	985
<i>Alex R. Keller, Raymond M. Spearrin, Fabio A. Bendana, Vincent Phong, Andrew Cortopassi</i>	
Thermite-for-Demise (T4D): Charge Shaping Exploratory Tests.....	998
<i>Alessandro Finazzi, Antonio M. Grande, Filippo Maggi</i>	
Additively Manufactured Energetic Solid Fuels in Airbreathing Propulsion	1012
<i>John Patten, Nelson Padilla, Charles R. Clark, Peter Pecic, Hunter Bassett, Daniel Cruz, Kareem A. Ahmed</i>	

COMBUSTION DIAGNOSTICS III

Temperature and Speciation Validation of a Robust Laser Spectroscopic Sensor Over a Steady 1D Flame.....	1020
<i>Marc B. Etienne, Nishan Khanal, Andrew M. DeRusha, Guillermo Barrios Cadenas, Justin Urso, Subith Vasu</i>	
Time-Histories of Nitrogen Oxides Behind Shock Waves With Relevance to Storable Propellant Ignition Kinetics	1027
<i>Benjamin R. Steavenson, Matthew I. Johnson, Daniel I. Pineda</i>	
Rainbow Schlieren Deflectometry for Scalar Measurements in Air-Breathing Propulsion.....	1039
<i>Nelson J. Padilla, John Patten, Charles R. Clark, Daniel Cruz, Kareem A. Ahmed</i>	
Multi-species Time-History Measurements During 1,3-Butadiene and Isoprene Oxidation Behind Reflected Shock Waves	1048
<i>Mohamed Sy, Jiabiao Zou, Ali Elkhazraji, Mohammad Adil, mhanna mhanna, Aamir Farooq</i>	
Shock-Tube Measurements of NH ₂ for Ammonia Kinetics	1058
<i>Matthew Abulail, Claire M. Gregoire, Olivier Mathieu, Eric L. Petersen</i>	

DETONATION COMBUSTION SYSTEMS

Design Changes and Initial Results From a New Detonation Wave Imaging Facility	1069
<i>Nicolas Berube, Daniel R. Dyson, Hamil Patel, Anthony Aguilera, Sydney M. Briggs, Nathaniel Root, Rodrigo Yuraszcek, Subith Vasu</i>	
Experiments and Large Eddy Simulation of Supersonic Combustion in the Small-Scale Flight Experiment	1079
<i>Christer Fureby, Jan Martinez Schramm</i>	
Interaction of Detonation Wave With Flush-Mounted Injector	1095
<i>Jayson C. Small, Liwei Zhang</i>	
Ignition of a Liquid-Fueled Scramjet Using a Pulse Detonation Ignitor	1108
<i>Yuval Aldema-Tshuva, Hertz Kadosh, Joel van der Lee, Rudy Kaner, Dan Michaels</i>	
Performance Analysis of New Modular Turbulator for Improved Detonation Tube Performance.....	1135
<i>Nathaniel Root, Nicolas Berube, Hamil Patel, Anthony Aguilera, Subith Vasu</i>	
Spray-Shock Interactions Downstream of a Converging-Diverging Nozzle	1141
<i>Christopher B. Reuter, Douglas A. Schwer</i>	

DETONATIONS, EXPLOSIONS, AND SUPERSONIC COMBUSTION

Assessment of the Wall Effects on the Cellular Structure by Combined Planar Laser-Induced Fluorescence and Rayleigh Scattering.....	1149
<i>Mhedine Ali Cherif, Samir B. Rojas Chavez, Karl P. Chatelain, Thibault F. Guiberti, Deanna A. Lacoste</i>	
Pressure Field Variations in Near-Limit Gaseous Detonations.....	1159
<i>Joshua Berson, Robyn Cideme, Rachel Hytovick, Kareem A. Ahmed</i>	
The Statistical Variability of Pressure in Propagating Detonations	1166
<i>Marcos I. De La Mora, Joshua Berson, Robyn Cideme, Rachel Hytovick, Kareem A. Ahmed</i>	
Analysis and Simulation of a Detonation Bounded by a Low Impedance Gas	1173
<i>Youssef K. Wahba, XiaoCheng Mi, Charles Kiyanda, Andrew J. Higgins</i>	

Three-Dimensional Micro-Jetting Dynamics in a Stoichiometric H ₂ /Air Detonation	1196
<i>Ramachandran Suryanarayan, Suo Yang</i>	

SPRAY IN HIGH SPEED FLOW

Influences of Ultrasonic Excitation on Breakup and Atomization of Liquid Jets in Crossflow	1211
<i>Charles R. Clark, Sheikh Salaudhin, Kha Nguyen, Kareem A. Ahmed, James Friend</i>	
Transport and Reignition of Unburnt n-Dodecane Fuel Droplets in a Transverse Jet in Supersonic Crossflow	1220
<i>Carson Ramm, Prashant Tarey, John Boles, Tanner Nielsen, Matthew Goodson, Jacob McFarland, Mesbah Uddin, Praveen Ramaprabhu</i>	
An Analysis of State Property Effects for Liquid Jets in High-Speed Crossflows	1232
<i>Justin D. Sprunger, Anirudh Ranganathan, Erik R. Fernandez, Emil Alunno, Kareem A. Ahmed</i>	
Modal Analysis of Liquid Jet-in-Crossflow Interaction With Solid Obstructions	1237
<i>Daniel S. Cruz, Charles R. Clark, Sheikh Salaudhin, Kareem A. Ahmed</i>	
The Effects of Momentum Flux Ratio and Airflow Temperature on a Fuel Injector With a Solid Obstruction in Subsonic Flow	1247
<i>Egan J. Rigney, Daniel Cruz, Charles R. Clark, Kareem A. Ahmed</i>	

DROPLET AND SPRAY COMBUSTION

Withdrawn: High-Pressure Droplet Combustion of Boron Loaded Gel Fuel for Ramjet Application	1257
<i>Ritesh Dubey, Sumit K. Gupta, Srinibas Karmakar</i>	
Experimental Investigation Into the Impact of Flow Dynamics on Glycerol Combustion Within a Swirl-Stabilized Combustor	1258
<i>Sukesh Sharma, Yogesh Biswal, Ketan V. Warghat, Mebougna Drabo, Pankaj S. Kolhe</i>	
Investigation of Cloud Group Evaporation in Combustion Environments	1268
<i>Khaoula Chougag, Max Fortin, Anthony Morales, Sheikh Salaudhin, Kareem A. Ahmed</i>	
Investigation of Hot surface Fuel Spray Ignition for Bio Derived Fuel Blends	1275
<i>Matthew K. Voigt, Sheikh Salaudhin, Kareem A. Ahmed</i>	
Experimental Investigation of the Thermo-Acoustic Response of Lean Spray Flame Combustion.....	1283
<i>Yogesh Biswal, Sukesh Sharma, Ketan V. Warghat, Guguloth M. Nayak, Mebougna Drabo, Pankaj S. Kolhe</i>	

SHOCK TUBES

Error In Shock Tube Ignition Delay Time Predictions Due to Bifurcation and Boundary Layer Effects.....	1293
<i>Ez A. Hassan, Mitchell D. Hageman, Michael S. Knadler, Stephen Lucas</i>	
Combustion-Driven Miniature Shock Tube With In-Situ Oxyhydrogen Generation: Energy and Impulse Analysis	1305
<i>Janardhanraj Subburaj, Adolfo R. Piminchumo Sausa, Aamir Farooq</i>	
Shock Tube Measurements of Sustainable Aviation Fuel Sooting Tendencies for Supersonic Commercial Transport	1318
<i>Koby Rouviere, Diego Ruiz-Pena, Juan Cruz Pellegrini, Jonathan Sanchez, Louis A. Vest, Ramees Rahman, Jacklyn P. Higgs, Subith Vasu, Farhan Arafin</i>	
Contact Surface Tailoring for Oxy-Fuel Ignition in a Shock Tube	1327
<i>Matthew G. Sandberg, Eric L. Petersen</i>	

Shock Tube Study of HTPB Pyrolysis Products at SFRJ Combustor Conditions	1347
<i>Juan Cruz Pellegrini, Diego Ruiz Pena, Louis A. Vest, Koby Rouviere , Jacklyn P. Higgs, Ramees Rahman, Farhan Arafin, Subith Vasu</i>	

Experimental and Numerical Study of Shock Dynamics in Double Diaphragm Shock Tubes	1354
<i>Touqeer Anwar Kashif, Janardhanraj Subburaj, Md Zafar Ali Khan, Aamir Farooq</i>	

FUELS AND ENERGETIC MATERIALS I

The Combustion Response of Liquid Methane and Oxygen Mixtures to Pyrotechnic Ignition	1370
<i>Zachary Negrette, Scott Jackson, Shervin Taghavi, Don Li, Elan Borenstein</i>	

NO and CO Measurements During Combustion of NG/H ₂ /NH ₃ Mixtures at High Pressure Inside a Shock Tube	1381
<i>Michael Pierro, Braden Venger, Cooper Mills, Amelia Marty, Christopher W. Dennis, Justin Urso, Ramees Khaleel Rahman, Subith Vasu</i>	

Frictional Ignition of Dissimilar-Metal Sliding Contacts in High-Pressure Oxygen.....	1388
<i>Andres Garcia Jimenez, Zachary C. Cordero, Fabio A. Bendana, Timothy M. Wabel, John D. Desain</i>	

Effects of Particle Size and Mixture Composition on Propulsive Performance of Gelled and Refrigerated Aluminum-Liquid Oxidizer Propellants	1411
<i>Ganeshkumar V, Dilip Srinivas Sundaram</i>	

HYDROGEN AND AMMONIA COMBUSTION

Experimental Investigation of Low-NO _x H ₂ Combustion Using Simultaneous Raman and LIF Spectroscopy	1425
<i>Zeinab Al Hadi, Suman Basnet, Sylvain Marragou, Priybrat Sharma, Thierry Schuller, Thibault F. Guiberti, Gaetano Magnotti</i>	

The Combustion Characteristics of NH ₃ /H ₂ Flames Inside a Radial Porous Media Burner	1435
<i>Guguloth M. Nayak, Silky Elanjickal, Beni Cukurel, Joseph Lefkowitz</i>	

100 kHz OH PLIF of High-Pressure H ₂ /NH ₃ and H ₂ /CH ₄ Flames	1442
<i>Alexander J. Hodge, Tristan T. Shahin, Rohan Gejji, Robert P. Lucht, Carson D. Slabaugh</i>	

Numerical Study of NH ₃ /H ₂ /Air Ignition in Nanosecond Plasma Discharges With Non-Equilibrium Energy Transfer	1454
<i>Zhiyu Shi, Xingqian Mao, Yiguang Ju</i>	

Experimental Investigation of Hydrogen- Air Flame Dynamics in Rectangular Closed Combustion Chambers of Variable Lengths	1461
<i>Manas Jain, Abhishek Kumar, Sandeep Pandey, Ratan Joarder</i>	

Comparative Analysis of Emissions and Flame Structures in Plasma-Assisted Ammonia and Ammonia/Hydrogen Flames	1469
<i>Hao Tang, Griffin Rahn, Evangelos Chatziandreou, Wenting Sun</i>	

FUELS AND ENERGETIC MATERIALS II

Burning Rate of AP/HTPB-Based Solid Rocket Propellants Containing Metal-Organic Framework Additives	1476
<i>Tanner G. Swindell, Thomas E. Sammet, Eric L. Petersen</i>	

DME-Propane Blends Ignition Experiments and Modeling for Heavy-Duty Mixing Controlled Compression Engines	1487
<i>Zuhayr Pasha Mohammed, Michael Pierro, Christopher W. Dennis, Aaron C. Guenther, Justin Urso, Ramees Rahman, Subith Vasu</i>	
Sensing Fuel Enthalpy of Vaporization From IR Spectra: Comparison of Model Approaches	1493
<i>Alice Moro, Ashish Sutar, Abhinav Abraham, Eric Mayhew, Kenneth Brezinsky, Patrick T. Lynch</i>	
Experimental Investigation of Hotspot Formation in HMX-Based Plastic-Bonded Explosives Under Shock Compression	1513
<i>Dhanalakshmi Sellan, Dana Dlott</i>	
Shock Driven Ignition and Acceleration of Reactive Particles.....	1521
<i>James Hearon, Rachel Hytovick, Kareem A. Ahmed</i>	

TURBULENT COMBUSTION

Large-Eddy Simulations of Soot Formation and Dispersion in Rich-Burn Quick-Mix Lean-Burn (RQL) Spray Combustor	1524
<i>Shubham B. Karpe, Suresh Menon</i>	
Multidimensional Chemistry Coordinate Mapping for Large Eddy Simulations of a Turbulent Premixed Bluff-Body Burner	1536
<i>Pierre Vauquelin, Yuchen Zhou, Arvid Åkerblom, Christer Fureby, Xue-Song Bai</i>	
Compressibility-Turbulence-Combustion Interaction in a Scramjet Flowpath	1553
<i>Jagmohan Singh, Shivank Sharma, Venkatramanan Raman</i>	
LES Investigation on the Supersonic Turbulent Combustion in Dual Combustion Ramjet Engine	1567
<i>Min-Seon Jo, Bu-Kyeng Sung, Seung-Min Jeong, JeongYeol Choi, Vigor Yang, Umesh Unnikrishnan</i>	
Large Eddy Simulation of Thermoacoustic Instabilities in Bluff-Body Stabilized Flames.....	1573
<i>Björn Jarfors, Christer Fureby</i>	
Direct and Indirect Combustion Noise Prediction in a Rich-Quench-Lean Combustor Using a Large Eddy Simulation.	1591
<i>Leo M. Kastenber, Achyut Panchal, Suresh Menon</i>	

FLAME DYNAMICS

Laminar Burning Speed Measurements of Dimethyl Ether/Air Mixtures in a Spherical Chamber.....	1603
<i>Ahmed F. Safdari, Gihun Kim, Ramees Rahman, Subith Vasu</i>	
Effect of Vortex Stretching on Flame Heat Release Rate Modulations	1610
<i>Saisanthosh G. Iyer, Ramakrishnan C, Amardip Ghosh</i>	
Nonpremixed Flames Near the Leading Edge of Parabolic Cylinders With Unity Lewis Numbers	1620
<i>Jose M. Martinez, Vinicius Maron Sauer</i>	
Investigation of Extinction Strain Rates and NH ₂ Concentrations in NH ₃ Counterflow Diffusion Flames	1629
<i>Srujan H. Gubbi, Bo Peng, Hao Tang, Rahul Vishwanath, Wenting Sun</i>	
Computational Investigation of Laminar Premixed Hydrogen/Ammonia Flames at Sub-Atmospheric Conditions	1637
<i>Davud Tule, Efsthathios-Al. Tingas</i>	

Author Index