2024 Spring Technical Meeting of the Central States Section of The Combustion Institute
Case Western Reserve University, Cleveland, OH
12 – 14 May 2024

Sunday, 12 May 2024

4:00 – 6:30 Registration: Nord Hall Atrium at Case School of Engineering
6:00 – 8:00 Welcome Reception: Nord Hall Atrium at Case School of Engineering

Monday, 13 May 2024

All Technical Sessions are held at the Tinkham Veale University Center

7:30 - 4:00 Registration: Second-Floor Grand Ballroom Foyer
7:00 - 8:00 Continental Breakfast: Second-Floor Grand Ballroom
8:00 – 8:15 Opening Remarks and Announcements in Second-Floor Grand Ballroom
Waruna Kulatilaka, Chair, CSSCI; **Robert Gao**, Department Chair, CWRU MAE; and **Ya-Ting Liao**, Local Host

8:15 - 9:15 James E. Peters Plenary Lecture in Second-Floor Grand Ballroom**: Prof. Carlos Fernandez- Pello,** University of California, Berkeley
Title: *Wildland fire spot ignition and subsequent growth*
Chair: W. Kulatilaka

9:15 - 9:25	**Transition to Morning Sessions**			
	Reaction Kinetics **Ballroom A** **Chair: C.R. Mulvihill**	**Diagnostics** **Ballroom B** **Chair: E.L. Braun**	**Fire** **Ballroom C** **Chair: S.F. Son**	**Internal Combustion Engines** **Senior Classroom** **Chair: S. Biswas**
9:25 - 9:45	**1A01: Chemical kinetic study of the flame-retardant effect of bis(2,2,2-trifluoroethyl) carbonate on ethyl methyl carbonate combustion** *C. Grégoire, Y.M. Almarzooq, M. Khan-Ghauri, P. Diévart, L. Catoire, E.L. Petersen, O. Mathieu*	**1B01: The use of NH radical as a heat release rate surrogate for atmospheric ammonia-hydrogen flames** *A.P. Hardaya, M. Hay, B.S. Soriano, J.H. Chen, W.D. Kulatilaka*	**1C01: Limiting oxygen volume fraction for flame spread extinction** *C. Liveretou, C. Scudiere, J. Rivera, L. Estenbach, C. Fernandez-Pello, M. Gollner*	**1D01: Investigation on effectiveness and misfire behaviors of pre-chamber combustion at idle speed** *C. Zhu, A. Diagne, M.S. Wooldridge*
9:45 - 10:05	**1A02: High-pressure shock-tube ignition of syngas under high-CO_2 dilution** *M. Abulail, M. Intardonato, M. Hay, S.P. Cooper, O. Mathieu, W.D. Kulatilaka, E.L. Petersen*	**1B02: Flame flashback investigations in hydrogen-enriched low swirl flames using high-speed OH planar laser-induced fluorescence** *P. Parajuli, P. Strakey*	**1C02: Numerical simulation of fire and thermal runaway propagation of lithium-ion batteries** *B. Wang, P. Kannan, Y.-T. Liao, M. Parhizi, B. Kwon, S. Madhi, V. Premnath, J. Jeevarajan*	**1D02: Predictive zero-dimension combustion modeling in internal combustion engines with residual fraction and exhaust gas recirculation** *C. Feyijimi, C. Depcik*

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10:05 - 10:25	**1A03: Assessing the homogeneity of propane/air ignition behind reflected shock waves** *M.G. Sandberg, D. Nativel, S.P. Cooper, M. Intardonato, M.K. Hay, M. Fikri, J. Herzler, W.D. Kulatilaka, E.L. Petersen, C. Schulz*	**1B03: Evaluation of UNIFAC group composition of gasoline using two-dimensional gas chromatography** *J.P. Chethalan, P.T. Lynch, K. Brezinsky*	**1C03: Lateral flame spread over thermally thin fuels in the presence of cross-flow due to forced or natural convection** *S. Bhattacharjee, F. Panzer*	**1D03: Evaluation of reduced order modelling of jet fuel combustion within military diesel engines** *J.A. Piehl, M. Tess*
10:25 - 10:45	**1A04: Enhancement of weak absorption signals in high throughput shock tube through ensemble averaging** *A. Moro, R.A. Shaik, A. Sutar, P. Lynch*	**1B04: Improving property predictions for jet fuels with NDIR channel optimization** *A. Sutar, K. Brezinsky, P.T. Lynch*	**1C04: Characterization of 18650 single and multi-cell thermal runaway** *P. Kannan, B. Wang, Y.-T. Liao, B. Kwon, M. Parhizi, S. Madhi, V. Premnath, J. Jeevarajan*	**1D04: Sensitivity of inlet port geometry on main chamber mixing study** *K. Beurlot, T. Jacobs*
10:45 - 11:00	**BREAK - Second-Floor Grand Ballroom Foyer**			
	Reaction Kinetics Ballroom A Chair: M.G. Sandberg	**Combustion Theory and Modeling Ballroom B Chair: R. Sivaramakrishnan**	**Novel Combustion Techniques Ballroom C Chair: D. Dasgupta**	**Internal Combustion Engines Senior Classroom Chair: K. Srinivasan**
11:00 - 11:20	**1A05: Experimental and detailed kinetics modeling study of bis(2,2,2-trifluoroethyl) carbonate, a fire suppressant for lithium-ion batteries** *M. Khan-Ghauri, C.M. Grégoire, K. Kanayama, P. Diévart, S. Takahashi, T. Tezuka, H. Nakamura, L. Catoire, K. Maruta, E.L. Petersen, O. Mathieu*	**1B05: Revisiting the laminar methane/hydrogen/air counterflow diffusion flame** *K. Pempek, B.K. Murdock, J.P. Gore, R.P. Lucht*	**1C05: Non-intrusive flame structure identification strategy for flame type identification in a premixed swirl burner** *C. Goertemiller, W. Northrop*	**1D05: Turbulent jet ignition using nanosecond pulsed discharge in an optical constant volume chamber** *D. Sen, S. Biswas*
11:20 - 11:40	**1A06: Study of low-to-moderate temperature oxidation of 1,2,4-trimethylbenzene/n-heptane blends** *S. Hossain, M. Abdulrahman, P. Lynch, K. Brezinsky*	**1B06: Analysis of coupled radiative flamelet generated manifolds for solid fuel opposed flow flame spread in microgravity** *K.L. Budzinski, P.E. DesJardin*	**1C06: Wood stove with forced convection for rich quench lean combustion** *A. McClinton, A.K. Agrawal*	**1D06: Optical investigation of propane-dimethyl ether (DME) fuel blends under compression-ignition engine conditions** *S. Doyle, D.A. Rothamer*

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11:40 - 12:00	**1A07: Autoignition characteristics of ammonia-dimethyl ether blends** *T. Goyal, J. Klein, O. Samimi-Abianeh*	**1B07: A localized kernel ridge regression approach for estimating chemical reaction rates** *O. Ukorigho, O. Owoyele*	**1C07: Multidimensional modeling of plasma assisted ignition using Gaussian process regression** *I. Kabil, C. Xu, T. Lu*	**1D07: 235ICEQ-0076 BTEX emissions from a gasoline direct injection engine operating on non-oxygenated gasoline and E10** *T.S. Patil, B.M. Wilmer, W.F. Northrop*
12:00 - 12:20	**1A08: OUT-21 Toward predictive pressure-dependent kinetics for non-adiabatic reactions** *C.R. Mulvihill, A.W. Jasper, Y. Georgievskii, S.J. Klippenstein*	**1B08: Towards integration of a Pareto-efficient combustion modeling framework into high-order Nek5000 spectral element CFD solver** *T. Kumar, P. Sharma, M. Ameen, P. Pal, C. Xu, M. Ihme*	**1C08: Design and analysis of a constant-volume strand burner apparatus** *T.G. Swindell, T.E. Sammet, F.A. Rodriguez, E.L. Petersen*	
12:30 - 1:30	**LUNCH – Second-Floor Grand Ballroom** **CSSCI Business Meeting - Second-Floor Grand Ballroom**			
1:30 - 2:30	**Plenary Lecture** in Second-Floor Grand Ballroom**: Prof. Ajay Agrawal,** The University of Alabama **Title:** *From Optical Spray Diagnostics to Peripheral Fuel Injection (PeFI): Advancing Diesel Combustion for High-Efficiency and Low-Emissions* **Chair:** R. Sankaran			
2:30 – 2:40	**Transition to Afternoon Sessions**			
	Reaction Kinetics Ballroom A Chair: O. Mathieu	**Diagnostics Ballroom B Chair: P.T. Lynch**	**Fire Ballroom C Chair: T. Hafiz**	**Industrial & Applied Combustion Senior Classroom Chair: T. Robertson**
2:40 - 3:00	**1A09: Initiation and secondary reactions in the pyrolysis of tetramethylsilane** *R. Sivaramakrishnan, A.W. Jasper, R.S. Tranter*	**1B09: Simultaneous imaging of OH* and CH* chemiluminescence in the exhaust of a rotating detonation engine** *A. James, A.K. Agrawal*	**1C09: Effects of ambient pressures and oxygen on upward flame spread** *R. Neupane, Y.-T. Liao*	**1D09: Assessing slagging impact and optimizing coal blends in coal-fired boilers: A combined CFD evaluation and optimization method** *A.D. Gutierrez, S. Saenz, J.J. Acuña*
3:00 - 3:20	**1A10: A physics-constrained autoencoder-NeuralODE framework for learning complex hydrocarbon fuel chemistry: Methane combustion kinetics** *T. Kumar, A. Kumar, P. Pal*	**1B10: Temperature imaging in H_2 blended NH_3 flames using femtosecond NO LIF** *M.K. Hay, M. Suarez, S. Pias, W.D. Kulatilaka*	**1C10: Study of flaming firebrand using numerical modeling and background oriented Schlieren visualization** *A.A. Naqvi, B.E. Schmidt, Y.-T.T. Liao*	**1D10: In pursuit of multifunctional composites for energetic and pressure sensing applications** *M. Örnek, C.T. V. Nunes, T.A. Hafner, S.F. Son*

	Reaction Kinetics Ballroom A Chair: O. Mathieu	Diagnostics Ballroom B Chair: P.T. Lynch	Fire Ballroom C Chair: T. Hafiz	Industrial & Applied Combustion Senior Classroom Chair: T. Robertson
3:20 - 3:40	**1A11: Experimental and fuel-surrogates modeling study of the oxidation of specialty jet fuels** *M. Abdulrahman, S. Hossain, M. Sheyyab, P.T. Lynch, K. Brezinsky*	**1B11: Applicability of flame chemiluminescence in liquid-fueled flames: Sensing and modelling** *J. Schihl, A. Gandomkar, P.M. Allison*	**1C11: Spacecraft habitability results from the Saffire VI experiment** *D.L. Urban, G.A. Ruff, P. Ferkul, J. Easton, M. Johnston, J. Owens, S. Olson, C. Fortenberry, J. Graf, O. George, B. Toth, F. Meyer, C. Eigenbrod, J.S. T'ien, Y.-T. T. Liao, C. Fernandez-Pello, G. Legros, A. Guibaud, N. Smirnov, O. Fujita, U. Rojas Alva, G. Jomaas*	**1D11: Flame characteristics of ammonia-dimethyl ether blends at high gas temperature and pressure** *T. Goyal, O. Samimi-Abianeh*
3:40 - 4:00	**1A12: Measuring H abstraction rates in F + butene using absorption spectroscopy in a miniature shock tube** *R.A. Shaik, R. Sivaramakrishnan, S. Hossain, K. Brezinsky, P.T. Lynch*	**1B12: Simultaneous NO and H atom imaging in flames using femtosecond LIF** *M.A. Suarez, M.K. Hay, W.D. Kulatilaka*	**1C12: Effect of bed size on flammability of Indian tropical forest litter** *H.B. Gaikwad, A. Kumar*	**1D12: Flame speed of ammonia-hydrogen blends at high gas temperatures and pressures** *J. Douvry-Rabjeau, T. Goyal, J. Klein, P. Zoldak, O. Samimi-Abianeh*
4:00 - 4:15	**BREAK - Second-Floor Grand Ballroom Foyer**			
		Detonations Ballroom B Chair: M. McClain	**Fire Ballroom C Chair: J. Han**	**Droplets and Sprays Senior Classroom Chair: V. Nayagam**
4:15 - 4:35		**1B13: Cryogenic extension of NASA species polynomials using hydrogen and oxygen at stoichiometry** *R.P. Thacker, Z. Harris, B. Maxwell*	**1C13: Heat release rate and thermal runaway propagation in lithium-ion batteries using surrogate cells** *K. Cartwright, P. Kannan, Y. Gu, C. Yuan, Y.-T. Liao*	**1D13: Droplet combustion dynamics of liquid fuels enhanced with carbon dots** *A.S.M. Sazzad Parveg, A. Ratner*
4:35 - 4:55		**1B14: Supersonic deflagration of hydrogen-air mixture** *J. Klein, T. Goyal, O. Samimi-Abianeh*	**1C14: Experimental and numerical approaches to optimize heat blocking efficiency in intumescent coatings.** *T. Hafiz, J. Covello, G. Wnek, Y.-T. Liao, A. Yousefi, A.K. Melaiye*	**1D14: Exploring the potential of nanocellulose as an additive in liquid fuels to improve combustion performance** *R. Mollick, A. Ratner*

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4:55 - 5:15		**1B15: Comparison of upstream-normal and upstream-angled fuel injection schemes in a generic scramjet combustor** *E.L. Braun, S.D. Hammack, T.M. Ombrello*	**1C15: Near-surface thermometry of solid fuel polyoxymethylene counterflow diffusion flame using hybrid fs/ps CARS** *S. Bidwai, G. Young, J.B. Michael*	**1D15: Investigating the influence of fueling strategies and spark on combustion instability for a single cylinder two-stroke natural gas engine** *F. Pommier, E. Stewart, T. Jacobs*
5:15 - 5:35		**1B16: Model of traversing turbulent jet ignition in a wave rotor combustor** *M. Jamshidnejad, S. Ghadiri, M.R. Nalim*	**1C16: Dual-pump coherent anti-Stokes Raman scattering thermometry and major species concentration measurements of H_2/CH_4 counterflow diffusion flames** *B.K. Murdock, K. Pempek, V. De La Trinidad, J.P. Gore, R.P. Lucht*	**1D16: Experimental investigation of water addition effects on diesel/kerosene/butanol spray combustion instability** *A. Kumar, S.M. Basha, S. Yang*
6:00 - 9:00	**Banquet at the Cleveland Museum of Natural History** 1 Wade Oval Dr, Cleveland, OH 44106 **Banquet Lecture: Prof. Harsha Chelliah,** University of Virginia **Title:** *From Fire Research to High-Speed Propulsion Systems – Fundamental Combustion Research Supported by National Science Foundation* **Chair:** Y.-T. Liao			

Tuesday, 14 May 2024

All Technical Sessions are held at the Tinkham Veale University Center

7:30 - 11:00 **Registration:** Second-Floor Grand Ballroom Foyer
7:00 - 8:00 **Continental Breakfast:** Second-Floor Grand Ballroom
8:00 - 8:05 **Announcements** in Second-Floor Grand Ballroom
Bryan Schmidt, Local Host

8:05 - 9:05 **Plenary Lecture** in Second-Floor Grand Ballroom**: Prof. Sayan Biswas,** The University of Minnesota
Title: *Plasma in Energy Research*
Chair: K. Srinivasan

9:05 - 9:15	**Transition to Morning Sessions**			
	Laminar Flames **Ballroom A** **Chair: D.E. Thomas**	**Industrial and Applied Combustion** **Ballroom B** **Chair: K. Ajmani**	**Alternative Fuels and Emissions** **Ballroom C** **Chair: S. Roy**	**Particulates and Multiphase Flows** **Senior Classroom** **Chair: J. Kojima**
9:15 - 9:35	**2A01: Experimental measurements of ammonia flame thickness from spherically propagating flames** *Y.M. Almarzooq, M. Hay, W.D. Kulatilaka, E.L. Petersen*	**2B01: An engineering approach to explosion vent sizing** *B. O'Bryan, C. Engebretson, C. Allen*	**2C01: Impact of fuel properties on lean blow out for sustainable aviation fuels** *D. Dasgupta, S. Som*	**2D01: Particle-scale simulation for co-firing biomass with coal to study interactions between two particles with realistic morphology** *D. Liang*
9:35 - 9:55	**2A02: Near-limit quenching behavior of low stretch diffusion flames in microgravity** *C. Li, J.S. T'ien, P.V. Ferkul, S.L. Olson, M.C. Johnston*	**2B02: Influence of blowoff procedure on flowfield and combustion phenomena near lean blowout in a swirl-stabilized liquid spray combustor** *N.C. Guntapalli, M. Gurunadhan, S. Menon*	**2C02: Review of sustainable aviation fuels and their combustion properties** *U.L. Costa, E.L. Petersen*	**2D02: On the development of non-intrusive diagnostics for a slab burner experiment** *E. Katz Ismael, K. Retfalvi, P.E. DesJardin*
9:55 - 10:15	**2A03: Measurement of MTBE and ETBE laminar flame speeds in air** *J.E. Jacobs, Y. Almarzooq, I. Parvez, E.L. Petersen*	**2B03: Cantera reactor network modeling of a domestic wood stove and comparisons to measurement** *L.G. Shankar, P.E. DesJardin*	**2C03: A multifidelity machine learning approach for predicting NOx emissions in a double-staged combustor** *P. John, V. Viswamithra, M. Gurunadhan, S. Menon, O. Owoyele*	**2D03: Flame propagation in stratified dust-air mixtures** *C. Engebretson, C. Allen*
10:15 - 10:35	**2A04: The ignition stage of dynamic flame behaviors in the mesoscale sudden-expansion** *S.-Y. Hsu, J.-H. Huang, C.-H. Tsai*		**2C04: A numerical study of NOx and soot emissions in *n*-heptane/methyl decanoate counterflow diffusion flames** *R. Suresh, C. Xu, S.K. Aggarwal*	**2D04: Measurements of soot emissions in high-pressure non-premixed n-heptane flames** *F.J. Guzman, J. Kojima, J. Klettlinger*

10:35 - 10:50	BREAK - Second-Floor Grand Ballroom Foyer		
	Laminar Flames **Ballroom A** **Chair: T. Goyal**	**Turbulent Combustion** **Ballroom B** **Chair: P.M. Allison**	**Alternative Fuels and Emissions** **Ballroom C** **Chair: S. Menon**
10:50 - 11:10	**2A05: Development of high efficiency heat extraction system to be used with wood fired heating systems** *A. Ghorashi, A.K. Agrawal, B. Khandelwal*	**2B05: Turbulent spherical flames in a constant-volume fan-stirred vessel** *N. Lindblade, M. Turner, Y. Almarzooq, E.L. Petersen*	**2C05: CFD evaluation of radial airflow lean direct injectors for commercial supersonics technology** *K. Ajmani*
11:10 - 11:30	**2A06: Hexamethyldisiloxane (HMDSO) impact on spherical propagating methane flame speeds** *Q. Meng, P. Dunphy, R. Ramesh, M. Gamba, M. Wooldridge*	**2B06: Turbulent burning velocity of lean premixed hydrogen/air flames at engine-relevant conditions** *Y. Wang, C. Xu, R. Scarcelli*	**2C06: Comparison of high-speed images of lean blowout for four national jet fuel combustion program fuels** *K.M. Tacina, T.G. Capil, Y.R. Hicks*
11:30 - 11:50	**2A07: The effects of pressure and optical thickness on radiative losses in spherical diffusion flames in microgravity** *K.A. Waddell, D.L. Dietrich, V. Nayagam*	**2B07: Investigating combustion dynamics through an optical pre-chamber** *A. Dhotre, S. Biswas*	**2C07: Design, calibration and validation of a robust and reliable nanofuel stability analyzing device** *W. Steiner, N. Nagarkar, R. Mollick, A. Ratner*
11:50 - 12:10	**2A08: Ammonia-hydrogen flame extinction at low and intermediate temperatures** *D.E. Thomas, J.C. Jarosz, W. Schutte*	**2B08: Flame characterization of a NASA Glenn natural gas and oxygen burner rig facility** *T.G. Capil, M.J. Presby, Y.R. Hicks*	**2C08: Development of an experimental apparatus for the study of fuel deposits at high temperatures** *A. Lira, R. Juárez, C. Loebick, E.L. Petersen*
12:10	**Box Lunches – Second-Floor Grand Ballroom Foyer** **Adjourn**		
1:00	**Facility Tours NASA Glenn and Fives North American Combustion Inc. Tours for those who registered.** **Bus leaves CWRU at 1:00** **11038-11112 Bellflower Rd**		

2024 CSSCI SPRING TECHNICAL PAPER OVERVIEW AUTHORS