

**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:
6:00 – 8:00 Welcome Reception:

Monday, 13 May 2024

7:30 - 4:00 Registration:
7:00 - 8:00 Continental Breakfast:
8:00 – 8:15 Opening Remarks and Announcements
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: Prof. Carlos Fernandez- Pello, University of California, Berkeley
Title: *Wildland fire spot ignition and subsequent growth*
Session Chair:

9:15 - 9:25	Transition to Morning Sessions			
	Reaction Kinetics Session Chair:	Diagnostics Session Chair:	Fire Session Chair:	Internal Combustion Engines Session Chair:
09:25 - 9:45	1A01: 235RKQ-0009 Chemical kinetic study of the flame-retardant effect of bis(2,2,2-trifluoroethyl) carbonate on ethyl methyl carbonate combustion <i>C. Grégoire, Y.M. Almarzooq, M. Khan-Ghauri, P. Diévert, L. Catoire, E.L. Petersen, O. Mathieu</i>	1B01: 235DIAQ-0011 The use of NH radical as a heat release rate surrogate for atmospheric ammonia-hydrogen flames <i>A.P. Hardaya, M. Hay, B.S. Soriano, J.H. Chen, W.D. Kulatilaka</i>	1C01: 235FRQ-0023 Limiting oxygen volume fraction for flame spread extinction <i>C. Liveretou, C. Scudiere, J. Rivera, L. Estenbach, C. Fernandez-Pello, M. Gollner</i>	1D01: 235IACQ-0008 Investigation on effectiveness and misfire behaviors of pre-chamber combustion at idle speed <i>C. Zhu, A. Diagne, M.S. Wooldridge</i>
9:45 - 10:05	1A02: 235RKQ-0010 High-pressure shock-tube ignition of syngas under high-CO₂ dilution <i>M. Abulail, M. Intardonato, M. Hay, S.P. Cooper, O. Mathieu, W.D. Kulatilaka, E.L. Petersen</i>	1B02: 235DIAQ-0012 Flame flashback investigations in hydrogen-enriched low swirl flames using high-speed OH planar laser-induced fluorescence <i>P. Parajuli, P. Strakey</i>	1C02: 235FRQ-0041 Numerical simulation of fire and thermal runaway propagation of lithium-ion batteries <i>B. Wang, P. Kannan, Y.-T. Liao, M. Parhizi, B. Kwon, S. Madhi, V. Premnath, J. Jeevarajan</i>	1D02: 235ICEQ-0028 Predictive zero-dimension combustion modeling in internal combustion engines with residual fraction and exhaust gas recirculation <i>C. Feyijimi, C. Depcik</i>

	Reaction Kinetics Session Chair:	Diagnostics Session Chair:	Fire Session Chair:	Internal Combustion Engines Session Chair:
10:05 - 10:25	1A03: 235RKQ-0015 Assessing the homogeneity of propane/air ignition behind reflected shock waves <i>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</i>	1B03: 235DIAQ-0026 Evaluation of UNIFAC group composition of gasoline using two-dimensional gas chromatography <i>J.P. Chethalan, P.T. Lynch, K. Brezinsky</i>	1C03: 235FRQ-0048 Lateral flame spread over thermally thin fuels in the presence of cross-flow due to forced or natural convection <i>S. Bhattacharjee, F. Panzer</i>	1D03: 235ICEQ-0030 Evaluation of reduced order modelling of jet fuel combustion within military diesel engines <i>J.A. Piehl, M. Tess</i>
10:25 - 10:45	1A04: 235RKQ-0054 Enhancement of weak absorption signals in high throughput shock tube through ensemble averaging <i>A. Moro, R.A. Shaik, A. Sutar, P. Lynch</i>	1B04: OUT-09 Improving property predictions for jet fuels with NDIR channel optimization <i>A. Sutar, K. Brezinsky, P.T. Lynch</i>	1C04: 235FRQ-0055 Characterization of 18650 single and multi-cell thermal runaway <i>P. Kannan, B. Wang, Y.-T. Liao, B. Kwon, M. Parhizi, S. Madhi, V. Premnath, J. Jeevarajan</i>	1D04: 235ICEQ-0043 Sensitivity of inlet port geometry on main chamber mixing study <i>K. Beurlot, T. Jacobs</i>
10:45 - 11:00	BREAK			
	Reaction Kinetics Session Chair:	Combustion Theory and Modeling Session Chair:	Novel Combustion Techniques Session Chair:	Internal Combustion Engines Session Chair:
11:00 - 11:20	1A05: 235RKQ-0033 Experimental and detailed kinetics modeling study of bis(2,2,2-trifluoroethyl) carbonate, a fire suppressant for lithium-ion batteries <i>M. Khan-Ghauri, C.M. Grégoire, K. Kanayama, P. Diévert, S. Takahashi, T. Tezuka, H. Nakamura, L. Catoire, K. Maruta, E.L. Petersen, O. Mathieu</i>	1B05: 235CTMQ-0047 Revisiting the laminar methane/hydrogen/air counterflow diffusion flame <i>K. Pempek, B.K. Murdock, J.P. Gore, R.P. Lucht</i>	1C05: 235NCTQ-0020 Flame structure and emissions from premixed ammonia combustion in a novel vortex tube burner <i>C. Goertemiller, W. Northrop</i>	1D05: 235ICEQ-0080 Turbulent jet ignition using nanosecond pulsed discharge in an optical constant volume chamber <i>D. Sen, S. Biswas</i>
11:20 - 11:40	1A06: 235RKQ-0042 Study of low-to-moderate temperature oxidation of 1,2,4-trimethylbenzene/n-heptane blends <i>S. Hossain, M. Abdulrahman, P. Lynch, K. Brezinsky</i>	1B06: 235CTMQ-0059 Analysis of coupled radiative flamelet generated manifolds for solid fuel opposed flow flame spread in microgravity <i>K.L. Budzinski, P.E. DesJardin</i>	1C06: 235NCTQ-0038 Wood stove with forced convection for rich quench lean combustion <i>A. McClinton, A.K. Agrawal</i>	1D06: 235ICEQ-0058 Optical investigation of propane-dimethyl ether (DME) fuel blends under compression-ignition engine conditions <i>S. Doyle, D.A. Rothamer</i>

	Reaction Kinetics Session Chair:	Combustion Theory and Modeling Session Chair:	Novel Combustion Techniques Session Chair:	Internal Combustion Engines Session Chair:
11:40 - 12:00	1A07: 235RKQ-0046 Autoignition characteristics of ammonia-dimethyl ether blends <i>T. Goyal, J. Klein, O. Samimi-Abianeh</i>	1B07: 235CTMQ-0070 A localized kernel ridge regression approach for estimating chemical reaction rates <i>O. Ukorigho, O. Owoyele</i>	1C07: 235NCTQ-0087 Multidimensional modeling of plasma assisted ignition using Gaussian process regression <i>I. Kabil, C. Xu, T. Lu</i>	1D07: 235ICEQ-0076 BTEX emissions from a gasoline direct injection engine operating on non-oxygenated gasoline and E10 <i>T.S. Patil, B.M. Wilmer, W.F. Northrop</i>
12:00 - 12:20	1A08: OUT-21 Toward predictive pressure-dependent kinetics for non-adiabatic reactions <i>C.R. Mulvihill, A.W. Jasper, Y. Georgievskii, S.J. Klippenstein</i>	1B08: OUT-03 Towards integration of a Pareto-efficient combustion modeling framework into high-order Nek5000 spectral element CFD solver <i>T. Kumar, P. Sharma, M. Ameen, P. Pal, C. Xu, M. Ihme</i>		1D08: 235ICEQ-0049 Effect of injector type and intake boosting on combustion, performance and emission characteristics of a spray-guided gasoline direct injection engine – A computational fluid dynamics study <i>R. Kumar, S. Bhaduri, J.M. Mallikarjuna</i>
12:30 - 1:30	LUNCH – CSSCI Business Meeting			
1:30 - 2:30	Plenary Lecture: 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 Session Chair:			
2:30 – 2:40	Transition to Afternoon Sessions			
	Reaction Kinetics Session Chair:	Diagnostics Session Chair:	Fire Session Chair:	Industrial & Applied Combustion Session Chair:
2:40 - 3:00	1A09: OUT-10 Initiation and secondary reactions in the pyrolysis of tetramethylsilane <i>R. Sivaramakrishnan, A.W. Jasper, R.S. Tranter</i>	1B09: 235DIAQ-0039 Simultaneous imaging of OH* and CH* chemiluminescence in the exhaust of a rotating detonation engine <i>A. James, A.K. Agrawal</i>	1C09: 235FRQ-0063 Effects of ambient pressures and oxygen on upward flame spread <i>R. Neupane, Y.-T. Liao</i>	1D09: 235IACQ-0081 Assessing slagging impact and optimizing coal blends in coal-fired boilers: A combined CFD evaluation and optimization method <i>A.D. Gutierrez, S. Saenz, J.J. Acuña</i>
3:00 - 3:20	1A10: OUT-02 A physics-constrained autoencoder-NeuralODE framework for learning complex hydrocarbon fuel chemistry: Methane combustion kinetics <i>T. Kumar, A. Kumar, P. Pal</i>	1B10: 235DIAQ-0052 Temperature imaging in H₂ blended NH₃ flames using femtosecond NO LIF <i>M.K. Hay, M. Suarez, S. Pias, W.D. Kutilaka</i>	1C10: 235FRQ-0061 Study of flaming firebrand using numerical modeling and background oriented Schlieren visualization <i>A.A. Naqvi, B.E. Schmidt, Y.-T.T. Liao</i>	1D10: 235IACQ-0086 In pursuit of multifunctional composites for energetic and pressure sensing applications <i>M. Örnek, C.T. V. Nunes, T.A. Hafner, S.F. Son</i>

	Reaction Kinetics Session Chair:	Diagnostics Session Chair:	Fire Session Chair:	Industrial & Applied Combustion Session Chair:
3:20 - 3:40	1A11: OUT-12 Experimental and fuel-surrogates modeling study of the oxidation of specialty jet fuels <i>M. Abdulrahman, S. Hossain, M. Sheyyab, P.T. Lynch, K. Brezinsky</i>	1B11: 235DIAQ-0066 Applicability of flame chemiluminescence in liquid-fueled flames: Sensing and modelling <i>J. Schihl, A. Gandomkar, P.M. Allison</i>	1C11: 235FRQ-0062 Spacecraft habitability results from the Saffire VI experiment <i>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</i>	1D11: 235LAMQ-0084 Flame characteristics of ammonia-dimethyl ether blends at high gas temperature and pressure <i>T. Goyal, O. Samimi-Abianeh</i>
3:40 - 4:00	1A12: OUT-19 Measuring H abstraction rates in F + butene using absorption spectroscopy in a miniature shock tube <i>R.A. Shaik, R. Sivaramakrishnan, S. Hossain, K. Brezinsky, P.T. Lynch</i>	1B12: 235DIAQ-0083 Simultaneous NO and H atom imaging in flames using femtosecond LIF <i>M.A. Suarez, M.K. Hay, W.D. Kulatilaka</i>	1C12: 235FRQ-0057 Effect of bed size on flammability of Indian tropical forest litter <i>H.B. Gaikwad, A. Kumar</i>	1D12: 235LAMQ-0085 Flame speed of ammonia-hydrogen blends at high gas temperatures and pressures <i>J. Douvry-Rabjeau, T. Goyal, J. Klein, P. Zoldak, O. Samimi-Abianeh</i>
4:00 - 4:15	BREAK			
	Energetic Materials Combustion Session Chair:	Detonations Session Chair:	Fire Session Chair:	Droplets and Sprays Session Chair:
4:15 - 4:35	1A13: 235ECMQ-0022 Design and analysis of a constant-volume strand burner apparatus <i>T.G. Swindell, T.E. Sammet, F.A. Rodriguez, E.L. Petersen</i>	1B13: 235DETQ-0014 Cryogenic extension of NASA species polynomials using hydrogen and oxygen at stoichiometry <i>R.P. Thacker, Z. Harris, B. Maxwell</i>	1C13: 235FRQ-0065 Heat release rate and thermal runaway propagation in lithium-ion batteries using surrogate cells <i>K. Cartwright, P. Kannan, Y. Gu, C. Yuan, Y-T. Liao</i>	1D13: 235DSQ-0074 Droplet combustion dynamics of liquid fuels enhanced with carbon dots <i>A.S.M. Sazzad Parveg, A. Ratner</i>
4:35 - 4:55		1B14: 235DETQ-0044 Supersonic deflagration of hydrogen-air mixture <i>J. Klein, T. Goyal, O. Samimi-Abianeh</i>	1C14: OUT-15 Experimental and numerical approaches to optimize heat blocking efficiency in intumescent coatings. <i>T. Hafiz, J. Covello, G. Wnek, Y-T. Liao, A. Yousefi, A.K. Melaiye</i>	1D14: OUT-14 Exploring the potential of nanocellulose as an additive in liquid fuels to improve combustion performance <i>R. Mollick, A. Ratner</i>
4:55 - 5:15		1B15: OUT-08 Comparison of upstream-normal and upstream-angled fuel injection schemes in a generic scramjet combustor <i>E.L. Braun, S.D. Hammack, T.M. Ombrello</i>	1C15: 235DIAQ-0029 Near-surface thermometry of solid fuel polyoxymethylene counterflow diffusion flame using hybrid fs/ps CARS <i>S. Bidwai, G. Young, J.B. Michael</i>	1D15: OUT-23 Investigating the influence of fueling strategies and spark on combustion instability for a single cylinder two-stroke natural gas engine <i>F. Pommier, E. Stewart, T. Jacobs</i>

	Energetic Materials Combustion Session Chair:	Detonations Session Chair:	Fire Session Chair:	Droplets and Sprays Session Chair:
5:15 - 5:35		1B16: 235NCTQ-0088 Model of traversing turbulent jet ignition in a wave rotor combustor <i>M. Jamshidnejad, S. Ghadiri, M.R. Nalim</i>	1C16: OUT-01 Dual-pump coherent anti-Stokes Raman scattering thermometry and major species concentration measurements of H₂/CH₄ counterflow diffusion flames <i>B.K. Murdock, K. Pempek, V. De La Trinidad, J.P. Gore, R.P. Lucht</i>	1D16: 235DSQ-0007 Experimental investigation of water addition effects on diesel/kerosene/butanol spray combustion instability <i>A. Kumar, S.M. Basha, S. Yang</i>
6:00 - 9:00	<p>Banquet at the Cleveland Museum of Natural History 1 Wade Oval Dr, Cleveland, OH 44106</p> <p>Banquet Lecture: Prof. Harsha Chelliah, University of Virginia Title: <i>From Fire Research to High-Speed Propulsion Systems – Fundamental Combustion Research Supported by National Science Foundation</i> Session Chair:</p>			

Tuesday, 14 May 2024

7:30 - 11:00 Registration:

7:00 - 8:00 Continental Breakfast:

8:00 - 8:05 Announcements
Bryan Schmidt, Local Host

8:05 - 9:05 Plenary Lecture: Prof. Sayan Biswas, The University of Minnesota

Title: *Plasma in Energy Research*

Session Chair:

9:05 - 9:15	Transition to Morning Sessions			
	Laminar Flames Session Chair:	Industrial and Applied Combustion Session Chair:	Alternative Fuels and Emissions Session Chair:	Particulates and Multiphase Flows Session Chair:
9:15 - 9:35	2A01: 235LAMQ-0016 Experimental measurements of ammonia flame thickness from spherically propagating flames <i>Y.M. Almarzooq, M. Hay, W.D. Kulatilaka, E.L. Petersen</i>	2B01: 235IACQ-0021 Cantera reactor network modeling of a domestic wood stove and comparisons to measurement <i>L.G. Shankar, P.E. DesJardin</i>	2C01: 235AFEQ-0004 Impact of fuel properties on lean blow out for sustainable aviation fuels <i>D. Dasgupta, S. Som</i>	2D01: 235PMFQ-0006 Particle-scale simulation for co-firing biomass with coal to study interactions between two particles with realistic morphology <i>D. Liang</i>
9:35 - 9:55	2A02: 235LAMQ-0034 Near-limit quenching behavior of low stretch diffusion flames in microgravity <i>C. Li, J.S. T'ien, P.V. Ferkul, S.L. Olson, M.C. Johnston</i>	2B02: 235IACQ-0051 Influence of blowoff procedure on flowfield and combustion phenomena near lean blowout in a swirl-stabilized liquid spray combustor <i>N.C. Guntapalli, M. Gurunadhan, S. Menon</i>	2C02: 235AFEQ-0024 Review of sustainable aviation fuels and their combustion properties <i>U.L. Costa, E.L. Petersen</i>	2D02: 235PMFQ-0031 On the development of non-intrusive diagnostics for a slab burner experiment <i>E. Katz Ismael, K. Retfalvi, P.E. DesJardin</i>
9:55 - 10:15	2A03: 235LAMQ-0019 Measurement of MTBE and ETBE laminar flame speeds in air <i>J.E. Jacobs, Y. Almarzooq, I. Parvez, E.L. Petersen</i>	2B03: 235IACQ-0077 An engineering approach to explosion vent sizing <i>B. O'Bryan, C. Engebretson, C. Allen</i>	2C03: 235AFEQ-0071 A multifidelity machine learning approach for predicting NO _x emissions in a double-staged combustor <i>P. John, V. Viswamithra, M. Gurunadhan, S. Menon, O. Owoyele</i>	2D03: 235PMFQ-0075 Flame propagation in stratified dust-air mixtures <i>C. Engebretson, C. Allen</i>
10:15 - 10:35	2A04: 235LAMQ-0017 The ignition stage of dynamic flame behaviors in the mesoscale sudden-expansion <i>S.-Y. Hsu, J.-H. Huang, C.-H. Tsai</i>		2C04: OUT-11 A numerical study of NO _x and soot emissions in <i>n</i> -heptane/methyl decanoate counterflow diffusion flames <i>R. Suresh, C. Xu, S.K. Aggarwal</i>	2D04: OUT-05 Measurements of soot and gaseous emissions in high-pressure non-premixed <i>n</i> -heptane flames <i>F.J. Guzman, J. Kojima, J. Klettlinger</i>
10:35 - 10:50	BREAK			

	Laminar Flames Session Chair:	Turbulent Combustion Session Chair:	Alternative Fuels and Emissions Session Chair:
10:50 - 11:10	2A05: 235LAMQ-0053 Development of high efficiency heat extraction system to be used with wood fired heating systems <i>A. Ghorashi, A.K. Agrawal, B. Khandelwal</i>	2B05: 235TCQ-0025 Turbulent spherical flames in a constant-volume fan-stirred vessel <i>N. Lindblade, M. Turner, Y. Almarzooq, E.L. Petersen</i>	2C05: 235AFEQ-0036 CFD evaluation of radial airflow lean direct injectors for commercial supersonics technology <i>K. Ajmani</i>
11:10 - 11:30	2A06: 235LAMQ-0060 Hexamethyldisiloxane (HMDSO) impact on spherical propagating methane flame speeds <i>Q. Meng, P. Dunphy, R. Ramesh, M. Gamba, M. Wooldridge</i>	2B06: 235TCQ-0067 Turbulent burning velocity of lean premixed hydrogen/air flames at engine-relevant conditions <i>Y. Wang, C. Xu, R. Scarcelli</i>	2C06: OUT-06 Comparison of high-speed images of lean blowout for four national jet fuel combustion program fuels <i>K.M. Tacina, T.G. Capil, Y.R. Hicks</i>
11:30 - 11:50	2A07: 235LAMQ-0064 The effects of pressure and optical thickness on radiative losses in spherical diffusion flames in microgravity <i>K.A. Waddell, D.L. Dietrich, V. Nayagam</i>	2B07: 235TCQ-0078 Investigating combustion dynamics through an optical pre-chamber <i>A. Dhotre, S. Biswas</i>	2C07: OUT-22 Design, construction and assessment of an improved nanofuel stability analyzer <i>W. Steiner, N. Nagarkar, R. Mollick, A. Ratner</i>
11:50 - 12:10	2A08: 235LAMQ-0072 Ammonia-hydrogen flame extinction at low and intermediate temperatures <i>D.E. Thomas, J.C. Jarosz, W. Schutte</i>	2B08: OUT-07 Flame characterization of a NASA Glenn natural gas and oxygen burner rig facility <i>T.G. Capil, M.J. Presby, Y.R. Hicks</i>	2C08: OUT-18 Development of an experimental apparatus for the study of fuel deposits at high temperatures <i>A. Lira, R. Juárez, C. Loebick, E.L. Petersen</i>
12:10	Box Lunches – Adjourn		
1:30	Facility Tours NASA Glenn and Fives North American Combustion Inc. Tours for those who registered		