



# Australian Combustion Symposium 2019

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## CONFERENCE BOOKLET

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The University of Adelaide  
4–6 December 2019

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Adelaide is going to take centre stage in combustion research over the next few months. It is fitting that it hosts the 2019 Australian Combustion Symposium as a preamble to hosting the global event of the 38<sup>th</sup> International Combustion Symposium in July 2020.

The combustion community in Australia and overseas is well positioned to respond to global challenges in energy supplies and continues to address issues of the gradual decarbonisation of the sector. This is evident from the broad scope of topics that are addressed at the 2019 Australian Combustion Symposium which is held at the University of Adelaide. A recent emphasis in many of the papers to be presented at this conference is on cleaner fuels and fuel blends, as well on understanding and controlling pollutants formation with a focus on particles.

The conference program also brings together an outstanding team of invited speakers. The “Bilger Lecture” will be presented by Professor Epaminondas Mastorakos, from the University of Cambridge addressing “Recent developments in turbulent combustion modelling and laser-based experiments and their relevance to practical systems”. Professor Mara de Joannon, from CNR, Italy will presented a plenary talk in the “Stability of MILD Combustion in temperature tailored reactors - A perspective on thermal conversion of energy carriers”, while Professor Bogdan Z. Dlugogorski, from Charles Darwin University will address the topic of “Flammability of Hydrogen Sulfide (H<sub>2</sub>S) and Carbon Disulfide (CS<sub>2</sub>)”.

The contribution of young scientists and research students is an essential part of these conferences. Therefore, a novel feature was introduced in this conference as a series of invited “Technical Talks” by Early Career Combustion Scientists who are on track to become future leaders of combustion research. Their talks address a broad range of interesting and highly relevant topics. For research students, and to assist with their travel costs to the conference, fifteen grants were awarded by the Australia and New Zealand Section of the Combustion Institute.

As Chairman of the ANZ-Section and on behalf of all our membership and delegates, I would like to thank the local organizing committee in Adelaide for their tireless work and dedication in making the 2019 Australian Combustion Symposium an outstanding success. Our thanks go to: A/Profs Paul Medwell and Zeyad Alwahabi, Dr Michael Evans, Drs Shaun Chan, Zhao Tian and Alfonso Chinnici, and Prof. Bassam Dally.

We hope you enjoy this conference and we look forward to seeing you at the upcoming 38<sup>th</sup> International Combustion Symposium which will also be held in Adelaide.

Assaad Masri  
25 November 2019

## PREFACE

The 2019 Australian Combustion Symposium will be held 4–6 December 2019 at The University of Adelaide. We are delighted that Prof. Epaminondas Mastorakos will deliver the Bilger Lecture, and esteemed plenary speakers will be Prof. Mara de Joannon and Prof. Bogdan Dlugogorski. Another eight invited speakers will also be featured in the programme to deliver technical talks.

The biennial meeting is Australia's preeminent conference in the field of combustion, and builds on a long-standing series of events, including Sydney (2017), Melbourne (2015) and Perth (2013). The conference will be a precursor to the prestigious *38th International Symposium on Combustion*, which will also be in Adelaide. Both meetings are held under the auspices of the Australia and New Zealand section of the Combustion Institute.

The programme features 55 presentations, which were selected based on the scientific review of a four-page research paper (8 pages for invited speakers) by two technical experts. Authors were given the opportunity of publishing the full paper or only the abstract.

The meeting would not be possible without the support of the following sponsors and exhibitors. We gratefully acknowledge the contributions of...

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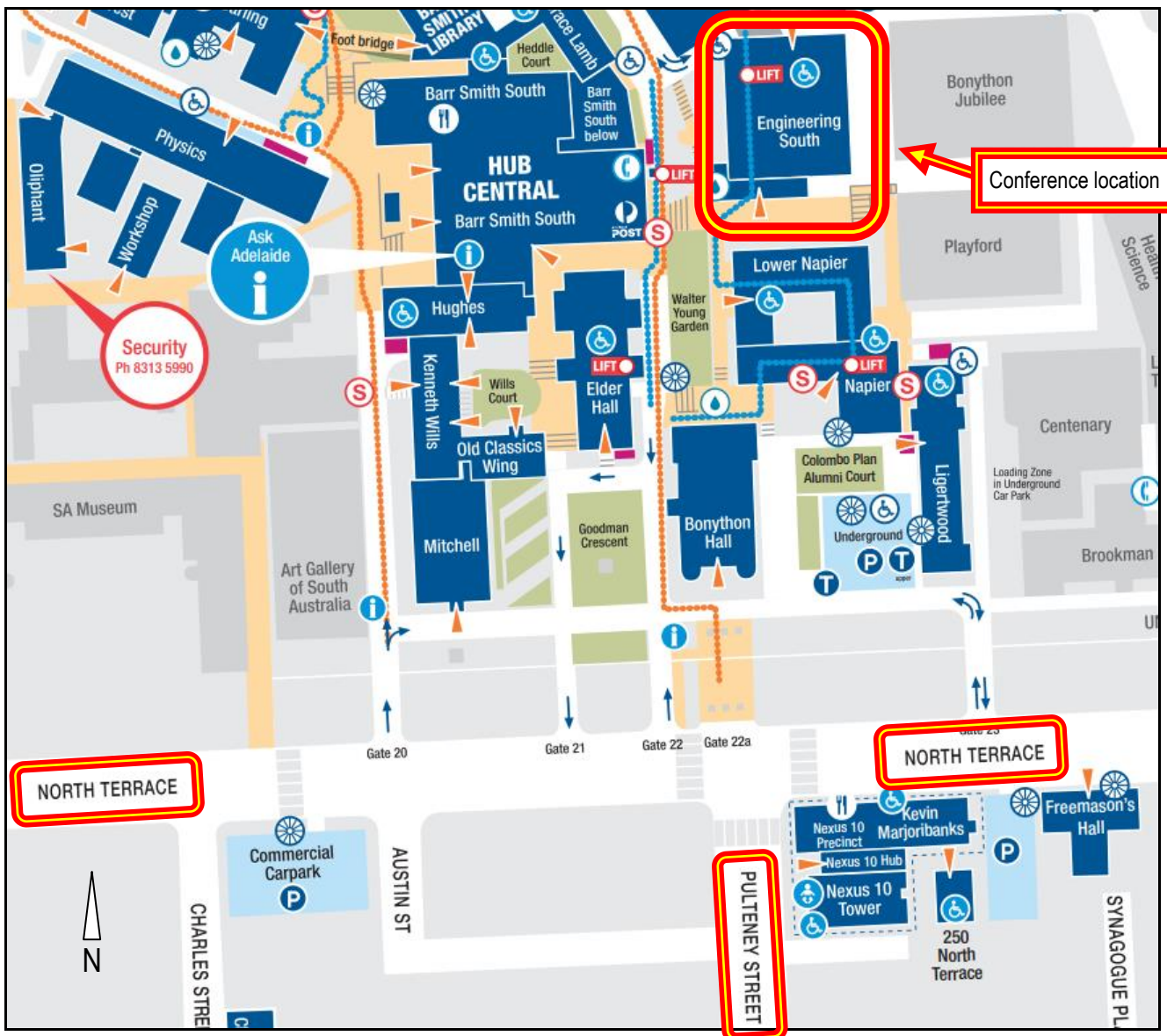
The local organising committee look forward to a successful meeting.

*Paul Medwell  
Zeyad Alwahabi  
Michael Evans  
Shaun Chan  
Alfonso Chinnici  
Zhao Tian  
Bassam Dally*



## CONFERENCE LOCATION

All sessions and breaks will be in the Engineering South Building, off North Terrace.



The Exhibitors Room is on Level 3, Room S326. Morning tea, lunch and afternoon tea will all be served in the Exhibitors Room.

Presentations will be shared between two adjoining rooms on Level 1 (Rooms S111 and S112). Plenary sessions will be in S112.

The University of Adelaide is smoke-free.

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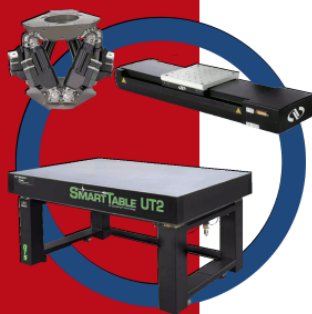
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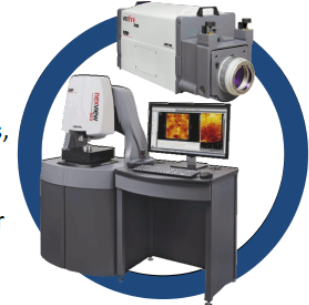
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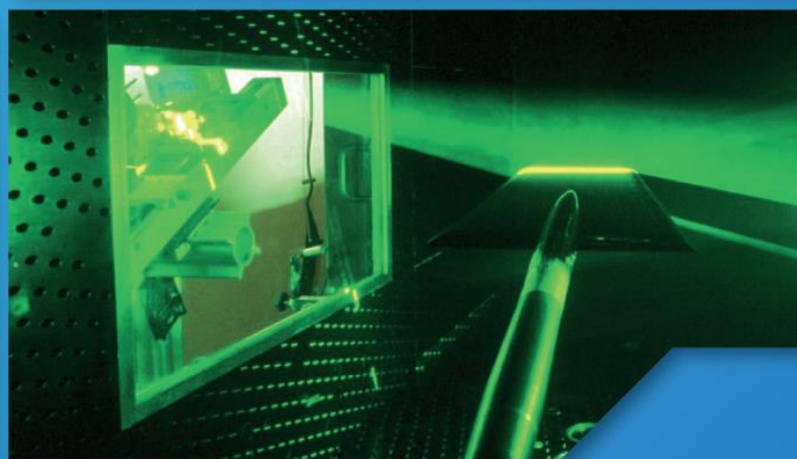


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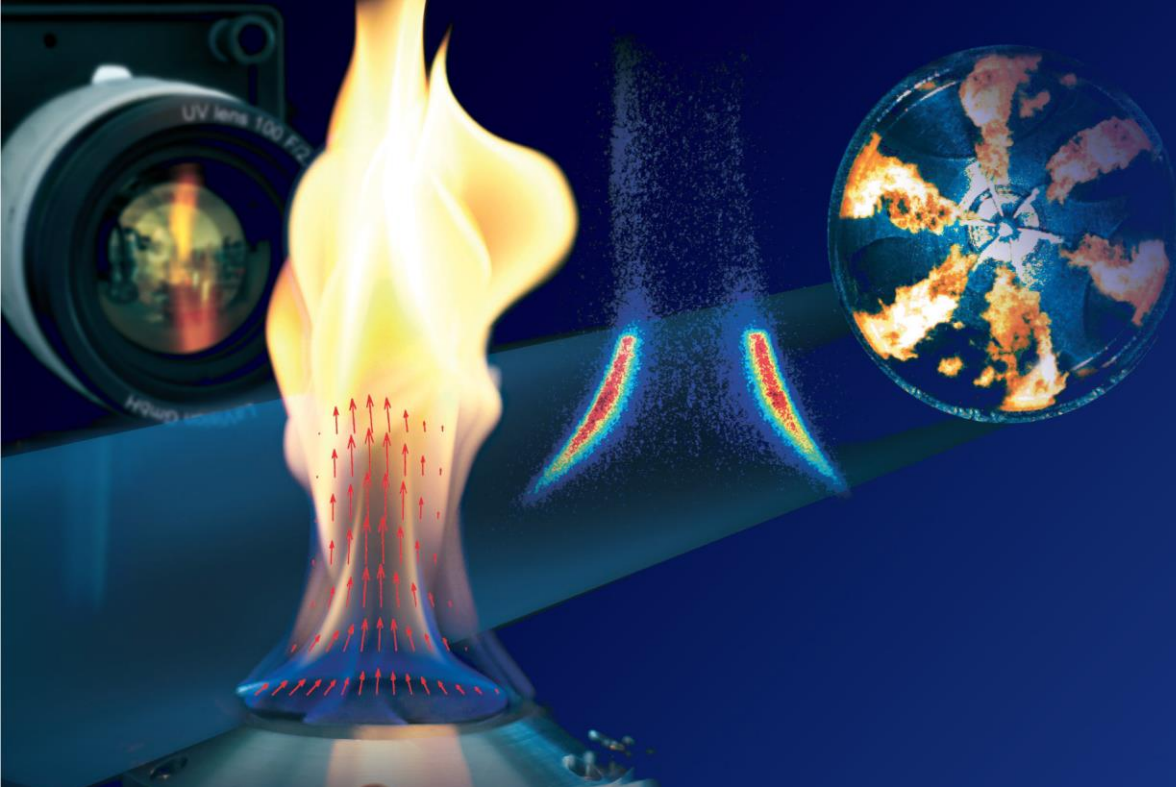
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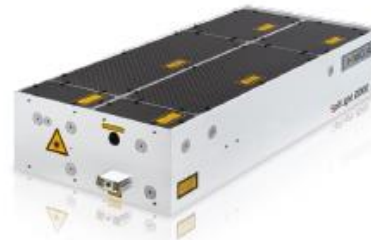
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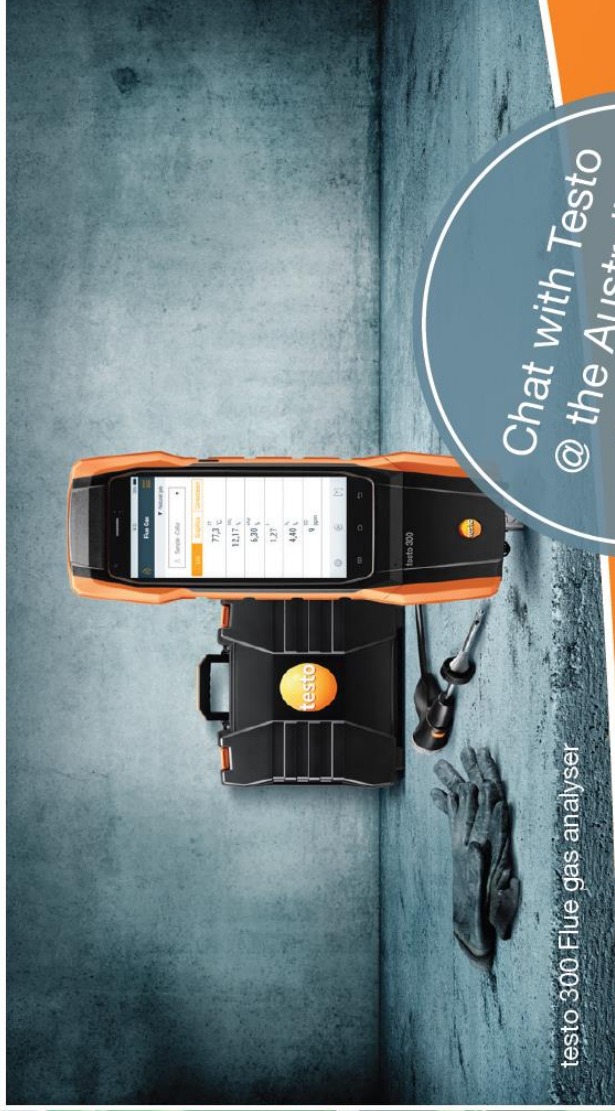
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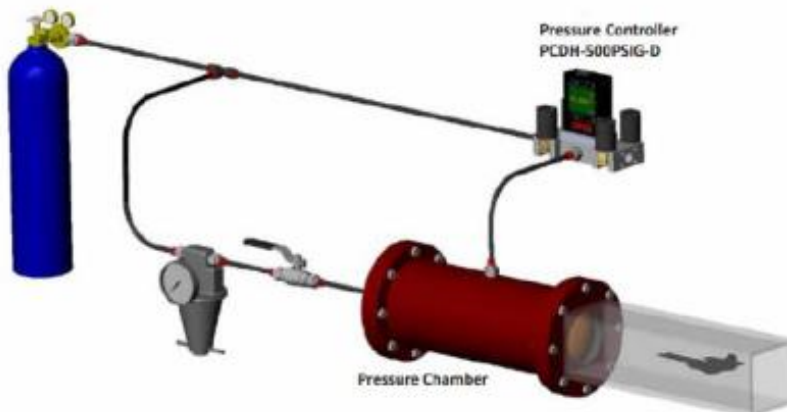
## Australian Combustion Symposium 2019

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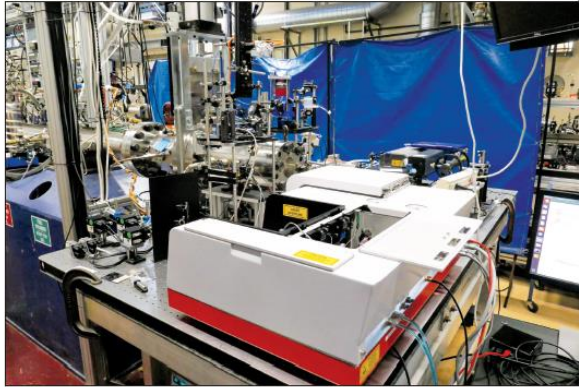
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# Bringing Quantum Cascade Laser Spectroscopy to Combustion Diagnostics

## Why new methods for combustion diagnostics?



*Experimental setup with the IRis-F1 at the shock tube (Hanson Group Lab, Stanford University)*

Absorption spectroscopy is an important tool for combustion diagnostics. And yet, combustion processes are also a challenging environment for most spectrometers, demanding specifications that traditional instruments often cannot meet.

**Speed.** The typical timescales involved in combustion processes range from microseconds to - at most - a few milliseconds. Studying a process that happens so fast requires an equally fast measurement method.

**Single-shot measurements.** By their very nature, combustion diagnostics involve processes which are hard to repeat: even when running two nominally identical shocks down a shock tube, the temperature and pressure produced will be slightly different. This means experiment data has to be collected in a single repetition.

**Broad spectral coverage.** Most combustion measurements aim to measure several species at the same time - both, narrowband and broadband absorbers. Being able to observe multiple spectral features is often a key requirement.

**Optical power.** Dealing with combustion necessarily entails managing large thermal emissions, and that requires very large optical power. This makes it possible to transmit through a shock tube and distinguish the instrument's laser light from the background thermal radiation.

## Advantages of dual-comb spectroscopy

Frequency comb laser sources based on quantum cascade lasers (QCLs) manage to fulfill the aforementioned requirements. By relying on fundamentally different principles than other types of spectrometers, this technology provides real advantages over both FTIR and single wavelength laser-based mid-infrared spectrometers.

The minimum time required for measuring a complete spectrum is less than one microsecond, a feature made possible by an innovative technology called multi-heterodyne detection. The broadband lasers emit several hundred colors at the same time, covering tens of wavenumbers. All the emitted wavelengths are detected simultaneously within microseconds.

In addition, frequency comb laser sources can offer brightness levels that are orders of magnitude higher than standard FTIR spectrometers. Because of this, dual-comb spectroscopy provides a unique combination of brightness, optical bandwidth, and speed.



*Setup of the combustion kinetics measurement at Prof. Farooq's Lab (KAUST)*

## The IRis-F1: a fast, high-resolution spectrometer



*IRsweep's IRis-F1: the first commercial turnkey quantum cascade laser frequency combs spectrometer*

IRsweep's goal is to bring high-performance mid-infrared spectroscopy to field applications - including combustion diagnostics.

The IRis-F1 spectrometer exploits the superior sensing performance of mid-infrared frequency combs. It offers an unmatched combination of fast detection, high brightness and broad spectral coverage.

Its suitability to combustion diagnostics has been thoroughly proven on several occasions, through our collaboration with experts of the field such as Professor Hanson's Group at Stanford University and Professor Farooq's at KAUST in Saudi Arabia.

It has been shown that the concentration of multiple species can be tracked during the evolution of a single shock with a duration of just one microsecond. The unique sensing capabilities provided by the IRis-F1 open the door to many new possibilities in the field of combustion process diagnostics.

## *SCHEDULE*

There will be two parallel sessions for the presentations, in rooms S111 and S112. Plenary presentations will be in S112 only.

Contributed presentations are 15 minutes duration, with 3 minutes for questions, and 2 minutes for changeover. Invited technical talks are double the amount allocated to contributed presentations. Plenary presentations are 45 minutes. Timing will be strictly adhered to.

Only the first named author is shown in the programme. A complete list of papers follows.

**Wednesday, 4th December**

Start	Room S111	Room S112
9:30	<b>ACS registration</b>	
10:20	<b>ACS Welcome and Morning Tea – Room S326</b>	
11:00	Session chair: Assaad Masri	
	<i>Bilger Lecture: Recent developments in turbulent combustion modelling and laser-based experiments and their relevance to practical systems – Room S112</i>	
	Epaminondas Mastorakos	ACS-050
12:00	Session chair: Bassam Dally	ACLD parallel session
	<i>Invited: The Dynamics of Supersonic Turbulent Combustion</i>	
	Vincent Wheatley	ACS-018
12:40	<b>Lunch – Room S326</b>	
14:00	Session chair: Bogdan Dlugogorski	Session chair: Mohsen Talei
	<i>A Parametric Study on Fluidisation Characteristics and Product Yields in Bubbling Fluidised Bed Reactor</i>	<i>Soot particle structure variation associated with in-cylinder gas pressure/temperature in a small-bore diesel engine</i>
	Joshua Clissold	Lingzhe Rao
	ACS-016	ACS-001
14:20	<i>An Experimental Study of Laminar Flame Speed of Partially Dissociated NH<sub>3</sub> and Air Mixtures</i>	<i>In-cylinder and exhaust soot morphology in an optical spark ignition direct injection (SID) petrol engine</i>
	Harry Lesmana	Dongchan Kim
	ACS-056	ACS-002
14:40	<i>Fast Pyrolysis of Lignin at Low Temperatures: An In-depth Understanding of the Char Structural Changes</i>	<i>Fuel reactivity effects on premixed combustion in a diesel engine</i>
	Yee Wen Chua	Yilong Zhang
	ACS-030	ACS-004
15:00	<b>Afternoon tea – Room S326</b>	
15:40	Session chair: Zhao Tian	Session chair: Richard Brown
	<i>Preliminary Observations of Turbulent Flames in a Confined and Pressurised Jet in Hot and Vitiated Coflow Burner</i>	<i>Invited: Combustion strategies for multi-fuel capable compression ignition engines</i>
	Michael Evans	
	ACS-035	
16:00	<i>Numerical Investigation of Tandem Cavity Configurations with Supersonic Ethylene Combustion</i>	
	Sarah Mecklem	Sanghoon Kook
	ACS-017	ACS-007
16:20	<i>Experimental and numerical study of ammonia oxidation and pyrolysis in a Jet Stirred Flow Reactor. Evaluation of wall surface reactions effects</i>	<i>Effect of inlet manifold water injection on diesel engine performance and emissions</i>
	Pino Sabia	Sujit Kafle
	ACS-044	ACS-043
16:40	<i>Hybrid solar-combustion processes of renewable fuels</i>	<i>Image selection method for combustion analysis in an optical diesel engine</i>
	Alfonso Chinnici	Siyuan Meng
	ACS-054	ACS-009
17:00	<i>One-Step Chemical Kinetic Scheme for Propane in High Temperature Applications</i>	<i>Comparison of real-time NO<sub>x</sub> emission measurements from two heavy-duty diesel engines</i>
	Raoul Mazumdar	G M Hasan Shahariar
	ACS-005	ACS-015
17:30	<b>ANZ-CI Biennial General Meeting – Room S112</b>	

Note: Only first-named author is shown. Any of the authors are eligible to present.



**Thursday, 5th December**

Start	Room S111	Room S112
08:40	Session chair: Assaad Masri	
	<i>Plenary: Stability of MILD Combustion in temperature tailored reactors - A perspective on thermal conversion of energy carriers – Room S112</i>	
	Mara de Joannon	ACS-051
09:40	Session chair: Matthew Cleary	Session chair: Sanghoon Kook
	<i>Invited: A Physical Understanding of how Multiple Mapping Conditioning Works</i>	<i>Invited: Industrial Gas Turbine Combustor Design: Exhaust CO Emissions</i>
	Andrew Wandel	Robert Gordon
	ACS-036	ACS-046
10:20	<b>Morning Tea – Room S326</b>	
11:00	Session chair: Evatt Hawkes	Session chair: Anand Veeraragavan
	<i>Invited: Sound sources in premixed flames</i>	<i>Invited: Recent Progress in the Control and Understanding of Turbulent Spray Formation</i>
	Mohsen Talei	Agisilaos Kourmatzis
	ACS-047	ACS-003
11:40	<i>High-order accurate hybrid LES/PDF simulations of an experimental H<sub>2</sub>/N<sub>2</sub> lifted jet flame</i>	<i>Comparative study of spray characteristics of high alcohol-diesel blends</i>
	Harshad Ranadive	Sattar Algayyim
	ACS-040	ACS-006
12:00	<i>Algebraic Flame Surface Density Model Development using Gene-Expression Programming</i>	<i>Initial Characterisation of a hybrid air-blast and electrostatic atomizer for spray combustion</i>
	Man-Ching Ma	Tushar Ahmed
	ACS-027	ACS-011
12:20	<i>Investigation of flammability factor in CNG jets using LES</i>	<i>Measurement of wave speeds at the liquid-air interface of an air-blast atomized biodiesel spray</i>
	Mohammad Reza Yosri	Aaron Gutteridge
	ACS-031	ACS-013
12:40	<b>Lunch – Room S326</b>	
14:00	Session chair: Matthew Dunn	Session chair: Armin Wehrfritz
	<i>Numerical Analysis of Point Source Fire on Fire-Wind Enhancement</i>	<i>Some Recent Results on Hydrogen Oxidation in a Flow Reactor</i>
	Esmaeel Eftekharian	Zhewen Lu
	ACS-021	ACS-028
14:20	<i>Ignition Waves in Compartment Fire Flashover</i>	<i>An Update on the Rate Constant of H + O<sub>2</sub> (+M) → HO<sub>2</sub> (+M), M = N<sub>2</sub> using H<sub>2</sub>/O<sub>2</sub>/NO<sub>x</sub> Reaction in a Flow Reactor</i>
	Vasily Novozhilov	Zhewen Lu
	ACS-023	ACS-029
14:40	<i>Numerical study of the flame structure and swirling motion of small-scale fire whirls</i>	<i>Chemistry reduction of hydrogen-methane mixtures with a focus on the laminar flame speed</i>
	Xiang Fang	Jen Zen Ho
	ACS-037	ACS-032
15:00	<b>Afternoon tea – Room S326</b>	
15:40	Session chair: Agisilaos Kourmatzis	Session chair: Robert Gordon
	<i>Joint OH-CH PLIF imaging in highly-sheared turbulent premixed propane flames</i>	<i>Classification of MILD and autoignitive ethylene flames diluted with N<sub>2</sub>, O<sub>2</sub> and CO<sub>2</sub></i>
	Mohammed Kanj	Jordan Kildare
	ACS-022	ACS-048
16:00	<i>PLIF Imaging of a Low Emission Reverse-Cross Flow Combustor</i>	<i>Numerical Modelling of Mild Combustion at Elevated Pressures</i>
	Shreshtha Kumar Gupta	Douglas Proud
	ACS-042	ACS-049
16:20	<i>Experimental Investigation of Soot Evolution in Turbulent Non-premixed Bluff-body Ethylene/Nitrogen Flames</i>	<i>Influence of steam dilution on flame structure and soot formation of hot, diluted ethylene flames</i>
	Amir Rowhani	Alfonso Chinnici
	ACS-055	ACS-053
16:40	<i>Effects of Inlet Oxygen Concentration on Direct Sulfation for Oxy-Fuel Circulating Fluidized Bed Combustion</i>	<i>Experimental research on NO emission of a coaxial jet triple channel nozzle with coal preheating combustion technology</i>
	Wei Li	Ziqu Ouyang
	ACS-014	ACS-012
18:15	<b>Dinner – Tram will depart University stop at 6:30pm sharp. Please arrive by 6:15pm.</b>	

**Friday, 6th December**

Start	Room S111	Room S112
08:40	Session chair: Assaad Masri	
	<i>Plenary: Flammability of Hydrogen Sulfide (H<sub>2</sub>S) and Carbon Disulfide (CS<sub>2</sub>) – Review of Present Insights into Reaction Mechanisms – Room S112</i>	
	Bogdan Dlugogorski	ACS-045
09:40	Session chair: Vincent Wheatley	Session chair: Vasily Novozhilov
	<i>Invited: Supersonic Ethylene Combustion – Revamping the Cavity</i>	<i>Invited: What is important for accurate soot predictions?</i>
	Anand Veeraragavan	Heinz Pitsch
	ACS-019	ACS-052
10:20	<b>Morning Tea – Room S326</b>	
11:00	Session chair: Aleš Srna	Session chair: Andrew Wandel
	<i>Effect of intake air e-boosting on external EGR-diluted diesel combustion</i>	<i>LES/PDF Modelling of Turbulent Premixed Flames in the Flamelet Regime Using an MMC – Shadow Position Mixing Model</i>
	Xinyu Liu	Yashar Shoraka
	ACS-010	ACS-020
11:20	<i>Multiple injections of iso-octane and n-heptane: Part-I</i>	<i>Grid Sensitivity Study for Air Blast Atomisation Using an LES-PDF form of ELSA Model</i>
	Sensen Xing	Fakhar Abbas
	ACS-038	ACS-025
11:40	<i>Multiple injections of iso-octane and n-heptane: Part-II</i>	<i>Particle-intense MMC-LES simulations of mixed-mode turbulent piloted jet flame</i>
	Haijun Mo	Saeed Aldawsari
	ACS-039	ACS-026
12:00	<i>A-priori evaluation of low-dimensional manifold combustion models under diesel engine conditions</i>	<i>Sound generation by turbulent premixed flames with reduced chemistry</i>
	Deepak Dalakoti	Davy Brouzet
	ACS-041	ACS-033
12:20	<i>Flame image velocimetry for in-flame flow field analysis in an optically accessible diesel engine</i>	<i>CFD modelling of DC arc plasma system for application in cleaner chemical production</i>
	Jinxin Yang	Jyothikrishna Perambadur
	ACS-008	ACS-034
12:40	<i>The Effect of the Reticulated Polyurethane Foam on the Suppression of Flame Propagation of the CH<sub>4</sub>-air mixtures</i>	<i>Computational Fluid Dynamics Modelling of Rotating Detonation Engines</i>
	Chenghu Zhang	Ian Shaw
	ACS-024	ACS-057
13:00	<b>Lunch – Room S326</b>	

## *LIST OF SUBMISSIONS*

Copies of the full papers (or abstract only, at the request of authors) is available on the conference website:

<http://anz-combustioninstitute.org/ACS2019/>

Papers have been assigned an identification number to help correlate between the timetable and the list.



001	Soot particle structure variation associated with in-cylinder gas pressure/temperature in a small-bore diesel engine <i>Lingzhe Rao, Yilong Zhang, Sanghoon Kook</i>
002	In-cylinder and exhaust soot morphology in an optical spark ignition direct injection (SID) petrol engine <i>Dongchan Kim, Sanghoon Kook</i>
003	Invited: Recent Progress in the Control and Understanding of Turbulent Spray Formation <i>Agisilaos Kourmatzis</i>
004	Fuel reactivity effects on premixed combustion in a diesel engine <i>Yilong Zhang, Siyuan Meng, Harsh Goyal, Sanghoon Kook, Chol-Bum Kweon, Kenneth Kim</i>
005	One-Step Chemical Kinetic Scheme for Propane in High Temperature Applications <i>Raoul Mazumdar, Hideaki Ogawa, Adrian Pudsey, Mathew Bricalli</i>
006	Comparative study of spray characteristics of high alcohol-diesel blends <i>Sattar Algayyim, Andrew Wandel</i>
007	Invited: Combustion strategies for multi-fuel capable compression ignition engines <i>Sanghoon Kook, Harsh Goyal, Yilong Zhang</i>
008	Flame image velocimetry for in-flame flow field analysis in an optically accessible diesel engine <i>Jinxin Yang, Lingzhe Rao, Yilong Zhang, Charitha de Silva, Sanghoon Kook</i>
009	Image selection method for combustion analysis in an optical diesel engine <i>Siyuan Meng, Yilong Zhang, Sanghoon Kook</i>
010	Effect of intake air e-boosting on external EGR-diluted diesel combustion <i>Xinyu Liu, Sanghoon Kook</i>
011	Initial Characterisation of a hybrid air-blast and electrostatic atomizer for spray combustion <i>Tushar Ahmed, Agisilaos Kourmatzis, Assaad Masri</i>
012	Experimental research on NO emission of a coaxial jet triple channel nozzle with coal preheating combustion technology <i>Ziqu Ouyang, Wen Liu, Yongjie Na, Xiaoyang Cao, Shujun Zhu</i>
013	Measurement of wave speeds at the liquid-air interface of an air-blast atomized biodiesel spray <i>Aaron Gutteridge, Gajendra Singh, Agisilaos Kourmatzis, Assaad Masri</i>

014	Effects of Inlet Oxygen Concentration on Direct Sulfation for Oxy-Fuel Circulating Fluidized Bed Combustion <i>Wei Li, Shiyuan Li</i>
015	Comparison of real-time NO <sub>x</sub> emission measurements from two heavy-duty diesel engines <i>G M Hasan Shahariar, Thuy Chu-Van, Timothy Bodisco, Mojibul Sajjad, Kabir Adewale Suara, Zoran Ristovski, Richard Brown</i>
016	A Parametric Study on Fluidisation Characteristics and Product Yields in Bubbling Fluidised Bed Reactor <i>Joshua Clissold, Salman Jalalifar, Fatemah Salehi, Rouzbeh Abbassi</i>
017	Numerical Investigation of Tandem Cavity Configurations with Supersonic Ethylene Combustion <i>Sarah Mecklem, Will Landsberg, Anand Veeraragavan</i>
018	Invited: The Dynamics of Supersonic Turbulent Combustion <i>Vincent Wheatley, Nicholas Gibbons</i>
019	Invited: Supersonic Ethylene Combustion – Revamping the Cavity <i>Anand Veeraragavan, Will Landsberg</i>
020	LES/PDF Modelling of Turbulent Premixed Flames in the Flamelet Regime Using an MMC – Shadow Position Mixing Model <i>Yashar Shoraka, Sebastian Galindo-Lopez, Matthew Cleary, Assaad Masri, Alexander Klimenko</i>
021	Numerical Analysis of Point Source Fire on Fire-Wind Enhancement <i>Esmaeel Eftekharian, Fatemah Salehi, Yaping He, Kenny Kwok</i>
022	Joint OH-CH PLIF imaging in highly-sheared turbulent premixed propane flames <i>Mohammed Kanj, Matthew Dunn, Mrinal Juddoo, Scott Steinmetz, Guoqing Wang, Assaad Masri</i>
023	Ignition Waves in Compartment Fire Flashover <i>Vasily Novozhilov</i>
024	The Effect of the Reticulated Polyurethane Foam on the Suppression of Flame Propagation of the CH <sub>4</sub> -air mixtures <i>Chenghu Zhang, Lijia Fan, Yujie Yang, Jihong Wei, Yufei Tan</i>
025	Grid Sensitivity Study for Air Blast Atomisation Using an LES-PDF form of ELSA Model <i>Fakhar Abbas, Giovanni Tretola, Matthew Cleary, Salvador Navarro-Martinez, Assaad Masri</i>
026	Particle-intense MMC-LES simulations of mixed-mode turbulent piloted jet flame <i>Saeed Aldawsari, Sebastian Galindo-Lopez, Matthew Cleary, Assaad Masri</i>

027	Algebraic Flame Surface Density Model Development using Gene-Expression Programming <i>Man-Ching Ma, Mohsen Talei, Richard Sandberg</i>
028	Some Recent Results on Hydrogen Oxidation in a Flow Reactor <i>Zhewen Lu, Yi Yang, Joshua Lacey, Michael Brear</i>
029	An Update on the Rate Constant of $H + O_2 (+M) \rightarrow HO_2 (+M)$ , $M = N_2$ using $H_2/O_2/NO_x$ Reaction in a Flow Reactor <i>Zhewen Lu, Yi Yang, Joshua Lacey, Michael Brear</i>
030	Fast Pyrolysis of Lignin at Low Temperatures: An In-depth Understanding of the Char Structural Changes <i>Yee Wen Chua, Yun Yu, Hongwei Wu</i>
031	Investigation of flammability factor in CNG jets using LES <i>Mohammad Reza Yosri, Joshua Lacey, Mohsen Talei, Robert Gordon, Michael Brear</i>
032	Chemistry reduction of hydrogen-methane mixtures with a focus on the laminar flame speed <i>Jen Zen Ho, Mohsen Talei, Robert Gordon, Michael Brear</i>
033	Sound generation by turbulent premixed flames with reduced chemistry <i>Davy Brouzet, Mohsen Talei, Michael Brear</i>
034	CFD modelling of DC arc plasma system for application in cleaner chemical production <i>Jyothikrishna Perambadur, Alexander Klimenko, Pradeep Shukla, Victor Rudolph</i>
035	Preliminary Observations of Turbulent Flames in a Confined and Pressurised Jet in Hot and Vitiated Coflow Burner <i>Michael Evans, Paul Medwell, Shaun Chan</i>
036	Invited: A Physical Understanding of how Multiple Mapping Conditioning Works <i>Andrew Wandel</i>
037	Numerical study of the flame structure and swirling motion of small-scale fire whirls <i>Xiang Fang, Anthony Yuen, Guan Yeoh, Sherman Cheung</i>
038	Multiple injections of iso-octane and n-heptane: Part-I <i>Sensen Xing, Guanxiong Zhai, Aleš Srna, Haijun Mo, Paul Medwell, Sanghoon Kook, Guan Yeoh, Shaun Chan</i>
039	Multiple injections of iso-octane and n-heptane: Part-II <i>Haijun Mo, Sensen Xing, Guanxiong Zhai, Aleš Srna, Paul Medwell, Sanghoon Kook, Guan Yeoh, Shaun Chan</i>

040	High-order accurate hybrid LES/PDF simulations of an experimental H <sub>2</sub> /N <sub>2</sub> lifted jet flame <i>Harshad Ranadive, Armin Wehrfritz, Evatt Hawkes</i>
041	A-priori evaluation of low-dimensional manifold combustion models under diesel engine conditions <i>Deepak Dalakoti, Armin Wehrfritz, Bruno Savard, Evatt Hawkes</i>
042	PLIF Imaging of a Low Emission Reverse-Cross Flow Combustor <i>Shreshtha Kumar Gupta, Santanu Pramanik, Vaibhav Kumar Arghode, R. V. Ravikrishna, Robert Gordon</i>
043	Effect of inlet manifold water injection on diesel engine performance and emissions <i>Sujit Kafle, Andrew Wandel, Saddam Al-Lwayzy</i>
044	Experimental and numerical study of ammonia oxidation and pyrolysis in a Jet Stirred Flow Reactor. Evaluation of wall surface reactions effects <i>Pino Sabia, Maria Virginia Manna, Raffaele Ragucci, Mara de Joannon</i>
045	Plenary: Flammability of Hydrogen Sulfide (H <sub>2</sub> S) and Carbon Disulfide (CS <sub>2</sub> ) – Review of Present Insights into Reaction Mechanisms <i>Bogdan Dlugogorski, Zhe Zeng, Ibukun Oluwoye, Mohammednoor Altarawneh</i>
046	Invited: Industrial Gas Turbine Combustor Design: Exhaust CO Emissions <i>Robert Gordon</i>
047	Invited: Sound sources in premixed flames <i>Mohsen Talei</i>
048	Classification of MILD and autoignitive ethylene flames diluted with N <sub>2</sub> , O <sub>2</sub> and CO <sub>2</sub> <i>Jordan Kildare, Michael Evans, Alfonso Chinnici, Paul Medwell</i>
049	Numerical Modelling of Mild Combustion at Elevated Pressures <i>Douglas Proud, Michael Evans, Paul Medwell</i>
050	Bilger Lecture: Recent developments in turbulent combustion modelling and laser-based experiments and their relevance to practical systems <i>Epaminondas Mastorakos</i>
051	Plenary: Stability of MILD Combustion in temperature tailored reactors - A perspective on thermal conversion of energy carriers <i>Mara de Joannon</i>
052	Invited: What is important for accurate soot predictions? <i>Heinz Pitsch</i>
053	Influence of steam dilution on flame structure and soot formation of hot, diluted ethylene flames <i>Alfonso Chinnici, Michael Evans</i>



054	Hybrid solar-combustion processes of renewable fuels <i>Alfonso Chinnici, Gus Nathan, Bassam Dally</i>
055	Experimental Investigation of Soot Evolution in Turbulent Non-premixed Bluff-body Ethylene/Nitrogen Flames <i>Amir Rowhani, Zhiwei Sun, Paul Medwell, Gus Nathan, Bassam Dally</i>
056	An Experimental Study of Laminar Flame Speed of Partially Dissociated NH <sub>3</sub> and Air Mixtures <i>Harry Lesmana, Mingming Zhu, Zhezi Zhang, Jian Gao, Junzhi Wu, Dongke Zhang</i>
057	Computational Fluid Dynamics Modelling of Rotating Detonation Engines <i>Ian Shaw, Michael Evans, Rey Chin, Paul Medwell</i>



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