

Australian & New Zealand Section of the Combustion Institute
Section Report
36th International Combustion Symposium

1. Section Overview

The Australian & New Zealand Section of the Combustion Institute (ANZ-CI) currently has around 65 members. The Section hosts a biennial local meeting, and supports attendance of members to the International Symposia, as well as the Asia-Pacific Conferences on Combustion (ASPACC). It also supports attendance of student members to the local meetings.

The current Section Committee is as follows:

Professor A.R. Masri, University of Sydney, Chair
Professor B.B. Dally, University of Adelaide, Deputy Chair
Professor M. J. Brear, University of Melbourne, Secretary
Professor E. Hawkes, University of New South Wales, Treasurer
Professor G.J. Nathan, University of Adelaide
Professor D.K. Zhang, University of Western Australia
Professor A. Klimenko, University of Queensland, co-opted member
Professor S. Pang, University of Canterbury, co-opted member

2. Australian Combustion Symposium 2015

The Australian and New Zealand Section of the Combustion Institute has been holding biennial conferences for more than 30 years. These meetings bring together local combustion scientists and young researchers from academia and industry, and provide a forum for the presentation of a wide range of papers in all aspects of fundamental and applied combustion science. Recent symposia were held in Western Australia (2013), Newcastle (2011), Queensland (2009), Sydney (2007), Adelaide (2005), Melbourne (2003) and Adelaide (2001).

The Australian Combustion Symposium for 2015 (ACS-2015) was held at the University of Melbourne, 7-9 December, 2015. The organizing committee was chaired by Professor Michael Brear from Melbourne University who was ably assisted by Dr Robert Gordon, Conference Secretary, Melbourne University, Dr Peter Hield, Conference Treasurer, DST Group, Dr Yi Yang, Conference Technical Committee Co-chair, Melbourne University, Dr Nigel Smith, Conference Technical Committee Co-chair, DST Group, and Dr Mohsen Talei, Conference Committee Member, Melbourne University. The Section expresses sincere gratitude to the organizers for their tireless efforts in bringing together a very successful conference.

The symposium brought together 134 participants presenting a record number of ninety three contributed papers which were subject to a peer review process. The papers were presented in five parallel sessions covering the following nine distinct colloquia: (i) turbulent combustion, pyrolysis and gasification, (iii) modelling and simulation, (iv) emission of pollutants, (v) fire, (vi) solid fuel combustion, (vii) ignition, fuels and engine, (viii) diagnostics, (ix) chemical kinetics and mechanisms. It is worth noting that about half of the registrants to this conference were students (67 of them). This is rewarding considering that the ANZ-CI continuously encourages students to join combustion research. To assist with their travel costs to

Melbourne, 21 grants (\$200 each) were awarded by the Australia and New Zealand Section of the Combustion Institute.

The ACS2015 Bilger Lecture was delivered by Professor Thierry Poinsoot (IMFT and CNRS, France). This was followed by five Plenary Lectures given by Professor Andrea D'Anna (University of Naples Federico II, Italy), Professor Min Xu (Shanghai Jiao Tong University, China), Professor Evatt Hawkes (University of New South Wales) and Doctor Matthew Cleary (University of Sydney).

The following prizes were awarded at the conclusion of the conference:

1. The Terry Wall Best Student Paper Award valued at \$800 for “the best paper on solid fuel combustion” was awarded to:
Mr Houzhi Wang (University of Adelaide)
For paper: 1B06
Title: Investigation of smouldering combustion of biomass fuel
Authors: H. Wang, P.R. Medwell, C.H. Birzer, P.J. van Eyk, Z.F. Tian, and M. Possell
2. The Best Student Paper Prizes valued at \$200 each were awarded to:
Miss Brruntha Sundaram (University of Queensland)
For paper: 1D03
Title: Developments in Multiple Mapping Conditioning for turbulent premixed combustion
Authors: B. Sundaram, A.Y. Klimenko, and M. J. Cleary
3. Mr Farzad Poursadegh (University of Melbourne)
For paper: 1E05
Title: A theoretical examination of spray supercriticality in compression ignition engines
Authors: F. Poursadegh, J.S. Lacey, M.J. Brear and R.L. Gordon

The total income for the conference was \$76,831.97, the total expenditure was \$62,268.24, resulting in a net profit of AUD\$14,563.73 which was shared equally between the Australia and New Zealand Section of the Combustion Institute and the local Organizing Committee.

The 2017 Australian Combustion Symposium will be held at the University of Sydney in conjunction with the Eleventh Asia-Pacific Conference on Combustion ASPACC-11 (2017).

The Passing of R.W. Bilger:

The Australia and New Zealand Section of the Combustion Institute has mourned the death of Professor Bob Bilger who was one of its pillars chairing it from 1980 to 1992. Professor Bilger passed away on October 2, 2015 at the age of eighty. His funeral, on October was attended by many members from our Section some of whom have flown from interstate. Combustion and Flame is publishing an obituary for Bob.

Professor Bilger has made massive contributions to combustion research and has provided guidance and inspiration to many in the field. His vision will continue to guide research activities for decades to come. Bob's kindness has touched the lives of many in our community and we'll always miss his wisdom and charming personality. The Australia and New Zealand Section of the Combustion Institute is eternally grateful for Bob's service who

is commemorated through “The Bilger Lecture”; the opening lecture of its biennial conference.

The 2015 Australian Combustion Symposium opened with a session in Memoriam of Professor Bilger. It included tributes from The President of the Combustion Institute, Professor Katharina Kohse-Höinghaus, and Professors Assaad Masri, Brian Haynes, Alex Klimenko, Damon Honnery and Bassam Dally.

3. Section activities with International Workshops

Members of the ANZ-CI Section continue to play leading roles at the international workshop series which take place around the various international conferences. Our members play very active and leading roles in: (i) The International Workshops on Measurements and Calculations of Turbulent Flames (TNF), (ii) The International Workshops on Turbulent Combustion of Sprays (TCS), (iii) The Engine Combustion Network (ECN), (iv) the International Sooting Flame Workshops (ISF) and the Conditional Moment Closure Workshops.

4. Bid to host 38th Combustion Symposium

The ANZ-CI Section has prepared a highly professional bid to host the 38th International Combustion Symposium in Adelaide in 2020. The ANZ-CI is grateful to Professors Bassam Dally and Gus Nathan for the time and efforts they dedicated in preparing this bid.

5. 10th ASPACC (19-22 July, 2015)

The Asia-Pacific Conference on Combustion (ASPACC) is a regional conference that provides a forum for presentation and discussion of research on combustion science and technology. The 10th ASPACC was held in Beijing China and was well attended by members from our section who also made contributions to the International Advisory Board, and to the Technical paper Committee. There were many invited reviews but only three plenary speakers given by:

- (i) **Professor Sebastian Candel** from Ecole Centrale de Paris, France: “Issues, progress and future challenges in combustion dynamics”
- (ii) **Professor Assaad Masri** from the University of Sydney, Australia: “Turbulent combustion of sprays: from dilute to dense”
- (iii) **Dr Jackie Chen** from Sandia National Laboratories, Livermore CSA, USA: “Towards exascale simulations of turbulent combustion”

I am pleased to report that the next ASPACC conference will be held at the University of Sydney in 2017 and this be in conjunction with the 2017 Australian Combustion Symposium and the Eighth Australian Conference on Laser Diagnostics in Fluid Mechanics and Combustion.

The ANZ-CI section has provided \$2250 of travel support to nine Australian students (\$250 each) to attend the ASPACC conference. Our Section also contributed a record number of 20 papers to this meeting (compared to 9 papers in the 2013 conference):

Papers with Australian Authors presented at the 10th ASPACC, Beijing China, July 19-22, 2015)	
Paper	Title and authors
1- Plenary	“Turbulent combustion of sprays: from dilute to dense” Assaad Masri

2	“A Numerical Study of ‘Spray A’ with Multiple-Injections Using the Transported PDF Method”, M. A. Chishty, M. Bolla, Y. Pei, E.R. Hawkes, and S. Kook
3	“An Experimental Study of Ignition and Combustion Characteristics of Single Droplets of Heavy Oil Residues” Mingming Zhu, Zhezi Zhang, Ce Zheng and Dongke Zhang
4	“Identification and Characterisation of Cellulose Fast Pyrolysis Products using a CDS Pyroprobe in Combination with Liquid Nitrogen Quenching Method” Wenchao Wan, Mingming Zhu, Zhezi Zhang, Wenxu Zhou, Pengfei Liu and Dongke Zhang
5	“Numerical Investigation of Pulverised Coal Combustion in a Self-Recuperative MILD Combustion Furnace” Manabendra Saha, Alfonso Chinnici, Paul R. Medwell, and Bassam B. Dally
6	“The Effect of Volume Ratio of Ethanol Directly Injected in a Gasoline Port Injection Spark Ignition Engine” Yuhan Huang, Guang Hong, Ronghua Huang.
7	“Effect of the Molecular Structures of Biodiesel on Emission Characteristics of Diesel Combustion in a Compression Ignition Engine” Yu Ma, Mingming Zhu and Dongke Zhang
8	“On the Boundary Conditions and Stability of Moderately Dense Spray Flames” A. Lowe, A. Kourmatzis, and A.R. Masri,
9	“Numerical Simulations of Turbulent Premixed Flames in Lean Methane/Air Mixtures” Zhiyan Wang, John Abraham
10	“An Investigation of the Scalar Dissipation Rate Behavior in a Premixed Hydrogen Flame” Mike Kuron, Zhuyin Ren, Hemanth Kolla, Evatt Hawkes, Jacqueline H. Chen, Tianfeng Lu
11	“The Effect of Nitric Oxide on Knock Onset of iso-Octane in a CFR Spark-Ignition Engine” Zhongyuan Chen, Hao Yuan, Yi Yang, Michael Brear
12	“A DNS Study of Radiation Effects on the Turbulent Premixed Flame Properties” S. Karimkashi, M. Bolla, H. Wang, E.R. Hawkes, H. G. Im
13	“Assessment of conditional moment closure for ignition in compositionally and thermally stratified mixtures” J. Behzadi, M. Bolla, M. Talei, E.R. Hawkes, T. Lucchini, G. D’Errico, S. Kook
14	“Investigation of smouldering combustion of biomass fuel” Houzhi Wang, Paul R. Medwell, Cristian H. Birzer, Philip J. van Eyk, Zhao F. Tian
15	“Soot volume fraction and temperature measurements in laminar C ₂ H ₄ /air diffusion flames with H ₂ and N ₂ blended at atmospheric pressure” Z.W. Sun, S.M. Mahmoud, B.B. Dally, G.J. Nathan, Z.T. Alwahabi
16	“Influence of simulated solar radiation on the soot volume fraction in laminar sooty flames” Xue Dong, Graham J. Nathan, Zhiwei Sun, Dahe Gu, Peter J. Ashman, Zeyad Alwahabi, Bassam Dally
17	“Application of Two-line Atomic Fluorescence to Sooting Flames under Irradiation from a High-Flux Solar Simulator” D. H. Gu, Z. W. Sun^{1,2}, G. J. Nathan, X. Dong, Z. T. Alwahabi, B. B. Dally and P. R. Medwell
18	“PDF Calculations of Piloted Turbulent Flames with Inhomogeneous Inlet Conditions” M.M.Hossain, S. Galindo, M.J. Cleary and A.R. Masri
19	“Mechanisms on Non-Linear Characteristics of Laminar Flame Speed of Lean H ₂ /CO Mixtures” Yang Zhang, Wenfeng Shen, Hai Zhang
20	“Height of the Methane Co-flowing Inverse Diffusion Flames under Various Oxygen Concentrations” Xiaolong Qiu, Yang Zhang, Junfu Lu, Yuxin Wu, Hai Zhang

6. 36th Combustion Symposium

The Section has provided Travel Grants to twenty-eight (28) members of the Australia and New Zealand Section to assist them in attending the Symposium. It has awarded its David Warren Travelling Fellowship to Dr Fatemeh Salehi from the University of Sydney. Congratulations to Dr Salehi on this highly deserved award. The Brian Haynes Travelling Award (for a researcher from a non-Go8 University) was awarded to Dr Xianpeng Gao from Murdoch University in Perth.

Thirty-five papers co-authored by Australians were accepted for oral presentation at the 36th Symposium in Seoul. This is a record number and continues the tradition of the ANZ-CI Section. They include an invited Topical Review by Professor Gus Nathan from The University of Adelaide. The accepted papers are listed here where each paper is preceded by its code in the Symposium program:

1. 4G08/09: Research challenges in combustion and gasification arising from emerging technologies employing directly irradiated concentrating solar thermal radiation.
Gus Nathan (Invited Review)
2. 1A11: Turbulent Flames with Compositionally Inhomogeneous Inlets: Resolved Measurements of Scalar Dissipation Rates
Hugh Colin Cutcher, Robert S. Barlow, Gaetano Magnotti, Assaad R. Masri
3. 1A12: Fuel Effects on the Stability of Turbulent Flames with Compositionally Inhomogeneous Inlets
Thibault Frederic Guiberti, Mrinal Juddoo, Deanna A Lacoste, Matthew D Dunn, William L Roberts, Assaad R Masri
4. 2A05: A two mixture fraction flamelet model for large eddy simulation of turbulent flames with inhomogeneous inlets
Bruce A. Perry, Michael E. Mueller, Assaad R. Masri
5. 2A06: MMC-LES Simulations of Turbulent Piloted Flames with Varying Levels of Inlet Inhomogeneity
Sebastian Galindo-Lopez, Fatemeh Salehi, Matthew J. Cleary, Assaad R. Masri
6. 2A12: Stabilization of Turbulent Auto-igniting Dimethyl Ether Jet Flames Issuing into a Hot Vitiated Coflow
Andrew R.W. Macfarlane, Matthew J. Dunn, Mrinal Juddoo, Assaad R. Masri
7. 3F06: Tracking the Evolution of Soot Particles and Precursors in Turbulent Flames Using Laser Induced Emission.
Daniel Bartos, Matthew Dunn, Mariano Sirignano, Andrea D'Anna, Assaad R. Masri
8. 4B02: Sparse-Lagrangian MMC simulations of an n-dodecane jet at engine-relevant conditions
Fatemeh Salehi, Matthew J. Cleary, Assaad R. Masri, Yipeng Ge, Alexander Y. Klimenko
9. 5E05: Turbulent Spray Flames of Intermediate Density: Stability and Near-Field Structure
Albyn Remi Anekamai Lowe, A. Kourmatzis, A. R. Masri
10. 2B12: Effect of jet-jet interactions on soot formation in a small-bore diesel engine
Minh K. Le, Yilong Zhang, Renlin Zhang, Lingzhe Rao, Sanghoon Kook, Qing Nian Chan, Evatt R. Hawkes
11. 4A01: Performance of transported PDF mixing models in a turbulent premixed flame
Michael Kuron, Zhuyin Ren, Hua Zhou, Evatt Hawkes, Joshua Tang, Jacqueline H Chen, Tianfeng Lu
12. 4B03: Influence of turbulent fluctuations on radiation heat transfer and soot/NO formation under ECN Spray A conditions
Michele Bolla, Muhammad A. Chishty, Evatt R. Hawkes, Qing N. Chan, Sanghoon Kook
13. 4B04: Doubly Conditional Moment Closure Modelling for HCCI with Temperature Inhomogeneities
Fatemeh Salehi, Mohsen Talei, Evatt R. Hawkes, Ankit Bhagatwala, Jacqueline H. Chen, Chun Sang Yoo, Sanghoon Kook
14. 4B05: A direct numerical simulation of cool-flame affected autoignition in diesel engine-relevant conditions
Alexander Krisman, Evatt R Hawkes, Mohsen Talei, Ankit Bhagatwala, Jacqueline H Chen

15. 4A07: A Comparison between Direct Numerical Simulation and Experiment of the Turbulent Burning Velocity-Related Statistics in a Turbulent Methane-Air Premixed Jet Flame at High Karlovitz Number
Haiou Wang, Evatt R. Hawkes, Bo Zhou, Jaqueline H. Chen, Zhongshan Li, Marcus Aldén
16. 5A04: Local extinction and reignition mechanism in a turbulent lifted flame: a direct numerical simulation study
Shahram Karami, Mohsen Talei, Evatt R. Hawkes, Jacqueline H. Chen
17. 2F09: Impact of acoustic forcing on soot evolution and temperature in ethylene-air flames
Agnes Jocher, Kae Ken Foo, Zhiwei Sun, Bassam Dally, Heinz Pitsch, Zeyad Alwahabi, Graham Nathan
18. 3F03: The Effect of Exit Strain Rate on Soot Volume Fraction in Turbulent Non-Premixed Jet Flames
Saleh M. Mahmoud, Graham J. Nathan, Zeyad T. AlWahabi, Zhiwei W. Sun, Paul R. Medwell, Bassam B. Dally
19. 3F05: Hydrodynamic and chemical effects of hydrogen addition on soot evolution in turbulent nonpremixed bluff body ethylene flames
Sili Deng, Michael E. Mueller, Qing N. Chan, Nadar H. Qamar, Bassam B. Dally, Zeyad T. Alwahabi, Graham J. Nathan
20. 3A04: A PDF approach to thin premixed flamelets using multiple mapping conditioning
Alexander Y Klimenko, Brruntha Sundaram
21. 5H10: Supersonic Combustion of Hydrocarbons in a Shape-Transitioning Hypersonic Engine
Zachary J. Denman, Vincent Wheatley, Michael K. Smart, Ananthanarayanan Veeraragavan
22. 3F01: Gas phase pyrolysis of endosulfan and formation of dioxin precursors of polychlorinated dibenzo-p-dioxins and dibenzofurans (PCDD/F)
Nirmala K. Dharmarathne, John C. Mackie, Eric M. Kennedy, Michael Stockenhuber
23. 3G06: Ignition and Combustion Characteristics of Single Particles of Zhundong Lignite: Effect of Water and Acid Washing
Zhezi Zhang, Mingming Zhu, Yang Zhang, Hendrix Y. Setyawan, Jianbo Li, Dongke Zhang
24. 5E11: An Experimental Study of the Ignition and Combustion Characteristics of Single Droplets of Biochar-Glycerol-Water Slurry Fuels
Mingming Zhu, Zhezi Zhang, Yang Zhang, Hendrix Setyawan, Pengfei Liu, Dongke Zhang
25. 1G06: Emission of particulate matter during the combustion of bio-oil and its fractions under air and oxyfuel conditions
Chao Feng, Xiangpeng Gao, Hongwei Wu
26. 2G07: Influence of biomass particle size on bed agglomeration during biomass pyrolysis in fluidized bed
Alan Burton, Hongwei Wu
27. 2G10: Inorganic PM10 emission from the combustion of individual mallee components and whole-tree biomass
Xiangpeng Gao, Muhammad Usman Rahim, Xixia Chen, Hongwei Wu
28. 1H03: Classification and Lift-Off Height Prediction of Non-Premixed MILD and Autoignitive Flames
Michael J Evans, Paul R Medwell, Hao Wu, Alessandro Stagni, Matthias Ihme

29. 2G09: Loading the same contents of sodium and quartz into different ash-removed coals to elaborately investigate the effect of coal particle combustion on the emission behavior of PM10
Chang Wen, Penghui Zhang, Dunxi Yu, Minghou Xu
30. 5F05: The catalytic oxidation of NH₃ on Co₃O₄: A theoretical study
Kambiz Shojaei, Brian S. Haynes, Alejandro Montoya
31. 5D07: N₂O formation and dissociation during ammonia combustion: A combined DFT and experimental study.
Juan D. Gonzalez, Maximilian Warner, Brian S. Haynes, Alejandro Montoya
32. 3A01: Sparse-Lagrangian MMC modelling of the Sandia DME (D-F) jet flames
Gregor Neuber, Andreas Kronenburg, Oliver T. Stein, Matthew J. Cleary, Bruno Coriton, Jonathan H. Frank
33. 4F03: Modelling flame synthesis of silica nanoparticles
Son Vo, Andreas Kronenburg, Oliver T. Stein, Matthew J. Cleary
34. 3B02: Autoignition studies of C₅ isomers in a motored engine
D. Kang, S.V. Bohac, A.L. Boehman, S. Cheng, Y. Yang, M.J. Brear
35. 3B03: Autoignition of pentane isomers in a spark-ignition engine
S. Cheng, Y. Yang, M.J. Brear, D. Kang, S. Bohac, A.L. Boehman

Assaad R. Masri
Chair, Australian and New Zealand Section
24th July 2016.