

Report to the Combustion Institute on the Activities of the China Section of the Combustion Institute

2014-2016

The China Section of the Combustion Institute is expanding rapidly, and now has more than 1000 members from academia and industry. The Section organizes meetings and other events on a regular basis with the aim of providing a forum for communications among specialists, stimulating dissemination of scientific and technical knowledge on combustion, and promoting collaboration among researchers working on different branches of combustion research.

During the period of 2014-2016, the officers and chairs of the China Section of the Combustion Institute have been as follows:

Section Chair: Fei Qi, Shanghai Jiao Tong University

Past Chair: Qiang Yao, Tsinghua University

Honorary Chair: Chunde Yao, Tianjin University

Vice Chairs: Daiqing Zhao, Guangzhou Institute of Energy Conversion, Chinese Academy of Sciences

Minghou Xu, Huazhong University of Science and Technology

Zuohua Huang, Xi'an Jiao Tong University

Zhen Huang, Shanghai Jiao Tong University

Zhongyang Luo, Zhejiang University

Mingfa Yao, Tianjin University

Qinggong Lv, Institute of Engineering of Thermophysics, Chinese Academy of Sciences

Naian Liu, University of Science and Technology of China

Funding

● Major Research Plan - The Fundamental Research on Turbulent Combustion for Engines

One eight-year "Major Research Plan" on combustion research was approved by the National Natural Science Foundation of China (NSFC) in August 2014. This combustion

initiative is funded at about 30-40 million US Dollars with the title of "The Fundamental Research on Turbulent Combustion for Engines", focusing on basic combustion issues with strategic importance to the nation and major frontier areas. Three topics were identified as the key aspects of this plan, (1) combustion reaction kinetics, (2) turbulence and combustion interactions, and (3) combustions at extreme conditions for liquid and gaseous fuels. All the combustion scientists from universities or research institutes in China are welcome to send applications. Meanwhile, the international or regional cooperation are especially encouraged to application.

Education

- **07/2014, Beijing**

- The Tsinghua-Princeton 2014 Summer School on combustion**

- The Tsinghua-Princeton 2014 summer school on combustion was held in Tsinghua University from July 20 to July 25, 2014. Four course were offered: Combustion Chemistry and modeling by Dr. Charles K. Westbrook, Lawrence Livermore National Laboratories; Quantitative Laser Diagnostics for Combustion Chemistry and Propulsion by Prof. Ronald K. Hanson, Stanford University; Combustion Theory by Prof. Moshe Matalon, University of Illinois at Urbana-Champaign and Computational Turbulent Combustion by Dr. Thierry Poinsot, Institut de Mécanique des Fluides de Toulouse, CNRS. 387 attendees from more than 20 countries and regions enjoyed the lectures very much.

- **07/2014, Tianjin**

- The 6th International Summer School of Engines**

- The 6th International Summer School of Engines was held in Tianjin on July 10-17, 2014. More than 100 participants attended the classes. Lectures were delivered by Prof. Wai Cheng from MIT, Prof. Tielong Shen from Sophia University, Prof. Choongsik Bae from KAIST, Prof. Jyh-Yuan Chen from UC Berkeley, Prof. Rui Chen from Loughborough University, Prof. Zhongshan Li from Lund University, Dr. Amin Velji from Karlsruhe University and Dr. Rolf Weinowski from FEV. The lectures covered topics on gasoline and diesel engine combustion, engine combustion simulation, engine and vehicle control, advanced engine technology, and engine laser diagnostics. The summer school was free to all attendees.

- **10/2014, Hefei**

- The Autumn School of Combustion Reaction Kinetics**

- The Autumn School of Combustion Reaction Kinetics was held in Hefei at National Synchrotron Radiation Laboratory, University of Science and Technology of China on October 24-26, 2014. More than 150 participants from 22 universities and research institutes attended the workshop. The lectures were delivered by Prof. Bin Yang from Tsinghua University, Prof. Fei Qi, Asso. Profs. Xiaoguo Zhou, Yang Pan, and Yuyang Li, Drs. Hanfeng Jin, Wenhao Yuan, and Lili Ye from University of Science and Technology of China. The lectures mainly focused

on the experiment, modeling and theory in combustion, and also included the application of mass spectrometry and spectroscopic technology in combustion.

- **07/2015, Beijing**

- The Tsinghua-Princeton 2015 Summer School on Combustion**

- The Tsinghua-Princeton 2015 summer school on combustion was held in Tsinghua University from July 12 to 18, 2015. 370 attendees attended. Four courses were offered: four courses offered: 1) Chemical Kinetic Modeling: Prof. Henry J. Curran, National University of Ireland, Galway; 2) Combustion Dynamics: Prof. Sébastien M. Candel, École Centrale Paris; 3) Combustion Theory and Applications in CFD: Prof. Heinz Pitsch, RWTH Aachen University; and 4) Advanced Laser Diagnostics in Combustion Research: Prof. Mark A. Linne, University of Edinburgh.

Cooperation

- **09/2014**

- The MOU on Fire Research Cooperation between SKLFS and FM Global Signed**

- On Sept. 11th, 2014, a signing ceremony of MOU on fire research was held among FM Global, State Key Laboratory of Fire Science (SKLFS) and Hefei Institute of Advanced Technology (IAT) at SKLFS. The MOU signing will be a milestone for further international cooperation between SKLFS and FM Global on the frontiers of fire research. Representatives from FM Global were Dr. Sergey B. Dorofeev, Research Director for Fire Hazards and Protection and Dr. Yi Wang, Group Manager of Fire Dynamics. Representatives from SKLFS were Prof. Heping Zhang (Director of SKLFS), Prof. Naian Liu (Vice Director of SKLFS), Prof. Jinhua Sun (Vice Director of SKLFS), and Prof. Weiguo Song. Prof. Shouxiang Lu (Executive Director of IAT) and Prof. Bing Wang (IAT Assistant Director) also attended the meeting. Prof. Naian Liu hosted the ceremony.

- **11/2014**

- National Center for International Research on Large-scale Fires Approved**

- In Nov. 2014, the China's Ministry of Science and Technology (MOST) released "2014 List of Approved National Centers for International Research", showing that the National Center for International Research on Large-scale Fires applied for by State Key Laboratory of Fire Science (SKLFS) together with four international partners has been approved officially. Four international partners of the center include Engineering Laboratory of National Institute of Standards and Technology (NIST-EL) in USA, Institute of Chemical Kinetics and Combustion (ICKC) in Russia, Centro de Estudos sobre Incêndios Florestais–Associação para o Desenvolvimento da Aerodinâmica Industrial (ADAI-CEIF, Center for Forest Fire Studies) in Portugal, and Imperial College of Science Technology and Medicine (Imperial) in UK. The MOST Special Support Programs for International Scientific Cooperation will give priority support for the approved centers so as to promote the development of the centers at a faster

pace and to encourage cooperation research programs to yield high-level or world-front findings.

- **11/2015**

- Joint Combustion Centre Collaboration Agreement between King Abdullah University of Science & Technology and Shanghai Jiao Tong University**

- In Nov. 2015, a delegation from Shanghai Jiao Tong University (SJTU) visited King Abdullah University of Science & Technology (KAUST) to sign the Joint Combustion Center Collaboration Agreement between the two universities. Representatives from SJTU were Prof. Zhen Huang (Vice President of SJTU) and Prof. Fei Qi. Representatives from KAUST were Prof. Jean M.J. Fréchet (Vice President of KAUST) and Prof. William L. Roberts (Director of Clean Combustion Research Center, CCRC). After the ceremony, there was a meeting to discuss the cooperated projects covering combustion reaction kinetics, spray combustion, plasma assisted combustion, advanced engines, as well as programs for student and staff exchange. In Feb. 2016, a delegation from CCRC visited SJTU to further promote the collaboration of the joint combustion center. The aim of the joint combustion center is to work together to promote the innovative, safety and scientific development of fossil energy, and clean and low-carbon energy, to meet national development targets for both China and Kingdom of Saudi Arabia.

Events

- **03/2014, Hangzhou**

- Joint NSF-NSFC Workshop on Combustion Related to Sustainable Energy**

- The Joint NSF-NSFC Workshop on Combustion related to Sustainable Energy was organized by Zhejiang University in Hangzhou on March 10-12, 2014. The workshop was jointly sponsored by the U.S. National Science Foundation (NSF) and the National Science Foundation of China (NSFC). This workshop was an invitation-only event, and included 10 invited participants from the U.S. and 10 from China. It included several themes, (1) Global Climate Change Considerations, (2) Sustainable/Renewable Fuel Supply, (3) Improved Efficiency of Combustion Systems, (4) Environmental Impacts beyond climate change, and (5) Enabling Technologies and Novel Combustion Concepts. This workshop aimed to bring together the lead researchers from the U.S. and China to address critical needs in the general area of combustion and identify priority research objectives for potential joint research projects.

- **09/2014, Hangzhou**

- The Sino-US Clean Energy Research Center - 2014 ACTC Joint Meeting**

- Sino-U.S. Clean Energy Research Center - 2014 ACTC Joint Meeting was organized by Zhejiang University in Hangzhou on September 18-20, 2014. More than 50 Chinese representatives and over 30 U.S. representatives attended the meeting. Five tasks were proposed for future cooperation between China and U.S., (1) Advanced power generation

technology, in particular, the pressurized oxygen enriched combustion and chemical chain combustion, (2) Cooperation and knowledge sharing for large projects in US and China, (3) CO₂ utilization and storage, especially oil displacement (EOR), water flooding (EWR) and micro algae growth, (4) Clean conversion, especially the gasification of coal, poly-generation and decomposition, and (5) System analysis and sharing, especially modeling and simulation. The two sides signed a memorandum of understanding at the end of the meeting.

- **09/2014, Hangzhou,**

- The 4th U.S.-China Symposium on CO₂ Emission Control Science and Technology**

- The 4th U.S.-China Symposium on CO₂ Emission Control Science and Technology was held in Hangzhou on September 20-22, 2014, organized by Zhejiang University and West Virginia University. The symposium was sponsored by U.S. Department of Energy (USDOE), and the Ministry of Science and Technology (MOST) and the National Energy Administration (NEA) of China. Prof. Zhongyang Luo from Zhejiang University and Dr. Scott Smouse from USDOE were served as chairmen of the symposium. More than 100 Chinese representatives and over 30 U.S. representatives attended the symposium. There were four technical sessions, (1) CCUS projects and international cooperation, (2) CO₂ Capture Technology, (3) CO₂ Utilization and Storage Technology, (4) Carbon emission measurement, monitoring, and verification (MMV).

- **10/2014, Hangzhou**

- The 8th International Conference on Combustion, Incineration-Pyrolysis, Emission and Climate Change**

- The 8th International Conference on Combustion, Incineration-Pyrolysis, Emission and Climate Change was organized by Zhejiang University in Hangzhou on October 15-17, 2014. Prof. Kefa Cen, academician of the Chinese Academy of Engineering was the chairman of the conference. Prof. Nickolas J. Themelis from Columbia University and Prof. Jong-In Dong from Seoul National University were served as co-chairman. The plenary speeches were delivered by Prof. Nickolas J. Themelis from Columbia University, Prof. Jianhua Yan from Zhejiang University, Dr. Hans hunsinger from Karlsruhe Institute of technology, Prof. Yong-Chil Seo from Yonsei University, and Prof. Masaki Takaoka from Kyoto University. There were 260 registered participants with more than half being abroad. Over 100 oral presentations and 63 posters were presented at the symposium.

- **10/2014, Xi'an**

- 2014 China National Symposium on Combustion**

- The 2014 China National Symposium on Combustion was held at Xi'an Jiaotong University, Xi'an, on October 31-November 2, 2014. There were four plenary lectures on the open ceremony by Academician Jianzhong Xu from Chinese Academy of Engineering Thermal Physics, Prof. Noam Lior from University of Pennsylvania, Prof. C. K. Law from Princeton

University, and Dr. Zhongying Wang from Energy Research Institute of National Development and Reform Commission. More than 800 registered participants from universities, research institutes and industry attended the event. 329 oral presentations and 194 posters were presented at the meeting.

- **11/2014, Nanjing**

- The 4th International Workshop on Oxy-FBC Technology**

- The 4th International Workshop on Oxy-FBC Technology was hosted by Southeast University, Nanjing, on November 5-7, 2014. 102 experts and scientists from 12 countries and regions attended the workshop. 4 keynotes and 36 oral presentations were delivered, covering three subjects (1) Oxy-fuel FBC combustion, (2) Calcium looping combustion for CO₂ capture, and (3) Chemical looping combustion with oxygen uncoupling. Dr. Stanley Santos from the International Energy Agency (IEA) shared the development of the oxy-fuel projects all over the world. Prof. Bo Leckner from Chalmers University of Science and Technology, Sweden, overviewed the oxy-CFB history in detail. Dr. Lunbo Duan from Southeast University, China, reviewed the oxy-CFB development in China.

- **11/2014, Tianjin**

- The 7th International Advanced Engine Control Symposium (AECS)**

- The 7th International Advanced Engine Control Symposium (AECS) was organized by Tianjin University in Tianjin on November 26-27, 2014. More than 224 participants including 44 from the industry attended the symposium. Prof. Per Anders Tunestal addressed the welcome speech. 17 oral presentations were delivered on the topics of modeling, identification and control techniques. A panel on how to reach 95g CO₂/km in China by 2025 was scheduled at the symposium.

- **07/2015, Beijing**

- The 8th International Symposium on Coal Combustion (ISCC-8)**

- The 8th International Symposium on Coal Combustion (ISCC-8) was hosted by Tsinghua University at Beijing Convention Center in Beijing on July 19-22, 2015. There were seven invited plenary lectures delivered by Prof. Guangxi Yue from Tsinghua University, Prof. Reinhold Kneer from RWTH Aachen University, Prof. Jost Wendt from University of Utah, Dr. Keiji Makino from Japan Coal Energy Association, Dr. Andrew Minchener from International Energy Agency (IEA), Prof. Rajender Gupta from University of Alberta, and Prof. Bhattacharya from Monash University. More than 220 registered participants from academia and industry from 14 countries attended the conference, and 6 topics were scheduled including basic coal properties, pulverized coal combustion, fluidized bed combustion, oxy-fuel combustion and CO₂ capture, pollutant emissions, and industrial applications.

- **07/2015, Beijing**

- The 10th Asia-Pacific Conference on Combustion**

The 10th Asia-Pacific Conference on Combustion (ASPACC) was hosted by the China Section of the Combustion Institute and Tsinghua University in Beijing on July 19-22, 2015. There were more than 400 participants including around 200 international attendees from 16 countries and regions. 326 oral presentations were distributed among 9 topics. The three invited plenary lectures were delivered (1) by Prof. Sébastien Candel of Ecole Centrale de Paris, France, on combustion dynamics, (2) by Prof. Assaad Masri of the University of Sydney, Australia, on spray combustion, and (3) by Dr. Jacqueline Chen of the Sandia National Laboratories, USA, on turbulent combustion. Social events included an outdoor barbeque reception and an Olympic Park tour. At the conference banquet, Young Investigator Awards were granted to the authors of six distinguished papers of the 9th ASPACC.

- **08/2015, Shanghai**

- The 5th Workshop for Future Automotive Powertrains**

- The 5th Workshop for Future Automotive Powertrains was hosted by Shanghai Jiao Tong University in Shanghai on August 21-23, 2015, with the theme of “Challenges and Strategies in Economy Improvement and Emissions Control for Automotive Powertrain”. More than 50 experts from academia and industry attended this workshop. Lectures covered topics on engine combustion technology development of passenger vehicles, challenges and research progress of alternative fuel vehicles in China, and fuel impacts on diesel engine combustion and emissions.

- **08/2015, Beijing**

- International Workshop on Detonation for Propulsion 2015 (IWDP 2015)**

- The International Workshop on Detonation for Propulsion 2015 (IWDP 2015) was held at Peking University, Beijing, on August 26-29, 2015, organized and chaired by Professor Jian-Ping Wang. As an annual international workshop, the IWDP is devoted to the new direction of power for aeronautics and astronautics and draws attention from the world. More than 50 researchers and experts from over 20 organizations attended the event. 18 invited lectures from 9 nations and regions were delivered, and covered topics on new concepts in detonative propulsion from subcomponents to system levels, fundamental and practical researches on detonative propulsion, numerical and experimental techniques in detonative propulsion.

- **08/2015, Tianjin**

- The 6th International Symposium On Clean and High-Efficiency Combustion in Engines (ISCE 2015)**

- The 6th International Symposium on Clean and High-Efficiency Combustion in Engines was held at Tianjin University, Tianjin, on August 27-30, 2015. More than 150 registered participants attended the symposium. 25 renowned engine scientists delivered insightful keynote lectures, including Prof. Volker Sick from University of Michigan, Dr. Timothy Johnson from Corning Co., Prof. Hua Zhao from Brunel University, and Prof. Wanhua Su from

Tianjin University.

- **09/2015, Shanghai**

- The 1st National Young Scholar Meeting on Combustion Research**

- The 1st National Young Scholar Meeting on Combustion Research was hosted by Shanghai Jiao Tong University in Shanghai on September 18-20, 2015. More than 150 participants from 41 universities and research institutes attended the event. There were 27 invited topic reviews and 6 parallel technical sessions covering discussions on laminar flames and combustion kinetics, turbulent combustion and numerical simulation, IC engine and gas turbine combustion, solid fuel combustion and combustion pollutants, combustion diagnostics and new combustion technology, and fire science and technology. The meeting successfully showcased the latest achievements in combustion research contributed by young Chinese researchers. Participants discussed the opportunities and challenges faced by the combustion community, and methods to enhance the communications and collaborations among young scholars.

- **10/2015, Wuzhen**

- The 9th Asian DME Conference**

- The 9th Asian DME conference was organized by China DME Association (CDA) and hosted by Shanghai Jiao Tong University in Wuzhen on October 16-18, 2015. About 80 participants from seven countries attended the conference. 13 oral presentations, 6 posters, and a panel discussion were scheduled, dealing with advanced DME production and application technology, industrial development and commercial opportunities, and government legislation and standards. Dr. Theo Fleisch (Chairman Emeritus of International DME Association) delivered the keynote lecture “History, Present and Future of DME”. Prof. Zhen Huang addressed the keynote lecture “Development of a DME Fueled Vehicle Engine in China”. As a major international conference held biennially, the Asian DME Conference offers participants authoritative and up-to-date information from industry and academia.

- **10/2015, Beijing**

- 2015 China National Symposium on Combustion**

- The 2015 China National Symposium on Combustion was held at North China Electric Power University, Beijing, on October 24-25, 2015. There were over 1000 registered participants from both home and abroad. Five invited presentations were delivered, 11 themes were scheduled, and over 600 papers were presented at the meeting. President of The Combustion Institute, Prof. Katharina Kohse-Höinghaus from University of Bielefeld delivered the lecture “Biofuel Combustion Chemistry”. The “Outstanding Contribution Award” was granted to Prof. Weibiao Fu from Tsinghua University for his academic achievements and creative work. The progress on the combustion projects of National Natural Science Foundation was discussed.

- **11/2015, Tianjin**

The 8th International Advanced Engine Control Symposium (AECS)

The 8th International Advanced Engine Control Symposium (AECS) was held by Tianjin University, Tianjin, on November 20-23, 2015. Seven experts from five countries delivered insightful lectures to the students of Tianjin University. The lectures covered topics on Gas Path Control, ECU powertrain electronic control unit HW & SW, Combustion Control, Air and Fuel Ratio Control in SI Engines, Calibration and Emissions, Hybrid Electric Vehicle Powertrain Control, and Control of Aftertreatment System. The 9th International Advanced Engine Control Symposium was announced to be held by Tianjin University, Tianjin, on November 12-13, 2016.

● **12/2015, Wuhan**

The 5th Sino-Australian Symposium on Advanced Coal and Biomass Utilisation Technologies

The 5th Sino-Australian Symposium on Advanced Coal and Biomass Utilisation Technologies was held in Wuhan on December 14-16, 2015. This symposium was jointly organized by Huazhong University of Science and Technology, China, and Curtin University, Australia. More than 90 participants from seven countries attended this symposium. This event covered 12 sessions on pyrolysis, biofuels and biochemicals, advanced materials and fuel cell, ash-related issues, alternative technologies, emission of pollutions, chemical looping, gasification, combustion, CO₂ and other topics. 53 oral and 22 poster presentations were presented at this symposium. Seven invited keynote lectures were delivered by Dr. Anthony Dufour from CNRS, University of Lorraine, France, Prof. Hero J. Heeres from University of Groningen, Netherlands, Prof. Fei Qi from Shanghai Jiao Tong University, China, Prof. Reginald E. Mitchell from Stanford University, USA, Prof. Bogdan Z. Dlugogorski from Murdoch University, Australia, Prof. Guangwen Xu from Institute of Process Engineering, CAS, China, and Prof. Hanping Chen from Huazhong University of Science and Technology, China.

● **04/2016, Hefei**

The 2nd National Young Scholar Meeting on Combustion Research

The 2nd National Young Scholar Meeting on Combustion Research was hosted by University of Science and Technology of China in Hefei on April 9-10, 2016. A total of 234 registered participants from more than 60 universities and research institutes attended the event. There were 20 invited topic reviews on combustion research and 6 parallel technical sessions covering discussions on laminar flames and combustion kinetics, turbulent combustion and numerical simulation, IC engine and gas turbine combustion, solid fuel combustion and combustion pollutants, combustion diagnostics and new combustion technology, and fire science and technology. An optional tour of the National Synchrotron Radiation Laboratory and State Key Laboratory of Fire Science was arranged during the meeting.

- **04/2016, Hefei**

- The 8th International Seminar on Fire and Explosion Hazards**

- The 8th International Seminar on Fire and Explosion Hazards (8th ISFEH) was held in Hefei, China, April 25-28, 2016. The Seminar, which takes place every 3 years, is one of the highest level international conferences in the fire and explosion research field. The 8th ISFEH aimed to present and discuss the latest research results and related technology development trends in fire and explosion science and technology. The attendees of the seminar showed their newest research by giving presentations of papers in their field. The program consisted of plenary talks, highlighted presentations, parallel sessions and poster sessions. Plenary talks were presented by: Dr. Randall McDermott from the National Institute of Standards and Technology; Dr. Nabiha Chaumeix from the Centre national de la recherche scientifique; Prof. Longhua Hu from the State Key Laboratory of Fire Science; Dr. Yajue Wu from Sheffield University.

- **06/2016, Hangzhou**

- The 5th U.S.-China Symposium on CO₂ Emission Control Science and Technology**

- The 5th U.S.-China Symposium on CO₂ Emission Control Science and Technology was organized by Zhejiang University and University of Wyoming in Hangzhou on June 5-7, 2016, sponsored by U.S. Department of Energy (DOE) and the Ministry of Science and Technology (MOST) and the Ministry of Education (MOE) of China. There were more than 100 representatives with about 30 from the United States. The symposium covered six topics, (1) CCUS projects and international cooperation, (2) CO₂ Capture Technology, (3) CO₂ Utilization Technology, (4) CO₂ Geological Sequestration Technology, (5) Carbon emission measurement, monitoring, and verification (MMV), and (6) CCUS regulation, carbon trade market development and experiences.