

Curriculum Vitae

Peter H. Joo, Ph.D.

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Nationality: Canadian

EDUCATION

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| PH.D. AEROSPACE ENGINEERING SCIENCE University of Toronto, Institute for Aerospace Studies (Toronto, Canada) Thesis Topic: Combustion and Soot-carbon particulate formation at elevated pressures Supervisor: Prof. Ömer L. Gülder | SEP 2005 - APR 2010 |
| M.SC.E. MECHANICAL AND MATERIALS ENGINEERING Queen's University (Kingston, Canada) Thesis Topic: Combustion, Flammability limits, Detonations and Explosion prevention Supervisor: Prof. Gabriel Ciccarelli | SEP 2003 - MAR 2005 |
| B.SC.E. MECHANICAL AND MATERIALS ENGINEERING Queen's University (Kingston, Canada) Area of Specialization: Thermodynamics and Fluid Sciences | SEP 1999 - APR 2003 |

PROFESSIONAL RESEARCH WORK HISTORY

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| POST-DOCTORAL RESEARCHER (TORONTO, CANADA) University of Toronto, Institute for Aerospace Studies <ul style="list-style-type: none">• Reviewer for the journal American Chemical Society (ACS).• Provided quantitative analysis on high-pressure primary soot particle morphology using T-E-Microscope.• Collaboration (joint-project) on high-pressure soot morphological structure study with University of Naples Federico II - Prof. Andrea D'Anna, and Institute for Research on Combustion (IRC) - Dr. Mario Commodo, and Dr. Anna Ciajolo, Naples, Italy.• Collaboration with Dr. Moah Christensen on high-pressure combustion, soot, and the environment.• Resulted in several journal publications (manuscripts-in-preparations) to the top-tier journals in the field. | JAN 2015 - PRESENT |
| POST-DOCTORAL RESEARCHER (LUND, SWEDEN) Lund University, Division of Combustion Physics, Department of Physics <ul style="list-style-type: none">• Project on the Design, Execution and Management of the high-pressure experimental research.• Designed a novel integrated high-pressure chamber and burner for combustion research.• Executed the investigation and quantified sooting characteristics using high-fidelity, advanced imaging laser-diagnostics on high-pressure flames.• Resulted in 1 refereed conference poster to 8th Mediterranean Combustion Symposium.• Resulted in 1 refereed journal paper publication to Review of Scientific Instruments. | NOV 2012 - OCT 2014 |
| POST-DOCTORAL RESEARCHER (TORONTO, CANADA) University of Toronto, Institute for Aerospace Studies <ul style="list-style-type: none">• Soot Session Chair, Proceedings of the Combustion Institute, Canadian Section, 2012.• Quantified soot concentration and temperature using spectroscopic soot emission data from high-pressure experimental flame.• Resulted in 1 refereed journal paper publication to Energy and Fuels.• Resulted in 1 refereed journal paper publication to Combustion and Flame. | JAN 2012 - OCT 2012 |
| POST-DOCTORAL RESEARCHER (THUWAL, SAUDI ARABIA) King Abdullah University of Science and Technology, Clean Combustion Researcher Center Visiting researcher at Seoul National University, Mechanical and Aerospace Engineering (Seoul, South Korea) <ul style="list-style-type: none">• Designed and executed the investigation to establish the fundamental knowledge of soot formation from primary fuel-mixtures of aviation and automotive surrogate fuels.• Quantified soot particulate concentrations from liquid fuels and gaseous fuel-mixtures using counter-flow flames with laser-scattering and -extinction diagnostic techniques (LS-LE).• Resulted in 1 refereed journal publication to the journal Proceedings of the Combustion Institute. | JUN 2010 - DEC 2011 |

PH.D. ENGINEER-IN-TRAINING (TORONTO, CANADA)**SEP 2005 - APR 2010**

University of Toronto, Institute for Aerospace Studies

- Designed burner systems and executed high-pressure soot formation-oxidation experiments up to 100 atm (10 MPa) using a steady-state, static, and continuous-flow high-pressure combustion chamber.
- Quantified soot concentrations and temperature in the flame using non-intrusive optical diagnostic method by measuring flame blackbody radiation emission.
- Made a discovery of a new substance: liquefied methane-water mixture at 60 atm and above, published in the journal Energy & Fuels.
- Resulted in 6 refereed articles in the highest-ranked journals in the field and 12 domestic & international conferences.

M.Sc.E. ENGINEER-IN-TRAINING (KINGSTON, CANADA)**SEP 2003 - MAR 2005**

Queen's University, Mechanical and Materials Engineering

- Designed and constructed experimental test apparatus to investigate explosion and flame abatement performances of safety devices, namely, DuPont high-temperature ceramic foams, in process industries.
- Acquired, analysed, and determined the flame quenching and flammability limits using the ceramic foams to yield product safety performances.
- Resulted in 1 refereed journal paper in Combustion Science and Technology and international & domestic conference paper presentations.

MANAGEMENT AND SUPERVISORY EXPERIENCE

UNIVERSITY OF TORONTO, INSTITUTE FOR AEROSPACE STUDIES (TORONTO, CANADA)**JAN 2015 - PRESENT**

- Lead in collaboration with Dr. Moah Christensen on the effect of high-pressure soot on the environment.
- Co-supervisor with Prof. Ömer L. Gülder for 1 Aerospace Masters student on high-pressure soot morphology study.
- Co-supervisor with Prof. Ömer L. Gülder for 1 Aerospace Masters student on spectroscopic radiation emission measurement and analysis.

LUND UNIVERSITY (LUND, SWEDEN)**Nov 2012 - Oct 2014**

- Planned and directed the development, facilitation and management of the high-pressure combustion laboratory with Dr. Li, Dr. Collin, 2 technical staffs, and 2 Ph.D. students (Joint Sweden and Holland).
- Managed the work order packages, equipment sourcing, and installation with the group.
- Oversaw the risk analysis assessment and worked closely with third-party safety consultation firm, DEKRA, and ensured full compliance with regulatory specification, testing, and CE certification of the high-pressure combustion chamber.
- Supervised and mentored 2 Ph.D. students on high-pressure combustion.

KING ABDULLAH UNIVERSITY OF SCIENCE AND TECHNOLOGY (THUWAL, SAUDI ARABIA)**JUN 2010 - DEC 2011**

- Provided training seminars to research scientists on liquid fuel vaporization techniques and combustion.

UNIVERSITY OF TORONTO, INSTITUTE FOR AEROSPACE STUDIES (TORONTO, CANADA)**2008 - 2010**

- Supervised and coached 2 Masters students on high-pressure combustion soot.

KEYNOTE / PLENARY / INVITED PRESENTATIONS

1. **Invited Lecture**, "Measurements of soot particle concentrations from hydrocarbon fuel combustion", Carleton University, Ottawa, Canada, April 12, 2012.
2. **Invited Lecture**, "Experimental investigations of combustion-generated soot particles", Ryerson University, Toronto, Canada, April 2, 2012.
3. **Invited Lecture**, "Soot Formation from Combustion of Hydrocarbon Fuels at Elevated Pressures", Eindhoven University of Technology, Eindhoven, The Netherlands, November 27, 2012.

TEACHING

UNIVERSITY OF TORONTO**2006-2008**

- Aerospace propulsion (AER510)
- Teaching assistant: Marked assignments for a class of 30 students and occasional lecturer.

QUEEN'S UNIVERSITY**2005**

- Compressible fluid flow (Mech 448)
- Teaching assistant: Marked assignments for a class of 100 students and occasional lecturer.

- QUEEN'S UNIVERSITY** **2004**
- Thermodynamics (Mech 230)
 - Teaching assistant: Prepared and conducted weekly tutorials and marked assignments for a class of 200 students.
- QUEEN'S UNIVERSITY** **2004**
- Fluid mechanics (Mech 341)
 - Teaching assistant: Prepared and conducted weekly tutorials and marked assignments for a class of 200 students.
- QUEEN'S UNIVERSITY** **2003**
- Manufacturing methods (Mech 213)
 - Teaching assistant: Provided machine training, conducted weekly lab sessions and marked lab reports for a class of 100 students.

RESEARCH PUBLICATIONS

For reference, the following is the impact factors for the highest-ranked journals in the field of combustion (as of 2017):

| Journal Name | Impact Factor | 5-yr Impact Factor |
|---|---------------|--------------------|
| Combustion and Flame | 4.168 | 4.806 |
| Proceedings of the Combustion Institute | 4.120 | 4.303 |
| Combustion Science and Technology | 1.27 | 1.26 |
| Energy & Fuels | 2.835 | 3.05 |
| Review of Scientific Instruments | 1.336 | 1.44 |

Refereed Journals (Journals for pre-2010 and some at 2011 publication names appear as H.I.Joo. The rest at 2011 and post-2011 appear as P. H. Joo)

Submitted manuscripts or in preparation

- M.1 **P. H. Joo**, "Soot and temperature field of non-premixed methane flames doped with ethanol at pressures up to 4 atm", Manuscript in preparation.
- M.2 **P. H. Joo**, "Combustion soot primary particle size of nitrogen diluted ethylene diffusion flames at pressures up to 20 bars", Manuscript in preparation.
- M.3 **P. H. Joo**, "Experimental investigation on the effect pressure on primary soot particle structure, morphology and dimensional dependence on laminar diffusion flame using Atomic Force Microscopy and RAMAN spectroscopy", Manuscript in preparation.
- M.4 **P. H. Joo**, "Dimensional analysis of primary soot particle size from a laminar methane diffusion flame at pressures up to 20 bar", Manuscript in preparation.

Published Papers

- J1. **P. H. Joo**, J. Gao, Z. Li, and M. Aldén, "Experimental apparatus with full optical access for combustion experiments with laminar flames from a single circular nozzle at elevated pressures", *Review of Scientific Instruments*, Vol. 86, pp. 035115 - 035115-7, 2015.
- J2. **P. H. Joo**, M. R. J. Charest, C. P. T. Groth, and Ö. L. Gülder, "Comparison of structure of laminar methane-oxygen and methane-air diffusion flames from atmospheric to 60 atm", *Combustion and Flame*, Vol. 160, pp. 1990-1998, 2013.
- J3. **P. H. Joo**, Y. Wang and S. H. Chung, "Sooting limit in counterflow diffusion flames of ethylene/propane fuels and implications to threshold soot index", *Proceedings of the Combustion Institute*, Vol. 34, pp. 1803-1809, 2013.
- J4. **P. H. Joo** and Ö. L. Gülder, "Formation of Liquid Methane-Water Mixture during Combustion of a Laminar Methane Jet at Supercritical Pressures", *Energy Fuels*, Vol. 26, pp. 5462-5467, 2012.
- J5. Ö. L. Gülder, G. Intasopa, **H. I. Joo**, P. M. Mandatori, D. S. Bento and M. E. Vaillancourt, "Unified behavior of maximum soot yields of methane, ethane and propane laminar diffusion flames at high pressures", *Combustion and Flame*, Vol. 158, pp. 2037-2044, 2011.

- J6. **H. I. Joo** and Ö. L. Gülder, “Experimental study of soot and temperature field structure of laminar co-flow ethylene-air diffusion flames with nitrogen dilution”, *Combustion and Flame*, Vol. 158, pp. 416-422, 2011.
- J7. M. R. Charest, **H. I. Joo**, Ö. L. Gülder and C. P. Groth, “Experimental and numerical study of soot formation in laminar ethylene diffusion flames at elevated pressures from 10 to 35 atm”, *Proceedings of the Combustion Institute*, Vol. 33, pp. 549-557, 2011.
- J8. **H. I. Joo** and Ö. L. Gülder, “Soot formation and temperature structure in small methane-oxygen diffusion flames at subcritical and supercritical pressures”, *Combustion and Flame*, Vol. 157, pp. 1194-1201, 2010.
- J9. **H. I. Joo** and Ö. L. Gülder, “Observation of Liquid Phase Material in Methane-Air Laminar Diffusion Flame Soot Experiments above 60 Atmospheres”, *Combustion and Flame*, Vol. 157, pp. 408-409, 2010.
- J10. **H. I. Joo** and Ö. L. Gülder, “Soot formation and temperature field structure in co-flow laminar methane-air diffusion flames at pressures from 10 to 60 atmospheres”, *Proceedings of the Combustion Institute*, Vol. 32, pp. 769-775, 2009.
- J11. **H. I. Joo**, K. Duncan, and G. Ciccarelli, “Flame-Quenching Performance of Ceramic Foam”, *Combustion Science and Technology*, Vol. 178, No. 10-11, pp. 1755-1769, 2006.

Refereed Conferences - International

Reviewed conference papers - those with an asterisk were presented by the candidate (C.1, C.2, C.5, C.7, C.8, C.10, C.11, and C.16).

- C1.* **P. H. Joo**, Z. Li, and M. Aldén, “Design of high pressure experimental apparatus with optical access for combustion experiments”, Joint meeting of the British and Scandinavian-Nordic Sections of the Combustion Institute, Cambridge, United Kingdom, March 27 - 28, 2014.
- C2.* **P. H. Joo**, Z. Li, and M. Aldén, “Structure of laminar methane flames at elevated pressures with full optical access”, 8th Mediterranean Combustion Symposium, Cesme, Ismir, Turkey, September 8- 13, 2013.
- C3. **P. H. Joo**, M. R. J. Charest, C. P. T. Groth and Ö. L. Gülder, “Two zone structure of laminar methane-oxygen diffusion flames at atmospheric and elevated pressures”, 23rd International Symposium on Transport Phenomena (ISPT 23), Auckland, New Zealand, November 19 - 22, 2012.
- C4. **P. H. Joo**, M. R. Charest, C. P. T. Groth, and Ö. L. Gülder, “Two zone structure of laminar methane-oxygen diffusion flames in comparison to methane-air flames”, AIAA Aerospace Sciences Meeting, August 2012.
- C5.* **H. I. Joo** and Ö. L. Gülder, “Experimental investigation of pressure dependence of soot formation in laminar ethylene-air diffusion flame with nitrogen dilution”, 8th Asia-Pacific Conference on Combustion (ASPACC), 2010, Hyderabad, India.
- C6. **H. I. Joo** and Ö. L. Gülder, “Structure of Laminar Methane-Oxygen Diffusion Flames at High Pressures”, AIAA Aerospace Sciences Meeting, January 2010; AIAA Paper No: AIAA-2010-0775.
- C7.* **H. I. Joo** and Ö. L. Gülder, “Observation of liquid phase material in methane-air laminar diffusion flame soot experiments above 60 atmospheres”, 6th U. S. National Combustion Meeting, May 2009, Ann Arbor, Michigan.
- C8.* **H. I. Joo** and Ö. L. Gülder, “Soot formation and temperature field structure in co-flow laminar methane-air diffusion flames at pressures from 10 to 60 atmospheres”, 32nd International Symposium on Combustion, August 3 - 8, 2008, Montreal, Canada
- C9. **H. I. Joo** and Ö. L. Gülder, “Pressure dependence of soot formation in diffusion flames”, ASME Paper GT2008-50437, Proceedings of ASME Turbo 2008, Berlin, Germany.
- C10.* **H. I. P. Joo** and G. Ciccarelli, “Flame quenching performance of ceramic foam”, International Colloquium on the Dynamics of Explosions and Reactive Systems (ICDERS), July 31 - August 5, 2005, Montreal, Canada.

Refereed Conferences - Domestic

- C11.* **P. H. Joo**, M. R. J. Charest, C. P. T. Groth and Ö. L. Gülder, “Two zone structure of laminar methane-oxygen diffusion flames in comparison to methane-air flames”, *Proceedings of the Combustion Institute / Canadian Section*, May 13 - 16, 2012, Toronto, Ontario, paper 10-011, pp. 416-421.

- C12.* M. R. J. Charest, **H. I. Joo**, Ö. L. Gülder, and C. P. T. Groth, "Predictions and Measurements of Soot Formation in High-Pressure Laminar Ethylene Diffusion Flames", Proceedings of the Combustion Institute/Canadian Section, May 9 - 12, 2010, Ottawa, Ontario, paper B5-4, pp. 279-284, 2010
- C13. **H. I. Joo** and Ö. L. Gülder, Proceedings of the Combustion Institute / Canadian Section, May 2008, Toronto, Ontario.
- C14. M. E. Vaillancourt, P. M. Mandatori, **H. I. Joo**, and Ö. L. Gülder, "Laminar Diffusion Flames of Methane, Ethane and Propane at Elevated Pressures", Proceedings of the Combustion Institute / Canadian Section, May 2007, Banff, Alberta.
- C15. **H. I. Joo** and Ö. L. Gülder, Proceedings of the Combustion Institute / Canadian Section, May 2006, Waterloo, Ontario.
- C16.* **H.I. Joo** and G. Ciccarelli, "Flame quenching performance of ceramic foam", Proceedings of the Combustion Institute / Canadian Section, May 2005, Spring Meeting, Halifax, Canada.
- C17. **H.I. Joo** and G. Ciccarelli, Proceedings of the Combustion Institute / Canadian Section, May 2004, Kingston, Ontario.

REFERENCES

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