

JOONSIK HWANG

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SUMMARY

Strong competencies in the following subjects and research fields:

- Fluid mechanics, aerosol science, thermodynamics, heat transfer, combustion, and automotive engineering
- Optical diagnostics in reactive flows and soot particles
- Engine performance emission tests with various combustion strategies and alternative fuels
- Computational fluid dynamics (CFD) simulation and model improvement for two-phase flow

Nine years of lab research experience with high proficiency in teaching, test rig design/assembly, procurement of customized parts, grant writing and administration. Excellent communication and public-speaking skills through numerous lectures and international conferences.

EDUCATION

Feb 2013 – Feb 2017	Ph.D., Korea Advanced Institute of Science and Technology (KAIST) , Daejeon, S. Korea Performance and emission improvement by microwave-assisted plasma ignition in a direct injection gasoline engine
Feb 2011 – Feb 2013	M.S., Korea Advanced Institute of Science and Technology (KAIST) , Daejeon, S. Korea Effects of fuel injection pressure and timing on the combustion and emission characteristics in a heavy-duty diesel engine fueled with waste cooking oil biodiesel
Feb 2007 – Feb 2011	B.S., Korea Advanced Institute of Science and Technology (KAIST) , Daejeon, S. Korea

OPTICAL DIAGNOSTICS EXPERIENCE

Long-distance microscope	Mie-scattering/extinction/schlieren	3-D Computed tomography
Phase Doppler interferometry	Laser induced fluorescence	Optical emission spectroscopy
Transmission electron microscope	Scanning electron microscope	

ACADEMIC EXPERIENCE

May 2020 – present	Assistant Professor, Department of Mechanical Engineering, Center for Advanced Vehicular Systems (CAVS) - Advanced Propulsion and Spray Lab (APSL) - Internal combustion engines: compression/spark ignition/hybrid engines - Alternative fuels (biodiesel, JP-8, natural gas...) - Advanced combustion (plasma-assisted ignition, low-temperature combustion) - Soot particle morphology by transmission electron microscopy (TEM) - High-speed optical diagnostics and 3D tomographic reconstruction of turbulent spray flame - Computational fluid dynamics (CFD) simulation of for internal/external fuel flow
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Oct 2017 – Apr 2020	<p>Postdoctoral researcher, Sandia National Laboratories, Livermore, USA</p> <ul style="list-style-type: none"> -High-speed Mie-scattering, extinction and schlieren imaging of Engine Combustion Network (ECN) gasoline and diesel injectors -3-dimensional computed tomographic reconstruction of spray -Spray characterization of alternative gasoline fuels (multi-components) -CONVERGE RANS/LES simulation of gasoline and diesel spray combustion -Model improvement (injector dribble and phase change in two-phase flow) -Internal flow imaging with long-distance microscopic lens and transparent nozzles -Gas solubility and cavitation analysis
Feb 2017 – Sep 2017	<p>Postdoctoral researcher, Korea Advanced Institute of Science and Technology (KAIST), Daejeon, S. Korea</p> <ul style="list-style-type: none"> -Team leader in experimental soot research -Image processing tool development for soot graphene layer and spray flame -Provide field supervision to three PhD students -Writing research proposal 'Optimization tool for hybrid-electric power plant for multiple purpose', Army Research Lab (ARL), \$200,000 (May 2017 – May 2019)
Feb 2013 – Feb 2017	<p>Teaching assistant (8 semesters) at Dept. of Mechanical Engineering, Korea Advanced Institute of Science and Technology (KAIST), Daejeon, S. Korea</p> <p>Courses: Basic mechanical practice, Mechanical engineering laboratory, Human and machine interaction, Engine technology, Vehicle technology and environment, Applied mathematics, Fluids and environments</p>
Dec 2016 – Jan 2017	<p>Visiting researcher, Indian Institute of Technology (IIT), Kanpur, India</p> <ul style="list-style-type: none"> -Mie-scattering imaging of diesel/biodiesel spray -Phase Doppler interferometry for droplet sizing and velocity measurement -Biodiesel application in a single cylinder diesel engine
Nov 2014 – Dec 2014	<p>Visiting researcher, Université d'Orléans, Orléans, France</p> <ul style="list-style-type: none"> -Microscopic imaging of initial diesel spray development -Investigation of fuel temperature effects on fuel flow and spray
Jul 2014 – Jul 2014	<p>Imperial-HKU Summer school, University of Hong Kong, Hong Kong</p> <ul style="list-style-type: none"> -Leadership training

HONORS AND AWARDS

2017	Travel fellowship award, Clean Combustion Research Center (CCRC), King Abdullah University of Science & Technology (KAUST)
2017	Best poster presentation award, International Society for Energy, Environment and Sustainability (ISEES)
2017	Best PhD thesis award, International Society for Energy, Environment and Sustainability (ISEES)
2016	Best research paper award, The Korean Society of Automotive Engineers (KSAE) ,
2013	Korea university students scholarship (₩ 300,000), The Korean Society of Automotive Engineers (KSAE)
2012	Participation prize (₩ 1,000,000), Halla Visteon idea contest on creative automotive system, Halla Visteon Climate Control Corp.
2011	The grand prize (₩ 10,000,000), Halla Visteon idea contest on creative automotive system, Halla Visteon Climate Control Corp.

2010	Best paper award, aerospace research paper open exhibition, Korea Aerospace Industries (KAI)
2009	The grand prize, introductory aerospace projects, Dept. of Aerospace Engineering, Korea Advanced Institute of Science and Technology (KAIST)

RESEARCH PROPOSALS AND GRANTS

Jun 2017 – Sep 2017	Co-Principal Investigator , ‘Literature survey on development and potential application of rotary engines’, LG Electronics , ₩ 10,000,000
Mar 2015 – Mar 2017	Co-Principal Investigator, ‘Development of microwave-assisted plasma ignition system (MAPIS) for vehicle application’, National Research Foundation (NRF) , Korea, ₩ 30,000,000
Jan 2014 – Jan 2017	Co-Principal Investigator, ‘Investigation of combustion and soot process in a compression ignition engine fueled with biodiesel’, National Research Foundation (NRF) , Korea, ₩ 120,000,000
May 2014 – May 2016	Co-Principal Investigator, ‘Research on the effects of microwave plasma ignition on gasoline engine combustion and performance’, Hyundai Motor Company , ₩ 136,000,000
Aug 2012 – Aug 2013	Co-Principal Investigator ‘The study about effects of diesel fuel temperature on spray and combustion characteristics’, Hyundai Motor Company , ₩ 85,000,000
May 2011 – May 2012	Co-Principal Investigator ‘Investigation of erosion behavior of water jacket in a diesel engine’, General Motors Daewoo Auto & Technology (GMDAT) , ₩ 70,000,000

PUBLICATIONS

Refereed journal articles

1. M Arienti, **J Hwang**, LM Pickett, Y Shekhawat, A thermally-limited bubble growth model for the relaxation time of superheated fuels, *International Journal of Heat and Mass Transfer* 159, 120089, 2020.
2. **J Hwang**, L Weiss, IK Karathanassis, P Koukouvinis, LM Pickett, SA Skeen, Spatio-temporal identification of plume dynamics by 3D computed tomography using engine combustion network spray G injector and various fuels, *Fuel* 280, 118359, 2020.
3. L Weiss, M Wensing, **J Hwang**, LM Pickett, SA Skeen, Development of limited-view tomography for measurement of Spray G plume direction and liquid volume fraction, *Experiments in Fluids* 61, 51, 2020.
4. C Patel, **J Hwang**, C Bae, RA Agarwal, AK Agarwal, Microscopic spray characteristics of biodiesels derived from Karanja, Jatropa, and waste cooking oils, *Journal of Energy Resources Technology* 142 (12),124501,2020.
5. **J Hwang**, FS Hirner, C Bae, C Patel, T Gupta, AK Agarwal, HRTEM evaluation of primary soot particles originated in a small-bore biofuel compression-ignition engine, *Applied Thermal Engineering* 159, 113899, 2019.
6. FS Firner, **J Hwang**, C Bae, C Patel, T Gupta, AK Agarwal, Performance and emission evaluation of a small-bore biodiesel compression-ignition engine, *Energy*, 2019.
7. C Patel, K Chandra, **J Hwang**, RA Agarwal, N Gupta, C Bae, T Gupta, AK Agarwal, Comparative compression ignition engine performance, combustion, and emission characteristics, and trace metals in particulates from Waste cooking oil, Jatropa and Karanja oil derived biodiesels, *Fuel* 236, 1366-1376, 2019.

8. FS Hirner, **J Hwang**, C Bae, C Patel, T Gupta, AK Agarwal, Nanostructure characterization of soot particles from biodiesel and diesel spray flame in a constant volume combustion chamber, *Fuel* 235, 130-149, 2019.
9. C Patel, **J Hwang**, K Chandra, RA Agarwal, C Bae, T Gupta, AK Agarwal, In-cylinder spray and combustion investigations in a heavy-duty optical engine fueled with waste cooking oil, Jatropha, and Karanja biodiesels, *Journal of Energy Resources Technology* 141 (1), 012201, 2019.
10. PM Pinazzi, **J Hwang**, D Kim, F Foucher, C Bae, Influence of injector spray angle and gasoline-diesel blending ratio on the low load operation in a gasoline compression ignition (GCI) engine, *Fuel* 222, 496-505, 2018.
11. **J Hwang**, C Bae, C Patel, RA Agarwal, T Gupta, AK Agarwal, Investigations on air-fuel mixing and flame characteristics of biodiesel fuels for diesel engine application, *Applied Energy* 206, 1203-1213, 2017.
12. **J Hwang**, W Kim, C Bae, W Choe, J Cha, S Woo, Application of a novel microwave-assisted plasma ignition system in a direct injection gasoline engine, *Applied Energy* 205, 562-576, 2017.
13. **J Hwang**, Y Park, K Kim, J Lee, C Bae, Improvement of diesel combustion with multiple injections at cold condition in a constant volume combustion chamber, *Fuel* 197, 528-540, 2017.
14. **J Hwang**, C Bae, J Park, W Choe, J Cha, S Woo, Microwave-assisted plasma ignition in a constant volume combustion chamber, *Combustion and Flame* 167, 86-96, 2016.
15. **J Hwang**, C Bae, T Gupta, Application of waste cooking oil (WCO) biodiesel in a compression ignition engine, *Fuel* 176, 20-31, 2016.
16. Y Jung, **J Hwang**, C Bae, Assessment of particulate matter in exhaust gas for biodiesel and diesel under conventional and low temperature combustion in a compression ignition engine, *Fuel* 165, 413-424, 2016.
17. Y Park, **J Hwang**, C Bae, K Kim, J Lee, S Pyo, Effects of diesel fuel temperature on fuel flow and spray characteristics, *Fuel* 162, 1-7, 2015.
18. D Kim, **J Hwang**, S Han, C Bae, Effects of cylinder head temperature and coolant velocity on the erosion behavior of water jacket in a diesel engine, *Wear* 342, 117-128, 2015.
19. **J Hwang**, Y Park, C Bae, J Lee, S Pyo, Fuel temperature influence on spray and combustion characteristics in a constant volume combustion chamber (CVCC) under simulated engine operating conditions, *Fuel* 160, 424-433, 2015.
20. **J Hwang**, Y Jung, C Bae, Spray and combustion of waste cooking oil biodiesel in a compression-ignition engine, *International Journal of Engine Research* 16 (5), 664-679, 2015.
21. **J Hwang**, Y Jung, C Bae, Comprehensive assessment of soot particles from waste cooking oil biodiesel and diesel in a compression ignition engine, *SAE International Journal of Fuels and Lubricants* 8 (2015-01-0809), 290-297, 2015.
22. **J Hwang**, D Qi, Y Jung, C Bae, Effect of injection parameters on the combustion and emission characteristics in a common-rail direct injection diesel engine fueled with waste cooking oil biodiesel, *Renewable Energy* 63, 9-17, 2014.

Refereed conference papers

1. **J Hwang**, K Yasutomi, M Arienti, LM Pickett, Numerical investigation of near nozzle flash-boiling spray in an axial-hole transparent nozzle, 2020-01-0828, SAE World Congress, Detroit, 21-23 April, USA 2020.
2. K Yasutomi, **J Hwang**, LM Pickett, B Sforzo, K Matusik, CF Powell, Transient internal nozzle flow in transparent multi-hole diesel injector, 2020-01-0830, SAE World Congress, Detroit, 21-23 April, USA 2020.
3. K Yasutomi, **J Hwang**, Julien Manin, LM Pickett, M Arienti, S Daly, SA Skeen, Diesel injector elasticity effects on internal nozzle flow, 2019-01-2279, *SAE Powertrain, Fuels and Lubricants*, Kyoto, Japan, 26-29 August, 2019.
4. PM Abers, E Cenker, K Yasutomi, **J Hwang**, LM Pickett, Effect of pressure cycling on gas exchange in a transparent fuel injector, 2019-01-2280, *SAE Powertrain, Fuels and Lubricants*, Kyoto, Japan, 26-29 August, 2019.

5. **J Hwang**, L Weiss, LM Pickett, SA Skeen, The influence of ambient conditions and fuel type on gasoline spray plume direction, *ILASS-AMERICAS (Institute for Liquid Atomization and Spray Systems)*, Tempe, USA 12-15 May, 2019.
6. **J Hwang**, C Bae, C Patel, AK Agarwal, T Gupta, Near nozzle flow and atomization characteristics of biodiesel fuels in a constant volume chamber, 2017-01-2327, *SAE Powertrain, Fuels and Lubricants*, Beijing, China, 16-19 October, 2017.
7. W Kim, **J Hwang**, C Bae, W Choe, J Cha, S Woo, Effects of microwave-assisted plasma ignition on flame initiation of premixed acetylene-air mixture, *Asian Conference on Thermal Sciences (ACTS)*, Jeju, Republic of Korea, 26-30 March, 2017.
8. **J Hwang**, C Bae, J Park, W Choe, J Cha, S Woo, F Foucher, C Mounaim-Rousselle, Microwave-assisted plasma ignition system (MAPIS) for a spark ignition engine, *FISITA*, Busan, Republic of Korea, 26-30 September, 2016.
9. **J Hwang**, C Bae, C Patel, AK Agarwal, T Gupta, An experimental investigation on spray characteristics of waste cooking oil, jatropha, and karanja biodiesels in a constant volume combustion chamber, 2016-01-2263, *SAE Powertrain, Fuels and Lubricants*, Baltimore, USA, 24-26 October, 2016.
10. **J Hwang**, Y Park, K Kim, C Bae, Spray and combustion process under simulated cold start condition in a constant volume combustion chamber, *ASPACC (Asia-Pacific Conference on Combustion)*, Beijing, China, 19-22 July, 2015.
11. **J Hwang**, Y Jung, C Bae, Comprehensive assessment of soot particles from waste cooking oil biodiesel and diesel in a compression ignition engine, 2015-01-0809, *SAE World Congress*, Detroit, 21-23 April, USA 2015.
12. **J Hwang**, Y Park, K Kim, C Bae, J Lee, S Pyo, Effect of diesel fuel temperature on injection quantity and macroscopic spray characteristics, *ILASS-ASIA (Institute for Liquid Atomization and Spray Systems)*, Shanghai, China 26-29 October, 2014.
13. **J Hwang**, Y Jung, C Bae, Particulate morphology of waste cooking oil biodiesel and diesel in a heavy-duty diesel engine, *International Conference on Optical Particle Characterization*, Tokyo, Japan, 10-14 March, 2014.
14. **J Hwang**, D Kim, S Han, C Bae, J Hong, S Shin, Effects of the surface temperature and the coolant velocity on the erosion behavior of water jacket in a diesel engine, ICMF 2013-377, *ICMF (International Conference on Multiphase Flow)*, Jeju, Republic of Korea, 26-31 May, 2013.
15. **J Hwang**, D Qi, Y Jung, C Bae, Effect of injection parameters on the combustion and emission characteristics in a compression ignition engine fuelled with waste cooking oil biodiesel, 2013-01-2662, *SAE Powertrain, Fuels and Lubricants*, Seoul, Republic of Korea, 21-23 October, 2013.

Non-referred conference papers / meeting presentations

1. **J Hwang**, L Weiss, IK Karathanassis, FC Koukouvinis, LM Pickett, SA Skeen, An update on Spray G measurements in a constant flow vessel, Engine Combustion Network (ECN) 6.9 Webex Meeting, September 5, 2019.
2. **J Hwang**, IK Karathanassis, FC Koukouvinis, L Weiss, LM Pickett, SA Skeen, Effects of fuel on mixing and nozzle tip wetting, Advanced Engine Combustion (AEC) Program review meeting, Detroit, USA, 13-16 August, 2019.
3. IK Karathanassis, **J Hwang**, L Weiss, F Koukouvinis, LM Pickett, M Gavaises, Spray characteristics of additised and renewable gasoline blends under realistic engine conditions, 6th Cavitation and Multi-phase Flows Workshop, Chania, Greece, 24-27 June, 2019.
4. **J Hwang**, IK Karathanassis, L Weiss, LM Pickett, Imaging of tip wetting at Spray G2 conditions, Engine Combustion Network (ECN) 6.7 Webex Meeting, June 5, 2019.
5. **J Hwang**, L Weiss, LM Pickett, SA Skeen, Identification of plume direction using ECN Spray G injector with various fuels, IEA Combustion Agreement Spray Workshop, Detroit, 8th April, USA 2019.
6. **J Hwang**, L Weiss, LM Pickett, SA Skeen, Development of limited-view tomography for measurement of Spray G plume direction and liquid volume fraction, Engine Combustion Network (ECN) 6.3 Webex Meeting, February 7, 2019.

7. **J Hwang**, L Weiss, LM Pickett, SA Skeen, Spatially and temporally resolved liquid volume fraction at G2 and G3 conditions with different fuels, Engine Combustion Network (ECN) 6.3 Webex Meeting, February 7, 2019.
8. **J Hwang**, L Weiss, LM Pickett, SA Skeen, Effects of fuel on gasoline plume direction and vaporization, Advanced Engine Combustion (AEC) Program review meeting, Tennessee, USA, January 29- February 1, 2019.
9. **J Hwang**, C Bae, Microwave-assisted plasma ignition in a direct injection gasoline engine, KAUST Research Conference: New Combustion Concepts, Thuwal, Saudi Arabia, 6-8 March, 2017.
10. **J Hwang**, C Bae, C Patel, AK Agarwal, T Gupta, Comparison of macroscopic spray characteristics of Waste cooking oil, Jatropha, and Karanja biodiesels, International Conference on Sustainable Energy and Environmental Challenges (SEEC), Mohali, India, 26-28 February, 2017.

Book chapters

1. **J Hwang**, W Kim, C Bae, Improvement of flame kernel growth by microwave-assisted plasma ignition, p129-142, Simulations and optical diagnostics for internal combustion engines: current status and way forward, Springer, 2019.
2. **J Hwang**, FS Hirner, C Bae, C Patel, T Gupta, AK Agarwal, Image-based flame temperature and soot analysis of biofuel spray combustion, p41-54, Engine Exhaust Particulates, Springer, 2019.
3. C Patel, **J Hwang**, AK Agarwal, C Bae, Characterization of biodiesel sprays, p203-219, Two-phase flow for automotive and power generation sectors, Springer, 2019.
4. **J Hwang**, C Bae, C Patel, T Gupta, AK Agarwal, Biodiesel soot characteristics, p45-55, Air Pollution and Control, Springer, 2018.

ACADEMIC SERVICE

Editor, Simulations and optical diagnostics for internal combustion engines: current status and way forward, **Springer**, 2019 (will be published in November).

Session Chair (Diesel spray 2 and 3 sessions), **JSAE/SAE Powertrains, Fuels and Lubricants (PFL) International Meeting**, Kyoto, Japan, August 26-29, 2019.

Session Chair (Combustion in compression ignition engines session, PFL220), **SAE World Congress**, Detroit, MI, USA, April 9-11, 2019.

Reviewer, **Applied Optics**, 2019 – present.

Reviewer, **Fuel**, 2019 – present.

Reviewer, **Energy**, 2019 – present.

Reviewer, **Society of Automotive Engineering (SAE)**, 2016 – present.

Reviewer, **International journal of Oil, Gas and Coal Technology (IJOGCT)**, 2016 – present.