ACME

Advanced Combustion via Microgravity Experiments

PUBLICATIONS TO DATE

Burning Rate Emulator (BRE) – *as of Nov. 2011*

Conference Proceedings and Posters

K.T. Dotson, M.J. Bustamante, P.B. Sunderland, J.G. Quintiere, *Laminar Burning on Flat Wicks at Various Orientations,* 7th U.S. National Combustion Meeting, Atlanta (2011) 5 pp.

Coflow Laminar Diffusion Flame (CLD Flame) - *as of Dec. 2011*

Peer-Reviewed Journal Papers

1. M.D. Smooke, R.J. Hall, M.B. Colket, J. Fielding, M.B. Long, C.S. McEnally, and L.D. Pfefferle, "Investigation of the Transition from Lightly Sooting towards Heavily Sooting Coflow Ethylene Diffusion Flames," *Combust. Theory Modelling* **8** , p. 593–606 (2004).
2. K.T. Walsh, J. Fielding, M.D. Smooke, M.B. Long, and A. Linan, "A Comparison of Computational and Experimental Lift-Off Heights of Coflow Laminar Diffusion Flames," *Proc. Comb. Inst.,* **30**, 1555-1563 (2005).
3. M.D. Smooke, M.B. Long, B.C. Connelly, M.B. Colket and R.J. Hall, "Soot Formation in Laminar Diffusion Flames," *Combust. Flame* **143**, 613-628 (2005).
4. S.B. Dworkin, B.C. Connelly, A.M. Schaffer, M.B. Long, M.D. Smooke, M.P. Puccio, B. McAndrews and J.H. Miller, "Computational and Experimental Study of a Forced, Time-Dependent, Methane-Air Coflow Diffusion Flame," *Proc. Comb. Inst.,* **31**, 971-978 (2007).
5. S. B. Dworkin, A. M. Schaffer, B. C. Connelly, M. B. Long and M. D. Smooke, M. A. Puccio, B. McAndrew, and J. H. Miller, "Measurements and Calculations of Formaldehyde Concentrations in a Methane/N_2/Air, Non-Premixed Flame: Implications for Heat Release Rate," *Proc. Comb. Inst.,* **32,** 1311–1318 (2009).
6. B. C. Connelly, M. B. Long, M. D. Smooke, R. J. Hall, and M. B. Colket, "Computational and Experimental Investigation of the Interaction of Soot and NO_x in Coflow Diffusion Flames," *Proc. Comb. Inst.,* **32,** 777–784 (2009).
7. B. C. Connelly, B. A. V. Bennett, M. D. Smooke and M. B. Long, "A Paradigm Shift in the Interaction of Experiments and Computations in Combustion Research," *Proc. Comb. Inst.,* **32,** 879–886 (2009).
8. S.B. Dworkin, J.A. Cooke, B.A.V. Bennett, B.C. Connelly, M.B. Long, M.D. Smooke, R.J. Hall and M.B. Colket, "Distributed-memory parallel computation of a forced, time-

dependent, sooting, ethylene/air coflow diffusion flame," *Combustion Theory and Modelling*, **13**, 795 - 822 (2009).
9. P. B. Kuhn, B. Ma, B. C. Connelly, M. D. Smooke, and M. B. Long, "Soot and Thin-filament Pyrometry Using a Color Digital Camera," *Proceedings of the Combustion Institute*, **33**, 743-750 (2011).
10. M. B. Long, "Imaging Flames: From advanced laser diagnostics to snapshots," in *Optical Processes in Microparticles and Nanostructures*, A. Serpengüzel and A.W. Poon, Editors. 2011, World Scientific.
11. J.D. Herdman, B.C. Connelly, M.D. Smooke, M.B. Long and J.H. Miller, "A comparison of Raman signatures and laser-induced incandescence with direct numerical simulation of soot growth in non-premixed ethylene/air flames," *Carbon*, **49**, 5298-5311 (2011).

Conference Proceedings and Posters

1. M.D. Smooke, K.T. Walsh, J. Fielding, M.B. Long, and A. Linan,"A Comparison of Computational and Experimental Lift-Off Heights of Coflow Laminar Diffusion Flames," presented at the *Thirtieth International Symposium on Combustion*, Chicago, IL, July 25-30, 2004.
2. B.C. Connelly, S.A. Kaiser, M.D. Smooke, and M.B. Long, "Two-dimensional Soot Pyrometry with a Color Digital Camera," *Proceedings of the Joint Meeting of the U.S. Sections of the Combustion Institute,* Drexel University, Philadelphia, PA, March 2005.
3. M. D. Smooke, B. C. Connelly, M. B. Long, M. E. Colket and R. J. Hall, "Computational and Experimental Study of Ethylene-Air Diffusion Flames," *Proceedings of the Joint Meeting of the U.S. Sections of the Combustion Institute,* Drexel University, Philadelphia, PA, March 2005.
4. M. D. Smooke, M. B. Long, B. C. Connelly, M. E. Colket and R. J. Hall, "Soot Formation in Ethylene-Air Diffusion Flames," *Sandia National Laboratories Workshop on Soot Formation*, Livermore, CA, April 2005.
5. B.C. Connelly, S.A. Kaiser, M.D. Smooke, and M.B. Long, "Advances in Two-dimensional Soot Pyrometry with a Color Digital Camera," Gordon Research Conference on Laser Diagnostics for Combustion, Wellesley, MA, August 2005.
6. B.C. Connelly, B.A. Bennett, S.B. Dworkin, M.D. Smooke, M.B. Long, M.A. Puccio, J.D. Herdman, J.H. Miller, "Computational and Experimental Study of Molecular Growth in Forced, Time-Varying Flames" *Proceedings of the Eastern States Section of the Combustion Institute*, University of Central Florida, Orlando, FL, November 2005.
7. S. B. Dworkin, B. C. Connelly, B. A. V. Bennett, A. M. Schaffer, M. B. Long, M. D. Smooke, M. P. Puccio, B. McAndrews and J. H. Miller, "Application of a Modified Vorticity-Velocity Formulation to Steady and Unsteady Laminar Diffusion Flames," *Journée des Doctorants du CMAP*, Palaiseau, France, March 7, 2007.
8. B.C. Connelly, M.D. Smooke, M.B. Long, R.J. Hall, and M.B. Colket, "Computational and Experimental Investigation of the Interaction of Soot and NOx in Coflow Diffusion Flames," *Proceedings of the 5th US Combustion Meeting*, University of California at San Diego, San

Diego, CA, March 25-28, 2007.

9. B.C. Connelly, B.A.V. Bennett, S. B. Dworkin, M.D. Smooke and M. B. Long, "A Paradigm Shift in the Interaction of Experiments and Computations in Combustion Research," *Gordon Research Conference on Laser Diagnostics in Combustion*, Magdalen College, Oxford, UK, August 12-17, 2007.
10. M.B. Long, B.C. Connelly, B.A.V. Bennett and M.D. Smooke, "A Paradigm Shift in the Interaction of Experiments and Computations," *First International SAOT Workshop on Optical Diagnostics for Flow and Combustion Research*," Erlangen, Germany, August 19-21, 2007.
11. M.D. Smooke, "Computational and experimental study of soot formation in coflow diffusion flames." Invited talk at *Eastern States Section of the Combustion Institute, Technical Meeting*, Charlottesville, Virginia, October 21-24, 2007.
12. B.C. Connelly, B.A.V. Bennett, M.D. Smooke and M. B. Long, "A Paradigm Shift in the Interaction of Experiments and Computations in Combustion Research," *Eastern States Section of the Combustion Institute, Technical Meeting*, Charlottesville, Virginia, October 21-24, 2007.
13. M. B. Long, "Probing Fire with Light," guest lecture at The Summer Science Program, Socorro, NM, July 3, 2007.
14. "Changing the way we think about combustion experiments – the interaction of computations and experiments," Mechanical Engineering Seminar, University of Connecticut, 17 April 2009.
15. Blair Connelly, Peter Kuhn, Bin Ma, and Marshall Long, Current state of combustion diagnostics on the International Space Station," Gordon Research Conference of Laser Diagnostics of Combustion, Waterville Valley, NH, 16-21 August 2009.
16. Blair C. Connelly, Luca Tosatto, Mitchell D. Smooke and Marshall B. Long, "Improving the interface between experiments and computations through intelligent experimental design," Gordon Research Conference of Laser Diagnostics of Combustion, Waterville Valley, NH, 16-21 August 2009.
17. Blair C. Connelly, Marshall B. Long, Mitchell D. Smooke, Meredith B. Colket, Robert J. Hall, "Two-dimensional laser-induced incandescence for soot volume fractions and primary particle size distributions," 6th U.S. National Combustion Meeting, The University of Michigan, Ann Arbor, Michigan, 17-20 May 2009.
18. Marshall B. Long, "Imaging Flames: From Advanced Laser Diagnostics to Snapshots," Plenary Lecture at the Eastern States Section of the Combustion Institute, Fall Technical Meeting, University of Maryland, College Park, 18-21October 2009.
19. B. Ma, S. Cao, B. A. V. Bennett, M. D. Smooke and M. B. Long, "Experimental and computational study of lifted coflow laminar diffusion flames under elevated pressures," 7th US National Technical Meeting of the Combustion Institute, Atlanta, GA, March 20-23, 2011.
20. Marshall B. Long, "Multispectral Imaging in Combustion Analysis," Invited presentation at OSA Advanced Photonics Congress, Toronto, Canada, 12-15 June 2011.
21. Jennifer D. Herdman, Blair C. Connelly, Mitchell D. Smooke, Marshall B. Long and J. Houston Miller, A comparison of Raman signatures and laser- induced incandescence with direct numerical simulation of soot growth in non-premixed ethylene/air flames," Gordon

Research Conference of Laser Diagnostics of Combustion, Waterville Valley, NH, 14-19 August 2011.
22. Bin Ma and Marshall B. Long, "Can SiC Fibers Serve As An Absolute Light Calibrator?" Gordon Research Conference of Laser Diagnostics of Combustion, Waterville Valley, NH, 14-19 August 20011.
23. B. Ma and M. B. Long, "Absolute light calibration in combustion experiments," Fall Technical Meeting of the Eastern States Section of the Combustion Institute, Storrs, CT Oct 9-12, 2011.
24. Su Cao, Beth Anne V. Bennett, Bin Ma, Marshall B. Long, Mitchell D. Smooke, "Computational and experimental study of laminar coflow methane-air diffusion flames under elevated pressures ," Fall Technical Meeting of the Eastern States Section of the Combustion Institute, Storrs, CT Oct 9-12, 2011.

Ph.D. Dissertation

B.C. Connelly, "Quantitative Characterization of Steady and Time-Varying, Sooting, Laminar Diffusion Flames using Optical Techniques," Ph.D. Thesis, Yale University, 2009.

Electric-Field Effects on Laminar Diffusion Flames (E-FIELD Flames) - *as of Sept. 2011*

GRADUATE STUDENTS

Ph.D. Dissertations

A.9 Rickard, M.A. (2005) "Ion-Driven Wind: Aerodynamics, Performance Limits, and Optimization"

A.10 Papac, M.J. (2005) "Electrical Aspects of Gaseous Fuel Flames for Microgravity Combustion and Combustion Control."

M.S. Theses

B.22 Gonzalez, M. (2000) "Prospects for an Electrohydrodynamic Spray Burner" (project)

B.24 Rickard, M.A. (2002) "The Study of an Electrified Air-Assisted Liquid Atomizer."

B.25 Papac, M.J. (2002) "N_2 CARS Thermometry and O_2 LIF Measurements of an Electrically Induced Microbuoyant Flame."

B.44 Tsai, H.-J. (2011) "Attempts to Model Electrical Field Effects on Flames." (project)

Visiting Researchers

C.7 Francesco Borgatelli, Polytechnic Milano – Engineering Degree student, 2006 – Feedback control of flames with electric fields, "Behavior of a Small Diffusion Flame Affected by an Electric Field," degree conferred 2008/2009.

C.11 Kiyotaka Yamashita, Post Doctoral Scientist, University of Tokyo, summer 2008 –

Numerical Simulation of Electric Effects in Diffusion Flames

C.14 Julian Glorian, Universite D'Orleans, France – Engineering Degree student 2011 – Computational study of ions and excited state species in a methane/air laminar diffusion flame

C.15 Benjamin Debareix, ISAE, ENSMA, France – Engineering Degree student 2011 (no formal report) – Open FOAM Computation of Jet Diffusion Flame Impinging on a Surface

INVITED TECHNICAL LECTURES

NASA Glenn Research Center, Cleveland, Ohio – Electric Field Effects in a Small Co-Flow Diffusion Flame (with S. Karnani), May 21, 2009

Japanese Combustion Symposium, Kyoto, Japan – Electrical Manipulation of Flames, December 4, 2008

University of Hawaii, Honolulu, HI, "Flame and Corona Ion Driven Winds," October 19, 2007

University of California, San Diego Fluid Seminar, San Diego, CA – Convective Transport in Flame and Corona Ion-Driven Winds, January 22, 2007.

National Cheng-Kung University, Tainan, Taiwan – Control of Ion Winds from Flames and Corona Discharges, March 23, 2006.

Interdisciplinary Transport Phenomena in Microgravity and Space Sciences IV, Tomar, Portugal – Using Large Electric Fields to Control Transport in Microgravity, August 11, 2005

California Institute of Technology – Characterizing Ionic Winds from Flames and Corona Discharges, February 25, 2005.

University of Southern California, Los Angeles, California – Electric Field Manipulation of Flames: and other tales of combustion control, March 7, 2001

PUBLICATIONS

Refereed Publications

A.40 Strayer, B.A., Posner, J.D., Dunn-Rankin, D., and Weinberg, F.J. (2002) "Simulating microgravity in small diffusion flames by using electric fields to counterbalance natural convection," *Proceedings of the Royal Society of London A*, 458 2021, 1151-1166.

A.41 Regele, J., Papac, M., Rickard, M., and Dunn-Rankin, D. (2002) "Effects of Capillary Spacing on EHD Spraying from an Array of Cone-Jets," *Journal of Aerosol Science*, Volume 33, Issue 11, November 2002, Pages 1471-1479.

A.45 Papac, M.J., Dunn-Rankin, D., Stipe, C.B., and Lucas, D. (2003) "N2 CARS Thermometry and O2 LIF Concentration Measurements in an Electrically Induced Microbuoyant Flame," *Combustion and Flame*, 133, 241-254.

A.46 Weinberg, F.J., Carleton, F.A., and Dunn-Rankin, D. (2003) "Electrically Charged Dispersions of Extinguishants for use in Microgravity Environments," *Combustion Science and Technology*, 175, 2161-2179.

A.48 Rickard, M., Dunn-Rankin, D., Weinberg, F., and Carleton, F. (2005) "Characterization of Ionic Wind Velocity," *Journal of Electrostatics*, 63, 711-716.

A.49 Weinberg, F., Carleton, F.A., and Dunn-Rankin, D. (2003) "Electrically Charged Dispersions of Extinguishants for use in Microgravity Environments," *Combustion Science and Technology*, 175, 2161-2179.

A.51 Rickard, M.A., Dunn-Rankin, D., Weinberg, F.J., and Carleton, F. (2006) "Maximizing Ion Driven Gas Flows," *Journal of Electrostatics*, 64, 368-276.

A.54 Papac, M.J. and Dunn-Rankin, D. (2008) "Modeling Electric Field Driven Convection in Small Combustion Plasmas and Surrounding Gases," *Combustion Theory and Modeling*, 12, 23-44.

A.55 Rickard, M.A. and Dunn-Rankin, D. (2007) "Numerical Simulation of a Tubular Ion-Driven Wind Generator," *Journal of Electrostatics*, 65, 646-654.

A.56 Weinberg, F.J., Carleton, F., and Dunn-Rankin, D. (2008) "Electric Field-Controlled Musicale Burners," *Combustion and Flame*, 152, 186-193.

ICA.1 Weinberg, F.J., Carleton, F., (2009) "Ionization and chemiluminescence during the progressive aeration of methane flames," *Combustion and Flame*, 156, 2276-2284.

A.64 Yamashita, K., Karnani, S., and Dunn-Rankin, D. (2009) "Numerical prediction of ion current from a small methane jet flame," *Combustion and Flame*, 156, 6, 1227-1233.

A.68 Weinberg, F.J., Carleton, F., Houdmont, R., Dunn-Rankin, D., and Karnani, S. (2011) "Syngas Formation in Methane Flames and Carbon Monoxide Release during Quenching," *Combustion and Flame*, 158, 273-280.

A.73 Borgatelli, F. and Dunn-Rankin, D. (2011) "Behavior of a Small Diffusion Flame as an Electrically Active Component in a High-Voltage Circuit," *Combustion and Flame*, accepted for publication, May.

Refereed Conference Proceedings (full peer-review)

B.8 Carleton, F., Dunn-Rankin, D., and Weinberg, F.J. (1998) "Optics of Small Diffusion Flames in Micro-gravity," *Proceedings of the 27th International Symposium on Combustion*, 2567-2572.

B.11 Rickard, M. and Dunn-Rankin, D. (2002) "Experimental study of an electrohydrodynamic, air-assisted liquid atomizer," *SAE Transactions: Journal of Fuels and Lubricants*, 1523-1531

B.14 Dunn-Rankin, D. and Weinberg, F.J. (2006) "Using Large Electric Fields to Control Transport in Microgravity," *Annals of the New York Academy of Sciences*, 1077, 570-584.

B.15 Papac, M.J. and Dunn-Rankin, D. (2006) "Canceling Buoyancy of Gaseous Fuel Flames in a Gravitational Environment using an Ion Driven Wind," *Annals of the New York Academy of Sciences*, 1077, 585-601.

Conference Papers (full papers, acceptance based on abstract)

D.41 Strayer, B.A., Posner, J.D., and Dunn-Rankin, D. (1999) "Temperature Field Measurements of a Non-premixed Flame under Electric Field Control," Western States Section/The Combustion Institute Fall Meeting, University of California, Irvine, CA, October 25-26.

D.43 Strayer, B.A., Posner, J.D., and Dunn-Rankin, D. (2000) "CARS Temperature Measurements of a Non-premixed Flame under Electric Field Control," Western States Section/The Combustion Institute Spring Meeting, Colorado School of Mines, Golden, CO, March 13-14.

D.47 Dunn-Rankin, D., Papac, M., Regele, J., and Rickard, M. (2001) "EHD Spraying from Single and Multiple Capillaries," 14th Annual International Liquid Atomization and Spray Systems (ILASS)-Americas Conference, Dearborn, Michigan, May 21-23. (see A.41)

D.49 Dunn-Rankin, D., Strayer, B.A., Carleton, F.A., and Weinberg, F.J. (2001) "Electrical Aspects of Microgravity Combustion," 6th Microgravity Combustion Workshop, Cleveland, Ohio, May 22-24.

D. 50 Strayer, B.A. and Dunn-Rankin, D. (2001) "Control of the Vaporization Rate in a Droplet Stream Flame using Electric Fields," Proceedings of NHTC'01, the 35th ASME National Heat Transfer Conference, Anaheim, California, June 10-12.

D.51 Strayer, B.A. and Dunn-Rankin, D. (2001) "Response of a Non-Premixed Flame to Electric Field Forcing," 18th International Colloquium on the Dynamics of Explosions and Reactive Systems, Seattle, Washington, July 29-August 3.

D.53 Weinberg, F.J., Carleton, F.A., and Dunn-Rankin, D. (2002) "Electrically Charged Dispersions of Extinguishants for use in Microgravity Environments," Mediterranean Combustion Symposium, Sharm El-Sheikh, Egypt, January 6-11. (see A.46)

D.55 Papac, M.J., Dunn-Rankin, D., Stipe, C.B., and Lucas, D. (2002) "CARS Temperature and LIF Oxygen Concentration Measurements in an Electrically Induced Microbuoyant Flame," Paper-072 of the Western States Section/The Combustion Institute Spring Meeting, San Diego, CA, March 25–26. (see A.45)

D.58 Lengsfeld, C.S., Lentz, Y., Anchordoquy, T., Dunn-Rankin, D., and Manning, M. (2002) "Suitability of Electrostatic Spraying for Macromolecular Therapeutics," 15th Annual ILASS Americas Conference, Madison, WI, May.

D.59 Rickard, M. and Dunn-Rankin, D. (2002) "Experimental study of a hybrid electrohydrodynamic, air-assisted liquid atomizer," SAE Paper FFL02-15, Fuels and Lubricants Conference, San Diego, CA, October 21–24. (see B.11)

D.62 Dunn-Rankin, D. and Weinberg, F.J. (2003) "Flames and Electric Fields in Microgravity," 7th International Workshop on Microgravity Combustion, Cleveland, Ohio, June 2–5.

D.63 Rickard et al. (2003) "Ionic Wind as a Controllable Air Source for an Electric Burner," Western States Section/The Combustion Institute Fall Meeting, UCLA, October 20–21.

D.69 Rickard, M.A., Carleton, F., Dunn-Rankin, D., and Weinberg, F.J. (2005) "Characterization of Ionic Wind Velocity," Paper PFA-19, Proceedings of Electrostatics 2005, Helsinki, Finland, June.

D.73 Gowadia, N. and Dunn-Rankin, D. (2005) "Electrospraying Biologically Active Materials," ILASS Americas 18th Annual Conference on Liquid Atomization and Spray Systems, Irvine, CA, May 23–25.

D.76 Dunn-Rankin, D. and Weinberg, F.J. (2005) "Using Large Electric Fields to Control Transport in Microgravity," Proceedings of the Physics of Transport in Microgravity

Science Conference, Tomar, Portugal, August 8–12.
D.77 Papac, M.J. and Dunn-Rankin, D. (2005) "Canceling Buoyancy of Gaseous Fuel Flames in a Gravitational Environment using an Ion Wind," Proceedings of the Physics of Transport in Microgravity Science Conference, Tomar, Portugal, August 8–12.
D.80 Papac, M.J., Chueh, P., Dunn-Rankin, D., and Weinberg, F.J. (2005) "Voltage-Current Characteristics of Small Diffusion Flames under the Combined Influence of Ion-Driven Winds and Natural Convection," Paper 05-F30, Proceedings of the Western States Section/The Combustion Institute Fall Meeting, Stanford, CA, October 17–18.
D.83 Borgatelli, F. and Dunn-Rankin, D. (2006) "Feedback Control of Ion Current from a Small Diffusion Flame," Paper 06S-44, Western States Section/The Combustion Institute Spring Meeting, University of Idaho, Boise, March 27–28.
D.91 Bennett, M., Borgatelli, F. and Dunn-Rankin, D. (2007) "Behavior of Non-Premixed Flames as Electrically Active Components in a High-Voltage Circuit," 21st International Colloquium on Dynamics of Explosions and Reactive Systems, Poitiers, France, July 23–27.
D.101 Karnani, S., Bennett, M., and Dunn-Rankin, D. (2008) "Electrical Properties of Small Diffusion Flames," Western States Section/The Combustion Institute Spring Meeting paper 08S-4, University of Southern California, Los Angeles, March 17–18.
D.106 Dunn-Rankin, D. (2008) "Electrical Manipulation of Flames," invited lecture, Japanese Combustion Symposium, Kyoto, Japan, December 4.
D.107 Karnani, S. and Dunn-Rankin, D. (2009) "Electric Field Effects on a Small Co-Flow Diffusion Flame," Paper 13A1, U.S. Combustion Meeting, Ann Arbor, Michigan, May 18–20.
D.115 Karnani, S., Coffin, P., Schoen, M., Dunn-Rankin, D., Takahashi, F., Yuan, Z.-Y., and Stocker, D. (2009) "Exploring the effects of gravity on a coflow diffusion flame in an electric field," Paper 09F-79 at the Western States Section/The Combustion Institute Fall Meeting, University of California, Irvine, October 26–27.
D.126 Swenson, K., Karnani, S., Dunn-Rankin, D., Takahashi, F., Stocker, D., and Guang, Z.-G. (2011) "Electric Field Induced Convection in Microgravity Combustion," 7th US National Combustion Meeting, Georgia Institute of Technology, Atlanta, GA, March 20–23.
D.129 Karnani, S., Dunn-Rankin, D., Takahashi, F., Yuan, Z.G., and Stocker, D. (2011) "Simulated Gravity Using Electric Fields in Microgravity Combustion," 23rd International Colloquium on the Dynamics of Explosions and Reactive Systems, Irvine, CA, July 24–29.

Conference Papers (only abstract required)

E.43 Dunn-Rankin, D., B. Strayer, Weinberg, F.J., and Carleton, F. (1999) "Electrical Aspects of Flames in Microgravity," Proceedings of the Fifth International Microgravity Combustion Workshop, NASA CP–1999-208917, 515–517.
E.46 Carleton, F., Dunn-Rankin, D., and Weinberg, F.J. (2000) "Electrical Spraying of Extinguishants for use in Microgravity," Poster Session, 28th International Symposium

on Combustion, Edinburgh, July 30–August 4.

E.47 Strayer, B.A., Posner, J.D., Dunn-Rankin, D., and Weinberg, F.J. (2000) "Further Studies on Simulating Microgravity Flames using Electric Fields," Poster Session, 28th International Symposium on Combustion, Edinburgh, July 30–August 4.

E.50 Papac, M.J. and Dunn-Rankin, D. (2004) "Ion current measurements and children imagery of acetylene, ethylene, ethane and methane diffusion flames exposed to electric field", Poster Session – 30th International Symposium on Combustion, University of Illinois, Chicago, August.

E.55 Weinberg, F.J., Carleton, F.A., and Dunn-Rankin, D. (2006) "Electric Field-Controlled Mesoscale Burners," Poster 1A14, 31st International Combustion Symposium, Heidelberg, Germany, August 7-13.

E.62 Karnani, S.S., Bennett, M., Yamashita, K., and Dunn-Rankin, D. (2008) "W5P019: Recent progress in exploring electric field effects on diffusion flame," Poster Session of the 32nd International Combustion Symposium, Montreal, Canada, August 3–9.

E.71 Proctor, C., Karnani, S., Dunn-Rankin, D., Takahashi, F., Yuan, Z.-G., and Stocker, D. (2010) "Exploring Electric Field Effects on Laminar Diffusion Flames in Microgravity," Poster Session of the 33rd International Combustion Symposium, Beijing, China, August 2-6.

Other Publications

G.3 "High-Velocity, Multistage, Nozzled, Ion Driven Wind Generator and Method of Operation of the Same Adaptable to Mesoscale Realization," Derek Dunn-Rankin and Matthew J. Rickard. United States Patent US 7,911,146 B2, issued March 22, 2011.

Flame Design - *as of Oct. 2011*

Peer-Reviewed Journal Papers

7. V.R. Lecoustre, P.B. Sunderland, B.H. Chao, R.L. Axelbaum, *Numerical Investigation of Spherical Diffusion Flames at their Sooting Limits*, Combustion and Flame, accepted (2011).
6. Q. Wang, B.H. Chao, *Kinetic and Radiative Extinctions of Spherical Burner-Stabilized Diffusion Flames*, Combustion and Flame 158 (2011) 1532-1541.
5. S.A. Skeen, G. Yablonsky, R.L. Axelbaum *Characteristics of Non-Premixed Oxygen-Enhanced Combustion: II. Flame Structure Effects on Soot Precursor Kinetics Resulting in Soot-Free Flames*, Combustion and Flame 157 (2010) 1745-1752.
4. S.A. Skeen, G. Yablonsky, R.L. Axelbaum *Characteristics of Non-Premixed Oxygen-Enhanced Combustion: I. The Presence of Appreciable Oxygen at the Location of Maximum Temperature*, Combustion and Flame 156 (2009) 2145–2152.
3. B.M. Kumfer, S.A. Skeen, R.L. Axelbaum *Soot Inception Limits in Laminar Diffusion*

Flames with Application to Oxy–Fuel Combustion, Combustion and Flame 154 (2008) 546–556.

2. K.J. Santa, B.H. Chao, P.B. Sunderland, D.L. Urban, D.P. Stocker, R.L. Axelbaum, *Radiative Extinction of Gaseous Spherical Diffusion Flames in Microgravity*, Combustion and Flame 151 (2007) 665-675.
1. K.J. Santa, Z. Sun, B.H. Chao, P.B. Sunderland, R.L. Axelbaum, D.L. Urban, D.P. Stocker, *Numerical and Experimental Observations of Spherical Diffusion Flames*, Combustion Theory and Modeling 11 (2007) 639-652.

Conference Proceedings and Posters

16. V.R. Lecoustre, P.B. Sunderland, B.H. Chao, R.L. Axelbaum, *Characterization of Microgravity Spherical Diffusion Flame Sooting Limits*, 7th U.S. National Combustion Meeting, Atlanta (2011) 6 pp.
15. V.R. Lecoustre, P.B. Sunderland, B.H. Chao, R.L. Axelbaum, *Numerical Study of Laminar Spherical Hydrogen Diffusion Flames at Low Flow Rates*, 7th U.S. National Combustion Meeting, Atlanta (2011) 6 pp.
14. V.R. Lecoustre, C.W. Moran, P.B. Sunderland, B.H. Chao, R.L. Axelbaum, *Experimental and Numerical Investigation of Extremely Weak Hydrogen Diffusion Flames*, 6th U.S. National Combustion Meeting, Ann Arbor (2009) 12 pp.
13. V.R. Lecoustre, P.B. Sunderland, B.H. Chao, R.L. Axelbaum, *Numerical Simulations of Soot Kinetics in Spherical Diffusion Flames*, Eastern States Meeting of the Combustion Institute, College Park (2009) 8 pp.
12. V.R. Lecoustre, P.B. Sunderland, B.H. Chao, D.L. Urban, D.P. Stocker, R.L. Axelbaum, *Numerical Simulations of Spherical Diffusion Flames at their Sooting Limits*, 6th U.S. National Combustion Meeting, Ann Arbor (2009) 9 pp.
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S. W. Yoo, '06

"On the structure and dynamics of stationary and rotating spherical diffusion flames"

Staff researcher, GE Aviation, Cincinnati