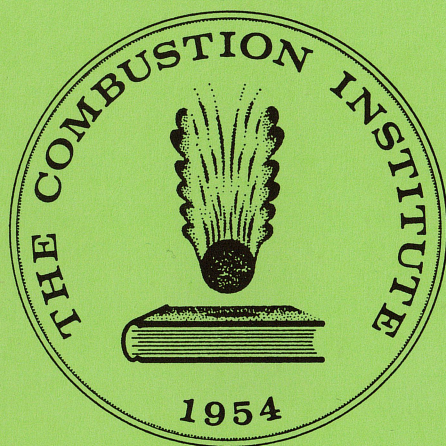


CHEMICAL AND PHYSICAL PROCESSES IN COMBUSTION



Rensselaer

1989 FALL TECHNICAL MEETING

The Eastern Section of The Combustion Institute
October 30, 31 and November 1, 1989, Albany, New York

Hosted by:

Rensselaer Polytechnic Institute

EASTERN SECTION OF THE COMBUSTION INSTITUTE - 1989 FALL TECHNICAL MEETING

SUNDAY, OCTOBER 29, 1989 6:30 - 9:00 P.M. -- REGISTRATION

MONDAY, OCTOBER 30, 1989

8:30 A.M. A. Invited Speaker -- "Optical Cross Sections of Flame Generated Aggregates",
Richard A. Dobbins, Brown University.

Session A-1 Combustion Diagnostics
Chairperson: Takashi Kashiwagi
National Institute of Standards and Technology

9:20 a.m. 1. "Temperature Measurements in Flames Using Thermally Assisted Laser
Induced Fluorescence of Ga," R. G. Joklik, J. J. Horvath, and H. G.
Semerjian, National Institute of Standards and Technology.

9:45 a.m. 2. "Temperature Measurements of Falling Droplets," M. R. Wells and L. A.
Melton, University of Texas at Dallas.

10:10 a.m. Coffee Break

10:30 a.m. 3. "Hydroxyl Radical Concentration Measurements in a Turbulent Flow Reactor
Using a High Temperature Laser Induced Fluorescence Probe," G. T.
Linteris, K. Brezinsky, and F. L. Dryer, Princeton University.

10:55 a.m. 4. "Luminescence from Dilute Methane-Fluorine Flames," C. Moore, M.
Erickson, and M. Kaufman, Emory University.

11:20 a.m. 5. "Application of Diffraction Tomography to Flame Imaging," D. J. Mollot, M
Soumekh, and N. Ashgriz, State University of New York at Buffalo.

11:45 a.m. 6. "Sooting Flame Diagnosis by Emission/Absorption Tomography," R. J. Hall
and P. A. Bonczyk, United Technologies Research Center

12:10 Lunch

MONDAY, OCTOBER 30, 1989

8:30 a.m. A. Invited Speaker -- "Optical Cross Sections of Flame Generated Aggregates,"
Richard A. Dobbins, Brown University.

Session B-1 Flame Modeling
Chairperson: Franco Tamanini
Factory Mutual Research Corporation

9:20 a.m. 29. "Cellular Structure of Very Lean Hydrogen Flames," G. Patnaik and K.
Kailasanath, Naval Research Laboratory.

9:45 a.m. 30. "Computational and Experimental Study of Axisymmetric Laminar Diffusion
Flames," M. D. Smooke and M. B. Long, Yale University.

10:10 a.m. Coffee Break

10:30 a.m. 31. "Combined Differential Thermal and Species Transport in a Strained,
Laminar Diffusion Flame," J. C. Hermanson and A. Vranos, United
Technologies Research Center.

10:55 a.m. 32. "Asymptotic Structure and Extinction of Diffusion Flames with Flame
Radiation," B. H. Chao and C. K. Law, Princeton University, and J. S. T'ien,
Case Western Reserve University.

11:20 a.m. 33. "Wick-Type Diffusion Flame," H.-Y. Lyu, L.-D. Chen, and K. Y. Hsu, The
University of Iowa.

11:45 a.m. 34. "Group Modeling of Turbulent Sprays," S. C. Yao and Q. Zhou, Carnegie
Mellon University.

12:10 Lunch

MONDAY, OCTOBER 30, 1989

8:30 a.m. A. Invited Speaker -- "Optical Cross Sections of Flame Generated Aggregated,"
Richard A. Dobbins, Brown University.

Session C-1 Soot Formation
Chairperson: Robert J. Santoro
The Pennsylvania State University

9:20 a.m. 57. "Estimation of Kinetic Parameters for PAH Agglomeration in Flames," J. H.
Miller, The George Washington University.

9:45 a.m. 58. "Simplified Models for the Production of Soot in a Premixed Flame, R. H.
Hall and M. B. Colket, United Technologies Research Center.

10:10 a.m. Coffee Break

10:30 a.m. 59. "Preliminary Results on Incipient Particle Formation in Laminar Diffusion
Flames," C. A. Smith, G. Sidebotham, and I. Glassman, Princeton University.

10:55 a.m. 60. "Dilution and Temperature Effects on Soot Formation in the Coflow Flame,"
R. L. Axelbaum and C. K. Law, Princeton University.

11:20 a.m. 61. "Soot Formation in Two Stage Combustion," D. A. Wirth and R. J. Roby,
Virginia Polytechnic Institute and State University.

11:45 a.m. 62. "Soot Formation in Fuel Sprays," T. E. Parker, J. R. Morency, and W. T.
Rawlins, Physical Sciences, Incorporated.

12:10 Lunch

MONDAY, OCTOBER 30, 1989

- 1:30 p.m. B. Invited Speaker -- "Funded Research: Are You Part of the Decision Process?," Julian Tishkoff and Mitat Birkan, AFOSR.
- Session A-2
Chairperson: Chemical Kinetics
Phillip Westmoreland
University of Massachusetts
- 2:20 p.m. 7. "Measurement of the Rate Coefficient of Reaction $H + O_2 = OH + O$," T. Yuan, C. Wang, M. J. Rabinowitz, and M. Frenklach, The Pennsylvania State University.
- 2:45 p.m. 8. "Kinetic Studies of Reactions of Peroxy Radicals in the Temperature Range 300-800 K by Flash Photolysis and UV Absorption," P. D. Lightfoot, B. Veyret, and R. Lesclaux, Universite de Bordeaux I, France.
- 3:10 p.m. Refreshment Break
- 3:35 p.m. 9. "Fragmentation Versus Isomerization: A Theoretical Study of the Methoxy Radical," M. Page, Naval Research Laboratory.
- 4:00 p.m. 10. "Kinetic and Thermochemical Studies of the Recombination Reaction $Na + O_2 + N_2$ from 590 to 1515 K by a Modified High-Temperature Photochemistry Technique," P. Marshall, A. S. Narayan, and A. Fontijn, Rensselaer Polytechnic Institute.
- 4:25 p.m. 11. "HTFFR Kinetics Studies of Reactions of AlCl and BCl with Several Oxidants," A. G. Slavejkov and A. Fontijn, Rensselaer Polytechnic Institute.
- 4:50 p.m. Adjourn
- 5:30 p.m. Executive Committee Meeting

MONDAY, OCTOBER 30, 1989

- 1:30 p.m. B. Invited Speaker -- "Funded Research: Are You Part of the Decision Process?," Julian Tishkoff and Mitat Birkan, AFOSR.
- Session B-2
Chairperson: Flame Propagation, Turbulence Scales and Mixing
William M. Pitts
National Institute of Standards and Technology
- 2:20 p.m. 35. "Flame Propagation and Extinguishment in Periodic Flow Fields," P. D. Ronney and W. D. Urban, Princeton University.
- 2:45 p.m. 36. "Temperature Time-Series Measurements in Premixed V-Shaped Flames," H. L. Ozem and F. C. Gouldin, Cornell University.
- 3:10 p.m. Refreshment Break
- 3:35 p.m. 37. "A Parametric Study on the Time Scales of the Scalar Field in Turbulent Premixed Flames: Implications for the Turbulent Burning Velocity," B. Deschamps and I. Gokalp, CNRS, Orleans, France.
- 4:00 p.m. 38. "Analysis of the Effects of Strain on Finite Rate Chemical Reaction of a Fuel Strip," B. M. Cetegen, University of Connecticut.
- 4:25 p.m. 39. "Supersonic Combustion Efficiency Determined from Wall Pressure and Temperature Measurement in a Mach 2 H_2 -Air Flowfield," C. Segal, J. C. McDaniel, R. H. Krauss, and R. B. Whitehurst, University of Virginia.
- 4:50 p.m. Adjourn
- 5:30 p.m. Executive Committee Meeting

MONDAY, OCTOBER 30, 1989

- 1:30 p.m. B. Invited Speaker -- "Funded Research: Are You Part of the Decision Process?," Julian Tishkoff and Mitat Birkan, AFOSR.
- Session C-2 Droplets
Chairperson: Stephen R. Turns
The Pennsylvania State University
- 2:20 p.m. 63. "Coke Particulate Formation in the Combustion of Residual Oil: Dependence of Particle Size and Mass on Initial Droplet Parameters," D. L. Urban and F. L. Dryer, Princeton University.
- 2:45 p.m. 64. "Analysis of Transient Combustion of a Multicomponent Liquid Fuel Droplet," M. Mawid and S. K. Aggarwal, University of Illinois.
- 3:10 p.m. Refreshment Break
- 3:35 p.m. 65. "Droplet Vaporization in High Pressure and Temperature Environments," H. Jia and G. Gogos, Rutgers University.
- 4:00 p.m. 66. "An Experimental Investigation on the Collision Behavior of Hydrocarbon Droplets," Y. Jiang, A. Umemura, and C. K. Law, Princeton University.
- 4:25 p.m. 67. Superheated Water Evaporation and Disruptive Burning," J. E. Shepherd and S. McCahan, Rensselaer Polytechnic Institute.
- 4:50 p.m. Adjourn
- 5:30 p.m. Executive Committee Meeting

TUESDAY, OCTOBER 31, 1989

- 8:30 a.m. C. Invited Speaker -- "Combustion Science - A Guide to High Temperature Materials Processing," Michael Frenklach, The Pennsylvania State University.
- Session A-3 Pyrolysis and Oxidation Chemistry
Chairperson: Arthur Fontijn
Rensselaer Polytechnic Institute
- 9:20 a.m. 12. "Modeling of PAH Profiles in Premixed Flames," H. Wang and M. Frenklach, The Pennsylvania State University.
- 9:45 a.m. 13. "Testing Predictions of C₂₋₄ Species in a Fuel-Rich Acetylene Flame," S. D. Thomas and P. R. Westmoreland, University of Massachusetts.
- 10:10 a.m. Coffee Break
- 10:30 a.m. 14. "The Role of Olefins in the Autoignition Chemistry of Paraffinic Hydrocarbons," R. D. Wilk, Union College, and N. P. Cernansky, Drexel University.
- 10:55 a.m. 15. "On the Kinetics and Thermodynamics of C₄H₅ Isomers," P. R. Westmoreland, University of Massachusetts.
- 11:20 a.m. 16. "Evidence of Side Chain Interaction in the Oxidation of O-xylene," J. L. Emdee, K. Brezinsky, and I. Glassman, Princeton University.
- 11:45 a.m. 17. "A Pressurized Flow Reactor for Studies of Homogeneous Gas-Phase Hydrocarbon Oxidation Through the NTC Region," D. N. Koert and N. P. Cernansky, Drexel University.
- 12:10 Lunch

TUESDAY, OCTOBER 31, 1989

8:30 a.m. C. Invited Speaker -- "Combustion Science - A Guide to High Temperature Materials Processing," Michael Frenklach, The Pennsylvania State University.

Session B-3
Chairperson: Turbulent Diffusion Flames
Domenic Santavicca
The Pennsylvania State University

9:20 a.m. 40. "Turbulent Structures in Axisymmetric Jets and Stabilization of Lifted Flames," W. M. Pitts, National Institute of Standards and Technology.

9:45 a.m. 41. "Measurements of Mixture-Fraction Correlations in Turbulent Jet Diffusion Flames," M. E. Kounalakis and G. M. Faeth, The University of Michigan.

10:10 a.m. Coffee Break

10:30 a.m. 42. "Temperature Fluctuations in Strongly Radiating Flames," J. P. Gore and U. - S. Ip, University of Maryland.

10:55 a.m. 43. "Flame Radiation Scaling in Turbulent Jet Flames," M. A. Delichatsios, Factory Mutual Research Corporation.

11:20 a.m. 44. "NO_x Emissions from Turbulent Propane Diffusion Flames," S. R. Turns and J. A. Lovett, The Pennsylvania State University.

11:45 a.m. 45. "Appropriate Turbulence-Chemistry Models for Nonpremixed Combustion," S. M. Correa, General Electric Corporate Research Center.

12:10 Lunch

TUESDAY, OCTOBER 31, 1989

8:30 a.m. C. Invited Speaker -- "Combustion Science - A Guide to High Temperature Materials Processing," Michael Frenklach, The Pennsylvania State University.

Session C-3
Chairperson: Combustion In Microgravity
Richard L. Axelbaum
Princeton University

9:20 a.m. 68. "Diffusion Flame over a Continuous Moving Fuel Plate in a Parallel Flow of Oxidizer under Microgravity," M. Vedha-Nayagam, Wyle Laboratories, and B. Agarwal and G. Fairweather, University of Kentucky.

9:45 a.m. 69. "Normal and Microgravity Experiments on Pulsating Flame Spread over Shallow Liquid Pools," H. D. Ross and R. G. Sotos, NASA Lewis Research Center.

10:10 a.m. Coffee Break

10:30 a.m. 70. "Diluent Effects on Quiescent Microgravity Flame Spread over a Thin Solid Fuel," S. L. Olson, NASA Lewis Research Center, and S. C. Stouffer, Purdue University, and T. Grady, United States Air Force Academy.

10:55 a.m. 71. "Oxygen-Concentration Effects on Microgravity Laminar Methane and Propane Diffusion Flames," M. Y. Bahadori, Science Applications International Corporation, and D. P. Stocker, NASA Lewis Research Center.

11:20 a.m. 72. "Radiative Pyrolysis of Thin Fuels in a Microgravity Environment," H. R. Baum and T. Kashiwagi, National Institute of Standards and Technology, and C. DiBlasi, University di Napoli, Italy.

11:45 a.m. 73. "Some Observations on the Burning of Methanol Droplets in Microgravity Using Various Inert Gases," M. Y. Choi, S. Y. Cho and F. L. Dryer, Princeton University, and J. B. Haggard, Jr., NASA Lewis Research Center.

12:10 Lunch

TUESDAY, OCTOBER 31, 1989

1:30 p.m. D. Invited Speaker -- "Recent Developments in Gaseous and Heterogeneous Detonation," Martin Sichel, University of Michigan.

Session A-4: Thermodynamics, Materials and Explosions
Chairperson: Paul Ronney
Princeton University

2:20 p.m. 18. "Accurate Heat Capacity Extrapolation for Use in High Temperature Reaction Modeling," E. R. Ritter and J. W. Bozzelli, New Jersey Institute of Technology.

2:45 p.m. 19. "Combustion Formation of Metallic Nitrides - Equilibrium Considerations," K. A. Davis, K. Brezinsky, and I. Glassman, Princeton University.

3:10 p.m. Refreshment Break

3:35 p.m. 20. "An Experimental Investigation of Air Line Explosions Caused by Film Detonations," Y. Guo and C. W. Kauffman, The University of Michigan.

4:00 p.m. 21. "Influence of Flow Turbulence on the Development of Confined Gas Explosions," F. Tamanini and J. L. Chaffee, Factory Mutual Research Corporation.

4:25 p.m. 22. "Determination of Solid Fuel Surface Temperature," X. Li and P. Durbetaki, Georgia Institute of Technology.

4:50 p.m. Adjourn

5:30 p.m. General Business Meeting (all members are invited)

6:30 p.m. Reception and Banquet

TUESDAY, OCTOBER 31, 1989

1:30 p.m. D. Invited Speaker -- "Recent Developments in Gaseous and Heterogeneous Detonation," Martin Sichel, University of Michigan.

Session B-4: Flame Spread and Flammability
Chairperson: Jay P. Gore
University of Maryland

2:20 p.m. 46. "Radiative Effects in Opposed-Flow Flame Spread over Thin Fuels," S. Bhattacharjee and R. A. Altenkirch, Mississippi State University.

2:45 p.m. 47. "A Numerical Model for Upward Flame Spread," C. I. Kim and A. K. Kulkarni, The Pennsylvania State University.

3:10 p.m. Refreshment Break

3:35 p.m. 48. "Wind-Aided Flame Spread over Non-Charring Solids," S. Agrawal and I. Wichman, Michigan State University.

4:00 p.m. 49. "A Preliminary Investigation of Flame Spread in Endotracheal Tubes," G. W. Sidebotham, Princeton University and G. L. Wolf, M.D., State University of New York.

4:25 p.m. 50. "The Use of Time to Ignition Data for Characterizing the Thermal Inertia and the Minimum (Critical) Energy for Ignition or Pyrolysis," M. A. Delichatsios, Th. Panagiotou, and F. Kiley, Factory Mutual Research Corporation.

4:50 p.m. Adjourn

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TUESDAY, OCTOBER 31, 1989

1:30 p.m. D. Invited Speaker -- "Recent Developments in Gaseous and Heterogeneous Detonation," Martin Sichel, The University of Michigan.

Session C-4 Pulsed Combustion
Chairperson: Sanjay M. Correa
General Electric Corporate Research Center

2:20 p.m. 74. "The Structure of Pulsed Turbulent Jet Flames," J. A. Lovett and S. R. Turns, The Pennsylvania State University.

2:45 p.m. 75. "A Large Amplitude Oscillating Combustor," G. J. Morris, M. J. Welter, and G. A. Richards, U. S. Department of Energy.

3:10 p.m. Refreshment Break

3:35 p.m. 76. "The Effect of Gaseous Fuel Flow Rate on Sound Level and Temperature in a Self-Aspirating Rijke Pulsating Combustor." G. Brinckman and D. Miller, Drexel University.

4:00 p.m. 77. "Stability Characterization of a Dump Combustor," L. A. Roe and R. S. Gabruk, Virginia Polytechnic Institute and State University, and A. S. Nejad, Wright-Patterson AFB, and S. C. Favaloro, Aeronautical Research Laboratory, Australia.

4:25 p.m. Adjourn

5:30 p.m. General Business Meeting (all members are invited)

6:30 p.m. Reception and Banquet

WEDNESDAY, NOVEMBER 1, 1989

8:30 a.m. E. Invited Speaker -- "Supercritical Water Oxidation," Michael Modell, Modell Development Corporation.

Session A-5 Hazardous Waste Destruction
Chairperson: J. Houston Miller
The George Washington University

9:20 a.m. 23. "Studies of Thermodynamic Non-ideality Effects on Chemical Equilibrium and Reaction Rates in Supercritical Fluids," N. Bergan, C. F. Melius, and H. A. Dwyer, Sandia National Laboratories.

9:45 a.m. 24. "Oxygen Catalyzed Hydro-Pyrolysis of Chlorobenzene," E. R. Ritter and J. W. Bozzelli, New Jersey Institute of Technology.

10:10 a.m. Coffee Break

10:30 a.m. 25. "Spouted Bed Combustion of Toluene and Chlorinated Aromatics," E. R. Altwicker, R. Kumar, N. V. Konduri, and M. S. Milligan, Rensselaer Polytechnic Institute.

10:55 a.m. 26. "Effect of CH_3Cl on the Stability of C_2H_4 /Air Combustion in a Toroidal Jet Stirred Reactor," R. B. Barat, A. F. Sarofim, and J. P. Longwell, Massachusetts Institute of Technology, and J. W. Bozzelli, New Jersey Institute of Technology.

11:20 a.m. 27. "Thermal Decomposition of Dichloromethane in Hydrogen/Oxygen/Argon Mixtures and in Pure Oxygen," W-P. Ho and J. W. Bozzelli, New Jersey Institute of Technology.

11:45 a.m. 28. "An HTP Kinetics Study of the $\text{O} + \text{HCl}$ Reaction from 350 to 1480 K," K. Mahmud, J. S. Kim, and A. Fontijn, Rensselaer Polytechnic Institute.

12:10 Adjourn

TUESDAY, OCTOBER 31, 1989

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General Electric Corporate Research Center

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12:10 Adjourn

WEDNESDAY, NOVEMBER 1, 1989

8:30 a.m. E. Invited Speaker -- "Supercritical Water Oxidation," Michael Modell, Modell Development Corporation.

Session B-5 Pool Fires and Fire Models
Chairperson: Fred Williams
Naval Research Laboratory

9:20 a.m. 51. "Investigation of Radial Effects on the Burning Rate in Liquid Pool Fires," S. Fischer and T. Kashiwagi, National Institute of Standards and Technology.

9:45 a.m. 52. "Fuel Structure Effects on Radiation Properties of Laminar Diffusion Flames," J. P. Gore, S. M. Skinner, and R. J. Gettings, University of Maryland.

10:10 a.m. Coffee Break

10:30 a.m. 53. "A Model to Predict Transient Combustion Behavior of Liquid Pool Fires," T. Inamura, K. Saito, and K. Taghavi, University of Kentucky.

10:55 a.m. 54. "The Effect of Ambient Oxygen Concentration on the Flame Behavior of Gaseous and Liquid Pool Fires," K. C. Adiga and D. E. Ramaker, George Washington University, P. A. Tatem and F. W. Williams, Naval Research Laboratory.

11:20 a.m. 55. "An Algorithm for Flow Through Horizontal Ceiling/Floor Vents," L. Y. Cooper, National Institute of Standards and Technology.

11:45 a.m. 56. "Downward Turning of a Ceiling Jet in an Enclosure Fire," Y. Jaluria and K. Kapoor, Rutgers University.

12:10 Adjourn

WEDNESDAY, NOVEMBER 1, 1989

8:30 a.m. E. Invited Speaker -- "Supercritical Water Oxidation," Michael Modell, Modell Development Corporation.

Session C-5 Ignition
Chairperson: Joseph E. Shepherd
Rensselaer Polytechnic Institute

9:20 a.m. 78. "Laser Spark Ignition of Laminar CH₄/Air Mixtures," C. M. Ho and D. A. Santavicca, The Pennsylvania State University.

9:45 a.m. 79. "Dependence of Minimum Ignition Energy on Ignition Parameters," A. Frendi and M. Sibulkin, Brown University.

10:10 a.m. Coffee Break

10:30 a.m. 80. "Ignition of a Fuel Spray by Hot Surfaces in a Constant Volume Combustion Vessel," M. Mawid and S. Aggarwal, University of Illinois.

10:55 a.m. 81. "Infrared Laser-Induced Activation of Natural Gas," A. T. Poulos and M. Lavid, M. L. Energia, Inc.

12:10 Adjourn