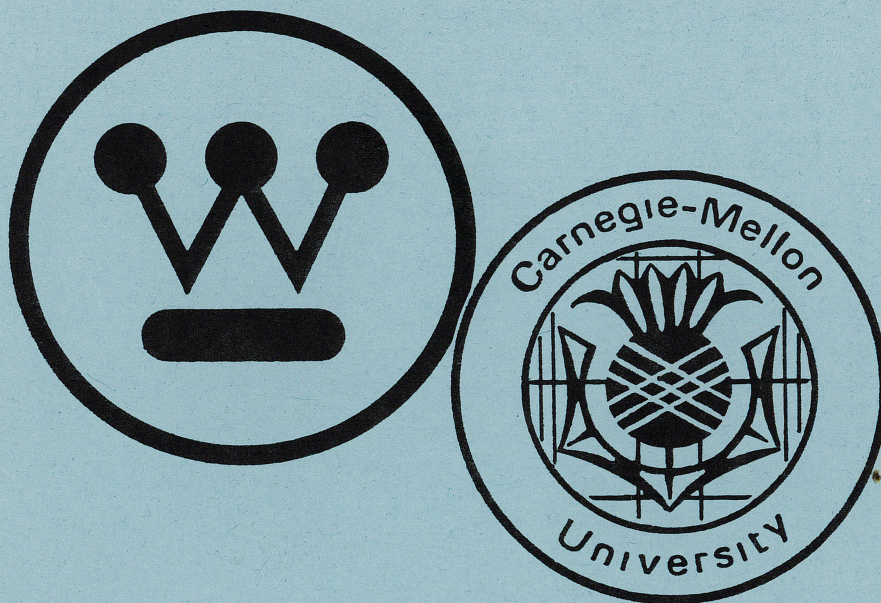


# **Chemical and Physical Processes in Combustion**



**1981 Technical Meeting  
The Eastern Section of the Combustion Institute  
October 27-29, Pittsburgh, Pennsylvania**

**Co-Hosted by**

**Westinghouse Research and Development Center  
Pittsburgh, Pennsylvania 15235  
and  
Carnegie-Mellon University  
Pittsburgh, Pennsylvania 15213**



EASTERN SECTION OF THE COMBUSTION INSTITUTE  
1981 FALL TECHNICAL MEETING  
October 27, 28 and 29, 1981  
Carnegie-Mellon University Campus  
Schenley Park  
Pittsburgh, Pennsylvania

MONDAY, OCTOBER 26, 1981

6:30-8:30 p.m. - Welcome Reception (Faculty Lounge)

TUESDAY, OCTOBER 27, 1981

8:00 a.m. - Registration (Skibo Building)

8:50 a.m. - Welcome and Introductory Remarks

Session A-1 (Ballroom)

Chairperson: Dr. C. Huggett

National Bureau of Standards

FLAME CHEMISTRY

9:00 a.m. 1 "Chemical Modeling of Combustion Systems," R. M. Fristrom, APL, The Johns Hopkins University  
(Invited Presentation)

9:45 a.m. Intermission

9:50 a.m. 2 "Competing Reaction Pathways for Flame Radicals: CH<sub>3</sub>O," F. F. Adams, U.S. Army Ballistic Proving Ground

10:10 a.m. 3 "Preliminary Observations on the High Temperature Oxidation of Ethanol," A. K. Hayashi and F. L. Dryer, Princeton University

10:30 a.m. Coffee Break (Highlander Room)

11:00 a.m. 4 "Mechanism of Ammonia Oxidation," A. M. Dean, J. E. Hardy, and R. K. Lyon, Corporate Research Laboratories, Exxon Research and Engineering Company

11:20 a.m. 5 "A Detailed Kinetic Study of the Oxidation of Wet CO in a Turbulent Flow Reactor," R. A. Yetter and F. L. Dryer, Princeton University

11:40 a.m. Lunch Break (Skibo Dining Facilities)



Session A-2 (Ballroom)

Chairperson: Dr. J. Quintiere  
National Bureau of Standards

FIRE PHENOMENA

- 1:40 p.m. 6 "Panel Discussion on Flame Spread," Moderator: F. A. Williams, Princeton University, Panelists: J. deRis, Factory Mutual Research Corporation, I. Glassman, Princeton University, and A. C. Fernandez-Pello, University of California, Berkeley (Invited Presentation)
- 2:25 p.m. Intermission
- 2:30 p.m. 7 "A Simplified Model of Flame-Spread Over Fuel Surfaces," I. S. Wichman and F. A. Williams, Princeton University
- 2:50 p.m. 8 "Surface Regression Effects on Flame Spread Correlations," R. A. Altenkirch, R. Eichhorn, and A. R. Rizvi, University of Kentucky
- 3:10 p.m. Refreshment Break (Highlander Room)
- 3:40 p.m. 9 "Flash Point Physics," A. M. Kanury, University of Notre Dame
- 4:00 p.m. 10 "Froude Modeling of Pool Fires," L. Orloff, Factory Mutual Research Corporation
- 4:20 p.m. 11 "Momentum Implications for Buoyant Diffusion Flames," B. J. McCaffrey, National Bureau of Standards
- 4:40 p.m. 12 "An Investigation of Buoyant Methane and Propane Fueled Flames in Still Air," S-M. Jeng, J-S. Shuen, L-D. Chen, and G. M. Faeth, The Pennsylvania State University

Session B-1 (Wherrett Room)

Chairperson: Professor A. M. Kanury  
University of Notre Dame

ROOM FIRE MODELING

- 9:50 a.m. 34 "Flow Induced by a Corner Fire in a Room - Some Experimental Results," K. D. Steckler, W. J. Rinkinen, and J. G. Quintiere, National Bureau of Standards
- 10:10 a.m. 35 "A Two-Layer Model of Turbulent Wall Flows Dominated by Buoyancy Forces," M. A. Delichatsios, Factory Mutual Research Corporation

10:30 a.m. Coffee Break (Highlander Room)

- 11:00 a.m. 36 "Direct Computation of Fire Induced Flow and Smoke Coagulation," H. R. Baum, R. G. Rehm, and G. W. Mulholland, National Bureau of Standards
- 11:20 a.m. 37 "Application of Fire Growth Models to Corridor Smoke Filling Experiments," W. W. Jones, National Bureau of Standards
- 11:40 a.m. 38 "Application of a Zone Model for a Tall Building Fire," T. Tanaka, Building Research Institute, Japan
- 12:00 p.m. Lunch Break (Skibo Dining Facilities)

Session B-2 (Wherrett Room)

Chairperson: Dr. H. F. Calcote  
AeroChem Research Laboratories, Inc.

SOOT FORMATION AND COMBUSTION

- 2:30 p.m. 39 "Optical Studies of Polycyclic Aromatic Hydrocarbons in Pyrolysis and Diffusion Flame Environments," J. H. Miller, W. G. Mallard, and K. C. Smyth, National Bureau of Standards
- 2:50 p.m. 40 "Combustion of Carbon Slurry Agglomerates in A Laminar Premixed Flame," G. A. Szekely, Jr. and G. M. Faeth, The Pennsylvania State University
- 3:10 p.m. Refreshment Break (Highlander Room)
- 3:40 p.m. 41 "The Temperaure Effect in Sooting Pre-mixed Flames," I. Glassman and P. U. Lara, Princeton University
- 4:00 p.m. 42 "Can  $C_3H_3^+$  Be an Important Soot Precursor?," K. C. Smyth, S. C. Lias, and P. Ausloos, National Bureau of Standards
- 4:20 p.m. 43 "Application of Pulsating Combustion in the Burning of Coal," B. T. Zinn, J. Carvalho, N. Miller, and B. R. Daniel, Georgia Institute of Technology



WEDNESDAY, OCTOBER 28, 1981

Session A-3 (Ballroom)

Chairperson: Professor W. A. Sirignano  
Carnegie-Mellon University

COAL COMBUSTION

- 9:00 a.m. 13 "Burning Coal Underground," R. F. Chaiken, United States Bureau of Mines (Invited Presentation)
- 9:45 a.m. Intermission
- 9:50 a.m. 14 "Mathematical Modelling of Some Chemical and Physical Processes in Underground Coal Gasification," J. R. Creighton, Lawrence Livermore National Laboratory
- 10:10 a.m. 15 "Sensitivity Analysis of Devolatilization Reactions," T. O'Brien and T. H. Pierce, Morgantown Energy Technology Center
- 10:30 a.m. Coffee Break (Highlander Room)
- 11:00 a.m. 16 "Gaseous Detonative Fracture of Porous Materials for Enhanced Fossil Fuel Utilization and Recovery," C. W. Kauffman, C. Yan, and J. A. Nichols, University of Michigan
- 11:20 a.m. 17 "Measurements of Coal Dust Flammability Using a Gravity-Tumbler Apparatus," S. E. Slezak, D. J. Fitch, R. O. Buckius, and H. Krier, University of Illinois at Urbana-Champaign
- 11:40 a.m. 18 "Combustion Behavior of Spent Shale Particles," M. Ho, Y. Manor, E. Suuberg, and H. Toor, Carnegie-Mellon University
- 12:00 p.m. Lunch Break (Skibo Dining Facilities)

Session A-4 (Ballroom)

Chairperson: Professor F. L. Dryer  
Princeton University

IGNITION PHENOMENA

- 1:30 p.m. 19 "A Theoretical and Computational Study of the Ignition of Pre-Mixed Gases," K. Kailasanath, E. S. Oran, and J. P. Boris, Naval Research Laboratory

- 1:50 p.m. 20 "Photochemical Ignition of Gaseous Mixtures," M. Lavid, Exxon Research and Engineering Company
- 2:10 p.m. 21 "An Experimental Investigation of the Minimum Ignition Energy of Monodisperse Sprays," K. K. Chan and C. E. Polymeropoulos, Rutgers University
- 2:30 p.m. 22 "Calculations of Flow in and About Fuel Droplets," M. J. Fritts, D. E. Fyfe, and E. S. Oran, Naval Research Laboratory
- 2:50 p.m. Refreshment Break (Highlander Room)
- 3:20 p.m. 23 "The Ignition of Toluene/Air Mixtures by Burning Metal Particles," T. J. Stanley, K. Thallner, J. Witt, A. Yee, W. A. Sirignano, and E. M. Suuberg, Carnegie-Mellon University
- 3:40 p.m. 24 "The Influence of Initial Fuel Temperature on Ignition Delay," L. O. Hoppie, Eaton Engineering and Research Center
- 4:00 p.m. 25 "Thermal Ignition of Dust Clouds," R. S. Conti, K. L. Cashdollar, I. Liebman, and M. Hertzberg, United States Bureau of Mines
- 4:20 p.m. 26 "Grain Dust Ignition by Friction Sparks," J. Allen and H. F. Calcote, AeroChem Research Laboratories, Inc.

Session B-3 (Wherrett Room)

Chairperson: Professor G. M. Faeth  
The Pennsylvania State University

DIAGNOSTICS

- 9:50 a.m. 44 "Laser-Induced Fluorescence Studies of the NCO Molecule," B. J. Sullivan, G. P. Smith, D. R. Crosley, and G. Black, SRI International
- 10:10 a.m. 45 "A Comparison of Techniques for the Reconstruction of Axisymmetric Flow Fields from Absorption Measurements," B. J. Hughey and D. A. Santavicca, Princeton University
- 10:30 a.m. Coffee Break (Highlander Room)
- 11:00 a.m. 46 "Measurement of Droplet Size and Velocity in Pulsed Diesel Sprays," N. Chigier, Carnegie-Mellon University



11:20 a.m. 47 "Laser Excitation of NCO A-X System Fluorescence In A  $\text{CH}_4/\text{N}_2\text{O}$  Flame Using an Argon Ion Laser," W. R. Anderson, J. A. Vanderhoff, A. J. Kotlar, L. J. Decker, and R. A. Beyer, U. S. Army Ballistic Research Laboratory

11:40 a.m. 48 "Saturated Fluorescence Measures of OH in  $\text{H}_2/\text{O}_2/\text{N}_2$  Flat Flames," R. P. Lucht, N. M. Laurendeau, and D. Sweeney, Purdue University

12:00 p.m. Lunch Break (Skibo Dining Facilities)

Session B-4 (Wherrett Room)

Chairperson: Dr. J. deRis

Factory Mutual Research Corporation

#### FLAME PROPAGATION

1:30 a.m. 49 "A Study of One-Dimensional Steady Laminar Flame-Propagation in Two-Phase Mixtures," S. K. Aggarwal and W. A. Sirignano, Carnegie-Mellon University

1:50 p.m. 50 "Sensitivity Analysis Applied to  $\text{H}_2\text{-O}_2\text{N}_2$  Premixed, Laminar, Steady-State Flames," T. P. Coffee and J. M. Heimerl, U. S. Army Ballistic Research Laboratory

2:10 p.m. 51 "On the Opening of Premixed Bunsen Flame Tips," C. K. Law, S. Ishizuka, and P. Cho, Northwestern University

2:30 p.m. 52 "Interaction of Flame/Wall In Narrow Channels," K. T. Rhee, Rutgers, The State University of New Jersey

2:50 p.m. Refreshment Break (Highlander Room)

3:20 p.m. 53 "Finite Reaction Rate and Lewis Number Effects on Diffusion Flames in Channels," H. R. Baum and D. M. Corley, National Bureau of Standards

3:40 p.m. 54 "Influence of Repeated Obstacles on Flame Acceleration in Off Stoichiometric  $\text{CH}_4\text{-Air}$  and  $\text{H}_2\text{-Air}$  Mixtures," C. Chan and J. H. Lee, McGill University

4:00 p.m. 55 "Numerical Simulations of Weak and Strong Ignition Systems," E. S. Oran, T. R. Young, and J. P. Boris, Naval Research Laboratory

4:20 p.m. 56 "Detonation Properties of Hydrogen-Air Mixtures," R. Knystautas, C. Guirao, J. H. Lee, and C. Valenta, McGill University

4:45 p.m. Business Meeting (Ballroom)  
All members are encouraged to attend.

THURSDAY, OCTOBER 29, 1981

Session A-5 (Ballroom)

Chairperson: Dr. F. W. Williams

Naval Research Laboratory

#### COMBUSTOR RESEARCH

9:00 a.m. 27 "Furnace Flames and Fluidized Combustion: Research Needs," J. M. Beér, Massachusetts Institute of Technology (Invited Presentation)

9:45 a.m. 28 "Radiative Heating and Evaporation of Droplets In Cylindrical Combustion Chambers," N. Ashgrizzadeh and S. Yao, Carnegie-Mellon University

10:05 a.m. 29 "Computer Simulation of Fluidized-Bed Dynamics," M. DelleDonne, P. Nicoletti, and T. O'Brien, E G & G Washington Analytical Services Center, Inc.

10:25 a.m. Coffee Break (Highlander Room)

10:55 a.m. 30 "Preliminary Investigations of A Double Vortex Combustion Chamber," T. Krepec and C. Kwok, Concordia University

11:15 a.m. 31 "Numerical Simulation of the Transition to Turbulence in Co-flowing Gas Jets," J. Tittsworth, J. P. Boris, and E. S. Oran, Naval Research Laboratory

11:35 a.m. 32 "Minimizing the Conversion of Fuel Bound Nitrogen to  $\text{NO}_x$  Using Catalytic Combustion," R. Prasad, L. A. Kennedy, and E. Ruckenstein, State Univeristy of New York at Buffalo

11:55 a.m. 33 "The Effect of Oil Layers on the Hydrocarbon Emissions from Spark-Ignited Engines," E. W. Kaiser, J. A. LoRusso, G. A. Lavoie, and A. A. Adamczyk, Ford Motor Company

12:15 p.m. Closing Remarks