2002 Spring Technical Meeting
Central States Section / The Combustion Institute
April 7-9, 2002
Knoxville, Tennessee

Sunday, April 7			
6:00-8:00 pm	**Registration & Reception [Lobby]**		
Monday, April 8			
8:20 am 8:30 am	Welcome [1] **Invited Speaker: William L. Grosshandler, NIST** *Research Needs for Fire Resistance Determination and Performance Prediction*		
9:20 am	A.1: SI Engines [2]	B.1: Diffusion Flames [3]	C.1: Soot & Precursors I [4]
12:00 noon	Lunch & Business Meeting [5]		
1:30 pm	A.2: Multiphase Combustion [2]	B.2: Partially-Premixed Flames [3]	C.2: Soot & Precursors II [4]
3:30 pm	A.3: Rockets, SCRam Jets & Condensed-Phase Systems [2]	B.3: Turbulent Flames [3]	C.3: Turbulent Combustion Modeling [4]
5:00-8:00 pm	**Tour of ORNL's National Transportation Research Center**		
Tuesday, April 9			
8:00 am	**James E. Peters Plenary Lecture: Gerard M. Faeth, University of Michigan** *Optical and Reactive Properties of Soot in Flame Environments* [1]		
9:00 am	A.4: Diesel Engines [2]	B.4: Premixed Flames [3]	C.4: Converters & Reformers [4]
10:50 am	A.5: Boilers & Furnaces I [2]	B.5: Fires [3]	C.5: Diagnostics I [4]
12:30 pm	Lunch [open location]		
1:30 pm	**Invited Speaker: Shiyi Chen, Johns Hopkins University** *Lattice Boltzmann Simulation of Reactive Flows* [1]		
2:30 pm		B.6: Kinetics [3]	C.6: Diagnostics II [4]

[1] All plenary sessions are in the Mississippi Room on the Ballroom Level
[2] Session A is in the Andrew Jackson Room on the Lobby Level
[3] Session B is in the Alvin York Room on the Lobby Level
[4] Session C is in the James Polk Room on the Lobby Level
[5] The Luncheon and Business Meeting is in the Georgia Room on the Ballroom Level
[6] The Reading and Preparation Room is in the Henry Knox Room on the Lobby Level

Program

2002 Spring Technical Meeting
Central States Section
The Combustion Institute
7-9 April 2002
Hyatt Regency
Knoxville, Tennessee

Sunday, April 7, 2002

6:00-8:00 PM Registration

Monday, April 8, 2002

8:20 AM Introduction: Jay P. Gore and Dennis P. Stocker

8:30 AM Invited Speaker: William L. Grosshandler, National Institute of Standards and Technology
(Session Chair: Jay P. Gore, Purdue University)
Research Needs for Fire Resistance Determination and Performance Prediction

SESSION A.1: SI Engines, Session Chairs: James A. Hilditch, Ford Research Laboratory and David L. Reuss, General Motors Research & Development Center

9:20 AM W.L. Easley and A.M. Mellor, Vanderbilt University
A Phenomenological Model for Autoignition in Direct Injection Diesel Engines

9:40 AM Johney Green, Jr., Robert Wagner and Stuart Daw, Oak Ridge National Laboratory
Model Based Control of Cyclic Dispersion in Lean Spark Ignition Combustion

10:00 AM James A. Hilditch and Zhiyu Han, Ford Research Laboratory
A Multi-dimensional Combustion Model for Gasoline Direct-Injection Engine Design

10:20 AM Break

10:40 AM Todd D. Fansler, Boris Stojkovic, Michael C. Drake and Martin E. Rosalik, General Motors Research & Development Center
Local Fuel-Air Ratio Measurements in Internal Combustion Engines using Spark-Emission Spectroscopy

11:00 AM Dar-Lon Chang and Chia-fon F. Lee, University of Illinois at Urbana-Champaign
Comparison of Simulations of Impingement from an Air-Assisted Fuel Injector and a Swirl Atomizer

11:20 AM Steve T. Chin and Chia-fon F. Lee, University of Illinois at Urbana-Champaign
The Effects of Wall-Wetting on Hydrocarbon Emissions in Engines

11:40 AM John R. Reisel, Jeffrey W. Dujmovic and Jason T. Krajewski, University of Wisconsin-Milwaukee
Effects of Engine Modifications on the Pollutant Emissions from Small Utility Engines

12:00 PM Lunch & Business Meeting

SESSION A.2: Multiphase Combustion, Session Chair: Fumiaki Takahashi, NASA Glenn Research Center

1:30 PM Dongyao Wang and Chia-fon F. Lee, University of Illinois at Urbana-Champaign
Preferential Vaporization Model for Multicomponent Droplets and Sprays Using Continuous Thermodynamics

1:50 PM H. Lee, S.L. Chang and M. Petrick, Argonne National Laboratory
A Numerical Study of the Impacts of the Blending of Volatile Component on Spray Evaporation and Combustion

2:10 PM Peter M. Struk and Daniel L. Dietrich, NASA Glenn Research Center; Masiki Ikegami and Guangwen Xu, National Institute of Advanced Industrial Science and Technology

Combustion of Single Decane Droplets in Microgravity - Comparison of Experiments with a Simplified Numerical Model

2:30 PM Siavash H. Sohrab, Northwestern University
Modified Form of the Helmholtz Vorticity Equation and its Solution for Spherical Flow within a Droplet in Uniform or Counterflow Streams

2:50 PM L.A. Kennedy, A.V. Saveliev, J.P. Bingue, A.A. Fridman, University of Illinois at Chicago
Filtration Combustion of a Methane Wave in Air for Oxygen Enriched and Depleted Environment

3:10 PM **Break**

SESSION A.3: Rockets, SCRam Jets and Condensed-Phase Systems, Session Chair: Robert D. Hancock, Air Force Research Laboratory

3:30 PM E. Shafirovich, A.S. Mukasyan and A. Varma, University of Notre Dame; G. Kshirsagar, Y. Zhang and J.C. Cannon, B/E Aerospace Inc.
Combustion of Low-Exothermic Condensed Systems for Oxygen Generation

3:50 PM Ryan Eyer, Herman Krier and Nick Glumac, University of Illinois at Urbana-Champaign
ALO Emission Temperatures from Aluminum Burning in Carbon Dioxide at Elevated Pressures

4:10 PM Orenthral T. Morgan, University of Alabama at Birmingham and John Baker, University of Alabama at Tuscaloosa
Magnetism, Equilibrium Combustion Compositions, and Theoretical Rocket Performance

4:30 PM Stephen C. Bates, Thoughtventions Unlimited LLC
Solid Hydrogen Fueling of an Air Breathing Supersonic Combustor

4:50 PM B. Han and C.J. Sung, Case Western Reserve University; M. Nishioka, University of Tsukuba
A Numerical Study of Vitiation Effects on Ignition in Two-Dimensional Supersonic Hydrogen/Air Mixing Layer

SESSION B.1: Diffusion Flames, Session Chair: Indrek Wichman. Michigan State University

9:20 AM Taehun Lee, Ching-Long Lin and Lea-Der Chen, University of Iowa
Lattice Boltzmann Simulation of Laminar Jet Diffusion Flames

9:40 AM J.R. Nanduri, C.J. Sung and J.S. T'ien, Case Western Reserve University
Dynamics of Radiative Edge Diffusion Flames

10:00 AM Sameer V. Naik and Normand M. Laurendeau, Purdue University; James A. Cooke and Mitchell D. Smooke
Soot and NO Formation in Counterflow Diffusion Flames under Oxygen-Enriched Conditions

10:20 AM **Break**

10:40 AM Fumiaki Takahashi, NASA Glenn Research Center; Viswanath R. Katta, Innovative Scientific Solutions, Inc
Diffusion Flame Stabilization and Reaction Kernel Structure in Microgravity

11:00 AM Mark Calvert and John Baker, University of Alabama; Kozo Saito, University of Kentucky
Laminar Slot Diffusion Flames in Non-Uniform Magnetic Fields: Experimental Flame Height Correlations

11:20 AM Achintya Mukhopadhyay and Ishwar K. Puri, University of Illinois at Chicago
Numerical Simulation of Industrial Nozzle-Mix Burners Per Strain

11:40 AM

12:00 PM **Lunch & Business Meeting**

SESSION B.2: Partially-Premixed Flames, Session Chair: Ajay K. Agrawal, University of Oklahoma

1:30 PM Xiao Qin, Chun W. Choi, Ishwar K. Puri and Suresh K. Aggarwal, University of Illinois at Chicago
Transition of Propagating Triple Flames to Burner Attached Flames in an Axisymmetric Jet

1:50 PM X.L. Zhu, O.J. Kim (Korea Institute of Machinery & Materials), R. Viskanta, T. Takeno (Meijo University) and J.P. Gore, Purdue University
A Study of Effects of Radiation Including Absorption on a Methane/Air Partially-Premixed Flame

2:10 PM Tariq Shamim, University of Michigan-Dearborn
Effect of Unequal Fuel and Oxidizer Lewis Numbers on Flame Dynamics

2:30 PM Fabrizio Bisetti, Karl M. Martin and O.A. Ezekoye, University of Texas at Austin
Extended Flame Stability for Partially Premixed Acetylene-Air Flames by Acoustic Control

2:50 PM

3:10 PM **Break**

SESSION B.3: Turbulent Flames, Session Chair: W. M. Roquemore, Air Force Research Laboratory

3:30 PM Jun Ji and Jay P. Gore, Purdue University
Flow Structure in Lean Premixed Swirling Combustion

3:50 PM Walter A. Guttenfelder, Michael W. Renfro, Galen B. King and Normand M. Laurendeau, Purdue University
Hydroxyl Time-Series Measurements in Turbulent Non-premixed Swirling Flames

4:10 PM A. Chaturvedy, M.W. Renfro and N.M. Laurendeau, Purdue University
Measurements of OH Time Series in Turbulent Nonpremixed Jet Flames

4:30 PM Yuan Zheng, Yudaya R. Sivathanu, and Jay P. Gore, Purdue University
Measurements and Stochastic Time and Space Series Simulations of Spectral Radiation in a Turbulent Non-premixed Flame

4:50 PM G.A. Richards, D.L. Straub and E.H. Robey, DOE National Energy Technology Laboratory
Passive-Active Control of Combustion Oscillations

SESSION C.1: Soot & Precursors I, Session Chair: Randy L. Vander Wal, NASA Glenn Research Center

9:20 AM A.M.El-Leathy, F.Xu, C.-H.Kim and G.M.Faeth, University of Michigan
Soot Formation and Early Oxidation in Laminar Diffusion Flames at Atmospheric Pressure

9:40 AM Peter T. A. Reilly, Ryan P. Rodgers, William B. Whitten and J. Michael Ramsey, Oak Ridge National Laboratory
The Chemistry of Precursor Soot and Its Ramifications

10:00 AM B. Yang, B. Hu, K. Yu, and U. Koylu, University of Missouri-Rolla
Preliminary Experiments in a Soot-Containing Non-premixed Turbulent Flame

10:20 AM **Break**

10:40 AM P.B. Sunderland, D.L. Urban and D.P. Stocker, NASA Glenn Research Center; B.-H. Chao and R.L. Axelbaum, Washington University
Sooting Limits of Microgravity Spherical Diffusion Flames

11:00 AM R.S.Tranter, H. Ramamorthy, A.Raman, R. Sivaramakrishnan and K. Brezinsky, University of Illinois at Chicago
Shock Tube Investigations of Hydrocarbon Oxidation and Pyrolysis Over Very Wide Pressure Ranges

11:20 AM Paolo Berta, Achintya Mukhopadhyay and Ishwar K. Puri, University of Illinois at Chicago; Silvia Granata, Eliseo Ranzi and Tiziano Faravelli, Politecnico di Milano
Effect of Partial Premixing on NOx and Soot Formation in Heptane-Air Flames

11:40 AM Wilson Merchan-Merchan, Alexei V. Saveliev, A.A. Fridman, and Lawrence A. Kennedy, University of Illinois at Chicago
Structure of Soot and Soot Precursor Particles Formed in Opposed Flow Methane Oxy-Flames

12:00 PM **Lunch & Business Meeting**

SESSION C.2: Soot & Precursors II, Session Chair: U. Koylu, University of Missouri-Rolla

1:30 PM Thang Q. Dam, University of Tennessee; John M.E. Storey, Oak Ridge National Laboratory
Nanoparticle Measurement Methods in Internal Combustion Engines

1:50 PM Alexei V. Saveliev, Wilson Merchan-Merchan, Lawrence A. Kennedy, and A.A. Fridman, University of Illinois at Chicago
Carbon Nanotubes and Carbon Nanofibers Formed on Catalytic Support in Opposed Flow Methane Oxygen Flame

2:10 PM Randy L. Vander Wal, Gordon M. Berger and Premal D. Patel, NASA Glenn Research Center; Thomas M. Ticich, Centenary College
The Application of Laser-Induced Incandescence to the Detection of Carbon Nanotubes and Carbon Nanofibers

2:30 PM Liming Yuan, Tianxiang Li, Wenchong Hu, Zhi Chen and Kozo Saito, University of Kentucky
Synthesis of Multi-Walled, Well-Aligned Carbon Nanotubes From Hydrocarbon Diffusion Flames

2:50 PM Randy L. Vander Wal, Lee J. Hall and Gordon M. Berger, NASA Glenn Research Center
Premixed Flame Synthesis of Carbon Nanotubes Using Supported Catalysts

3:10 PM **Break**

SESSION C.3: Turbulent Combustion Modeling, Session Chair: Kozo Saito, University of Kentucky

3:30 PM K. Su and C.Q. Zhou, Purdue University Calumet
Group Spray Modeling of Gas Turbine Combustion Flows

3:50 PM Scott M. Martin, Ford Motor Company
The Premixed Conditional Moment Closure Method

4:10 PM Sha Zhang, Jeremy D. Slade and J.M. McDonough, University of Kentucky
A Low-Order Discrete Dynamical System Model of Turbulent Fluctuations in a Reduced Mechanism for H2-O2 Combustion

4:30 PM J.M. McDonough, University of Kentucky
A 'Synthetic Scalar' Subgrid-Scale Model for Large-Eddy Simulation of Turbulent Combustion

4:50 PM Razi Nalim and Kerem Pekkan, Indiana University-Purdue University
Comparisons of Combustion Models for Wave Rotor Combustion Simulation

5:30-8:00 PM **Tour of ORNL's National Transportation Research Center**

Tuesday, April 9, 2002

8:00 AM **Invited Speaker: Gerard M. Faeth, University of Michigan**
(Session Chair: Dennis P. Stocker, NASA Glenn Research Center)
James E. Peters Plenary Lecture:
Optical and Reactive Properties of Soot in Flame Environments

1:30 PM **Invited Speaker: Shiyi Chen, Johns Hopkins University**
(Session Chair: Stuart Daw, Oak Ridge National Laboratory)
Lattice Boltzmann Simulation of Reactive Flows

SESSION A.4: Diesel Engines, Session Chair: Chia-fon F. Lee, University of Illinois at Urbana-Champaign

9:00 AM Venkatesh Gopalakrishnan and John Abraham, Purdue University
An Investigation of Ignition and Heat Release Characteristics in Diesel Engines Using an Interactive Flamelet Model

9:20 AM John F. Thomas, Michael D. Kass, John M. Storey and Norberto Domingo, Oak Ridge National Laboratory; Tye Barber, Tennessee Technological University
Targeting the EPA HD-FTP 2007 Emission Standards Using a Modern Diesel Engine with EGR and a SCR/CRT Aftertreatment System

9:40 AM Ralph N. McGill, John M. E. Storey and Robert F. Wagner, Oak Ridge National Laboratory; David K. Irick, The University of Tennessee
A Comparison of Regulated and Unregulated Emissions from Light and Medium Duty Engines Operated on Diesel and Biodiesel Blends

10:00 AM William P. Partridge , Jr. and Sam Lewis, Oak Ridge National Laboratory; Mike Ruth, Rob Smith and John Stang, Cummins, Inc.
Resolving EGR Distribution and Mixing

10:200 AM Yanbin Mo, K. Clark Midkiff and Stuart R. Bell, University of Alabama
A Multi-Zoned Phenomenological Model of NO Formation in a DI Diesel Engine

10:40 AM **Break**

SESSION A.5: Boilers and Furnaces I, Session Chair: K. Clark Midkiff, University of Alabama

10:50 AM Pauline Hack, Yufeng Duan, Shawn Kellie, Yan Cao and Wei-Ping Pan, Western Kentucky University
Investigation into Trace Elemental Composition in Ash on Mercury Emissions in a Utility PC Boiler

11:10 AM Rodger Greenwell, Lingyu Huang and Wei-Ping Pan, Western Kentucky University
Field Testing of Reducing Mercury with High Chlorine Coals

11:30 AM Sen Li, Yan Cao, Shawn Kellie and Wei-Ping Pan, Western Kentucky University
Field Corrosion Testing with High Chlorine Coal in a Low NOx Burner Utility Boiler

11:50 AM K. Scheeringa and C.Q. Zhou, Purdue University Calumet; S.L. Chang, Argonne National Laboratory
A Numerical Investigation of Combustion Patterns in Various Furnaces

12:10 PM Timothy L. Marbach and Ajay K Agrawal, University of Oklahoma
Combustion Characteristics of a Natural Gas Burner Using Inert Porous Media

12:30 PM **Lunch**

SESSION B.4: Premixed Flames, Session Chair: Ofodike A. Ezekoye, University of Texas at Austin

9:00 AM Ranjan Ganguly and Ishwar K. Puri, University of Illinois at Chicago
Effect of Micro-jet Injection on the Nonpremixed Flames

9:20 AM Lijun Song and John Abraham, Purdue University

Structure of a Reacting Wall Jet

9:40 AM Zhongxian Cheng, Joseph A. Wehrmeyer and Robert W. Pitz, Vanderbilt University
Opposed Jet Flames of Lean Premixed Hydrocarbon-Air Reactants vs. Hot Products

10:00 AM Ishwar K. Puri and Chun Choi, University of Illinois at Chicago
Response of Flame Speed to Positively and Negatively Curved Premixed Flames

10:20 AM

10:40 AM **Break**

SESSION B.5: Fires, Session Chair: Ishwar K. Puri, University of Illinois at Chicago

10:50 AM Y. Xin and J.P. Gore, Purdue University; K. McGrattan, R.G. Rehm and H.R. Baum, National Institute of Standards and Technology
Large Eddy Simulation of Buoyant Turbulent Pool Fires

11:10 AM Y. Long and I.S. Wichman, Michigan State University
Studies of Detailed Heat Transfer Processes in Flame Spread Over Thin Fuels in Microgravity

11:30 AM L.M. Oravecz-Simpkins and I.S. Wichman, Michigan State University
Spreading Diffusion Flame Instabilities For Thin Solid Fuels in Reduced Buoyancy Conditions

11:50 AM A.F. Durkin, H.V. Pham and F.W. Williams, Navy Technology Center for Safety and Survivability
The Impact of Intumescent Coatings on Shipboard Fires

12:10 PM P. Akbari and I.S. Wichman, Michigan State University
Influence of Bubbles on In-Depth Structure of Surface Layers of Thermoplastics During Combustion

12:30 PM **Lunch**

SESSION B.6: Kinetics, Session Chair: Kenneth Brezinsky, University of Illinois at Chicago

2:30 PM K. Baek, A. Gentemann and J.A. Caton, Texas A&M University
Selective Non-Catalytic Removal of NO2 by Ammonia: Experimental and Numerical Results

2:50 PM Sukesh Roy, Jonathan DuBois and Robert Lucht, Texas A&M University
Radical Concentration Measurements in the Near-Substrate Region of Low-Pressure Diamond-Forming Flames

3:10 PM John Griner and K.M. Isaac, University of Missouri-Rolla
Induction Time and Detonation Wave Structure of Acetylene, Ethylene and JP-10

SESSION C.4: Converters and Reformers, Session Chair: Joseph A. Wehrmeyer, Vanderbilt University

9:00 AM Tailai Hu and Nick G. Glumac, University of Illinois, Urbana-Champaign
The Effect of Temperature Slip in Combustion Synthesis and Catalytic Combustion Systems

9:20 AM Sandip Mazumder and Debasis Sengupta, CFD Research Corporation
Efficient Modeling of Full-Scale Catalytic Converters Using a Novel Sub-Grid Scale Approach

9:40 AM Y. Huang and C.J. Sung, Case Western Reserve University; J.A. Eng, General Motors Research & Development Center
Effects of n-Butane Addition on Reformer Gas Combustion

10:00 AM Yu-Li Cheng, Matt Bushore and Lea-Der Chen, University of Iowa
Review of Hydrogen Generation for 'On-Board' Automotive Applications

10:20 AM

10:40 AM **Break**

SESSION C.5: Diagnostics I, Session Chair: Robert Lucht, Texas A&M University

10:50 AM Michael W. Renfro, Purdue University
Fluorescence Lifetime Measurements in 1-atm Flames using Nanosecond-Pulsed Lasers

11:10 AM Lubomir A. Ribarov, Joseph A. Wehrmeyer, and Robert W. Pitz, Vanderbilt University
Multiline Hydroxyl Tagging Velocimetry in Reacting and Nonreacting Experimental Flows

11:30 AM Sukesh Roy, Viswanathan N. Velur, Robert P. Lucht and Michael S. Brown, Texas A&M University; James R. Gord, Air Force Research Laboratory
Demonstration of Triple-Pump Coherent Anti-Stokes Raman Scattering Measurements in Hydrogen-Air Diffusion Flame for Simultaneous Temperature and Species Concentration Measurements

11:50 AM

12:10 PM

12:30 PM **Lunch**

SESSION C.6: Diagnostics II, Session Chair: James R. Gord, Air Force Research Laboratory

2:30 PM Michael W. Renfro, Krishnakumar Venkatesan and Normand M. Laurendeau, Purdue University
Cross-sections for CH Quenching by N2 and H2O from 1740 to 2160 K

2:50 PM Xudong Xiao and Ishwar K. Puri, University of Illinois at Chicago
Digital Recording and Numerical Reconstruction of Holograms: A New Optical Diagnostic for Combustion

3:10 PM Sherif F. Hanna, Rodolfo Barron-Jimenez, Thomas N. Anderson, Robert P. Lucht, Thomas Walther and Jerald A. Caton, Texas A&M University
Diode-Laser-Based Ultraviolet Absorption Sensor for NO