

## CURRICULUM VITAE

### NAME:

Eric G. Eddings

### TITLE:

Associate Professor, Department of Chemical Engineering, University of Utah

### EDUCATION:

Ph.D. Chemical Engineering, University of Utah, 1992

B.S. Chemical Engineering, University of Utah, 1988

### PROFESSIONAL SOCIETIES:

- American Institute of Chemical Engineers (AIChE)
- Combustion Institute
- American Society of Engineering Educators (ASEE)
- American Society of Mechanical Engineers (ASME)

### INDUSTRIAL EXPERIENCE:

#### Technical Advisor (2001-present)

*Reaction Engineering International, Salt Lake City, Utah*

#### Senior Consultant (2003-2004)

*Tsinghua Tongfang Co. Ltd, Beijing, China*

#### Vice President (1998-2001)

*Reaction Engineering International, Salt Lake City, Utah:* Responsible for business development in new areas of technical expertise outside the scope of current corporate experience. Responsible for the identification and development of technologies and scientific capabilities.

#### Manager, Industrial Technologies (1996-1998)

*Reaction Engineering International, Salt Lake City, Utah:* Responsible for managing industrial systems numerical modeling programs. Programs to date encompass the utility, cement, metallurgical and chemical process industries, with responsibilities over the technical, fiscal and temporal progress of these programs.

#### Senior Engineer (1992-1996)

*Reaction Engineering International, Salt Lake City, Utah:* Research and consulting in the area of pollutant formation and control in combustion processes. Application of reacting

computational fluid dynamics (CFD) model to industrial problems and experimental investigations of pollutant formation/destruction.

**Lead Chemist (1988)**

*Unisys Corp., Salt Lake Printed Circuit Facility, Salt Lake City, Utah:* Chief liaison between process engineering and the chemical laboratory. Other duties included scheduling, developing new analytical methods, documentation of procedures, training. Advisor to floor support engineering.

**Assistant Chemist (1985-1987)**

*Unisys Corp., Salt Lake Printed Circuit Facility, Salt Lake City, Utah:* Process control chemistry for printed circuit manufacturing facility. Waste treatment process control chemistry; evaluating new treatment techniques. Analysis & disposition of hazardous waste drums. Wide variety of analytical instrumentation including: atomic absorption, UV/VIS, and IR spectrophotometry; gas and liquid-ion chromatography; and cyclic voltammetry.

**Printed Circuit Process Technician (1982-1985)**

*Sperry Corp., Central Printed Circuit Facility, Salt Lake City, Utah:* Operated several chemical processes involved in the manufacture of multilayer printed circuit boards including: chemical etching & photo-resist stripping, copper & solder plating. Oversee storage & dispensing of process chemicals, including drum stock and tank farm.

**ACADEMIC EXPERIENCE:**

**Associate Professor (2001-present)**

*University of Utah, Dept. of Chemical Engineering, Salt Lake City, Utah:* Research in the general areas of combustion and environmental studies, and teaching responsibilities within the discipline of Chemical Engineering. Serving as Director of the Combustion Research Group with responsibility over two laboratory sites with a Laboratory Manager and technical staff at each site.

**Visiting Scholar (March/April 2001)**

*Tsinghua University, Dept. of Thermal Engineering, Beijing, People's Republic of China:* Funded by the Chinese State Education Commission to visit the university to establish collaborative efforts in the area of biomass fuel utilization in fluidized-bed and stoker-fired combustors.

**Research Associate Professor (2000-2001)**

*University of Utah, Dept. of Chemical and Fuels Engineering, Salt Lake City, Utah:*

**Research Assistant Professor (1998-2000)**

*University of Utah, Dept. of Chemical and Fuels Engineering, Salt Lake City, Utah*

**Instructor (1991)**

*University of Utah, Dept. of Chemical Engineering, Salt Lake City, Utah:* Taught undergraduate course in Fundamentals of Process Engineering.

## **Research Assistant (1988 - 1992)**

*University of Utah, Dept. of Chemical Engineering, Salt Lake City, Utah:* Designed, constructed, and operated a fixed-bed reactor for use in fundamental kinetic studies of toxic metals in high temperatures and reactive environments. Also utilized a 500,000 Btu/hr pilot-scale rotary kiln for additional studies of toxic metals behavior.

## **HONORS AND AWARDS:**

- Outstanding Teaching Award, College of Engineering, 2007
- Outstanding Instructor, Department of Chemical Engineering, 2007-2008
- Rated in Top 15% of College of Engineering instructors (2004, 2005, 2006, 2007)
- Kirkpatrick Chemical Engineering Honor Award (2005)
- Phi Kappa Phi (1992)

## **PATENTS PENDING:**

C.A. Wight, **E.G. Eddings** and W. Ciro, "Method for Reducing Violence of Accidental Explosions of Solid Rocket Motors and Other Energetic Devices," U.S. Patent Pending, filed June 2005.

## **RESEARCH GRANTS:**

- Current:**
- “Oxyfiring of Coal in Entrained-Flow and Fluidized Bed Combustors,” Praxair, Inc., August 2007 – August 2009, \$764,000.
  - “Detailed Study of Shale Pyrolysis for Oil Production,” U.S. DOE/Utah Heavy Oil Center, co-PI w/Milind Deo, May 2007 – June 2008, \$150,000.
  - “Oxy-Coal Combustion using Oxygen Transport Membranes,” U.S. Department of Energy, w/Praxair, Inc., April 2007 – March 2010, \$594,547.
  - “Development of Fundamental Rate Parameters for Oxy-Coal Firing in Circulating Fluidized Beds,” U.S. Department of Energy, Utah Clean Coal Center, July 2006 – June 2008, \$185,000.
  - “Investigation of the Emission Characteristics of Modified Coals”, Headwaters Energy Services, Inc., June 2007 – December 2008, \$144,000.
  - “Validation of Simulations for Jet Fuel Pool Fires – Year 6-10”, U.S. DOE program through the Center for Simulation of Accidental Fires and Explosions (C-SAFE) at the University of Utah, Dec. 2002 – Mar. 2009, \$2,270,000.

“Biomass Fuel Characterization in Stoker-Fired Furnaces”, Detroit Stoker Company, July 2001 – July 2007, \$119,000.

***Past:***

“Chemical Production from Coal and Oil Shale Using a Retort,” Millennium Synfuels, Inc., co-PI w/JoAnn Lighty, Kevin Whitty, Geoff Silcox, April – Feb. 2008, \$255,000.

“Combustion Characteristics of Corn Stover in a Stoker-Fired Furnace,” Detroit Stoker Company, August 2007, \$15,667.

“Combustion Characteristics of Suspension-Fired Distiller Grains and Palm Kernels,” Detroit Stoker Company, June-July 2007, \$36,212.

“Fuel Rich Reagent Injection for NO<sub>x</sub> Control,” Electric Power Research Institute w/Reaction Engineering International, April-May, 2007, \$14,150.

“Pilot-scale Demonstration of Advanced Layered Technology Approach (ALTA) for NO<sub>x</sub> Control in Coal-Fired Utility Boilers,” U.S. Department of Energy, w/Electric Power Research Institute and Reaction Engineering International, Oct. 2005-Apr. 2007, \$90,000.

“Sulfur Capture in Coal-Fired Stoker Furnaces”, Detroit Stoker Company, October 2006 – December 2006, \$24,000.

“Hydrocarbon Emissions from Cement Samples”, various cement companies, with Reaction Engineering International, Nov. 1999 – Dec. 2006, \$99,000.

“Emission Characteristics of Catalytically-Modified Pulverized Coal”, Headwaters Energy Services, Inc., May 2005 – December 2006, \$136,500.

“SO<sub>2</sub> Evolution and Capture on Cement Raw Materials,” Portland Cement Association, w/CTLGroup, Dec. 2005-Dec. 2006, \$64,000.

“Performance-Enhancing Liquid Additives for Coal-fired Power Generation,” Afton Chemical Corp., w/Reaction Engineering International, August 2005 – December 2006, \$54,360.

“Mercury Evolution from Cement Raw Materials”, Portland Cement Association w/Reaction Engineering International, June 2005 – April 2006, \$28,000.

“Multifunctional Fuel Additives for Reduced Jet Fuel Particulate Emissions”, U.S. Air Force, Phase II SBIR w/Reaction Engineering International, August 2003 – November 2005, \$200,000.

“Cofiring Bagasse and Cane Waste in Stoker-fired Boilers”, Detroit Stoker Company, March 2004 – June 2005, \$22,000.

“Enhanced Coal Reburning Under Oxidizing Conditions,” U.S. DOE, October 2002 – June 2004, \$50,000.

“Residual Ash from Coconut Char Sorbent”, U.S. Army, Phase II-plus SBIR w/Reaction Engineering International, June 2004 – August 2004, \$10,000.

“Flame Stability of Pulverized Petroleum Coke,” ConocoPhillips w/Reaction Engineering International, Sept. – Oct. 2003, \$35,000.

“Catalytic NO<sub>x</sub> Reduction Using Waste Paint Pigments,” Waste Markets, Inc., Sept. – Nov. 2003, \$5,000.

“Design of Catalyst Slipstream Reactor,” American Electric Power (AEP) w/Reaction Engineering International, Sept. – Nov. 2003, \$7,000.

“Construction and Testing of a Corrosion Management Methodology for Coal-Fired Boilers,” Ohio Coal Development Office, State of Ohio w/Reaction Engineering International, June. – Nov. 2003, \$23,000.

“Hydrocarbon Emissions from Cement Samples”, various cement companies, with Reaction Engineering International, Nov. 1999 - June 2004, \$90,000.

“NO<sub>x</sub> Control Optimization and Integration to Utility Boilers”, U.S. DOE program, subcontract from Reaction Engineering International, Dec. 1999 – Sept. 2004, \$287,625.

“Oxygen Enhanced Combustion for NO<sub>x</sub> Control”, U.S. DOE program, subcontract from Praxair, Inc., Dec. 1999 – Dec. 2003, \$324,000.

“Fuel Additives for Reduced Jet Fuel Particulate Emissions”, U.S. Air Force, Phase I SBIR w/Reaction Engineering International, July 2002 – December 2002, \$25,000.

“Development and Demonstration of Novel Low NO<sub>x</sub> Burners for Boilers,” Institute of Gas Technology, Dec. 1999 – June 2002, \$40,000.

“Evolution of Nitrogenous Species from Mining Leachate Residues,” Cement Industry Environmental Consortium, July 2001 – October 2002, \$28,678.

“Conversion and Deposition Behavior of Black Liquor and Biomass during Thermal Conversion, DOE/NREL with Brigham Young University, Jan. – Sept. 2001, \$58,000.

“Validation of Simulations for Jet Fuel Pool Fires”, U.S. DOE program through the Center for Simulation of Accidental Fires and Explosions (C-SAFE) at the University of Utah, co-PI with Adel Sarofim, Oct. 1997 – Sept. 2002, \$2,066,000.

“Destruction of Biosludge in a Stoker-Fired Furnace”, Detroit Stoker Company, Sept. 2001 – January 2002, \$12,000.

“Construction of a Pilot-Scale Stoker Furnace”, Detroit Stoker Company, June 2000 – July 2001, \$178,000.

“Methods for the Reduction of NO<sub>x</sub> Emissions and Unburned Carbon in Ash – Phase II”, U.S. DOE program with Reaction Engineering International, co-PI with David Pershing, Sept. 1998 – Oct. 2000, \$461,621.

“Low Emission Boilers Systems (LEBS)”, U.S. DOE program with D.B. Riley, Inc., co-PI with David Pershing, Oct. 1997 – Sept. 2001, \$2,802,754.

“Minimization of NO<sub>x</sub> Emissions From Multi-Burner Coal-Fired Boilers”, U.S. DOE program, co-PI with David Pershing and Adel Sarofim, Sept. 1997 – Sept. 2001, \$487,000.

“Fuel-Rich SNCR”, Reaction Engineering International, Feb-March 1999, \$9,000.

“Thermal Soil Desorption”, ThermoRetec, March-April 1999, \$10,000.

“Processing and Drying of Biomass Residue for Feedstock to a Dedicated Cogeneration Facility”, DOE SBIR Phase I with Reaction Engineering International, \$14,000.

“Kinetics of Sulfur Evolution During Coal Combustion”, Electric Power Research Institute (EPRI) program, with Reaction Engineering International, July – October, 2000, \$5,000.

## GRADUATE STUDENTS SUPERVISED:

### **Current:**

Ignacio Preciado – Ph.D. Chemical Engineering  
Jingwei Zhang – Ph.D. Chemical Engineering (co-advisor w/Jost Wendt)  
Astrid Sanchez – Ph.D. Chemistry, University of Antioquia, Colombia,  
(co-advisor w/Prof. Fanor Mondragon)  
Joseph Adams – Ph.D. Chemical Engineering  
Liyong Wang – Ph.D. Chemical Engineering  
Pankaj Tiwari – Ph.D. Chemical Engineering (co-advisor w/Milind Deo)  
Elizabeth Lund – Ph.D. Chemical Engineering  
Jake Bauman – Ph.D. Chemical Engineering (co-advisor w/Milind Deo)

### **Previous:**

Tara Henriksen – “*Simultaneous Spatially and Temporally Resolved Laser Induced Incandescence and Laser Induced Fluorescence Measurements in Jet Propulsion Fuel 8 and Heptane Pool Fires,*” Ph.D. Thesis, Chemical Engineering, December 2007.

Alexander Santamaria – “*Chemical-Structural Characterization and Ethanol Effect on the Products Generated in Ethylene and Benzene Inverse Diffusion Flames,*” Ph.D. Thesis, Chemistry, University of Antioquia, Colombia (co-advisor w/Prof. Fanor Mondragon), February 2007.

Joy Sroykum – “*Statistical Validation of Chemical Kinetic Mechanisms in Reacting Flows,*” M.S. Thesis, Chemical Engineering, August 2007.

Jacob Kingston – “*Drag on Non-Spherical, Non-Isometric Fuel Particles in Stoker-Fired Boilers,*” Ph.D. Thesis, Mechanical Engineering, December 2006.

Mauricio Naranjo – “*Particle Development in a Fluidized Bed Black Liquor Steam Reformer,*” M.S. Thesis, Chemical Engineering (w/Kevin Whitty), June 2006.

Nathan Peterson – “*Measurement of Sulfur Dioxide in a Black Liquor Recovery Boiler,*” M.S. Thesis, Chemical Engineering (w/Kevin Whitty), Dec. 2005.

Shihong Yan – “*Formulation and Some Applications of Jet Fuel Surrogates,*” Ph.D. Thesis, Chemical Engineering, Dec. 2005.

Ignacio Preciado – “*Effect of Temperature, O<sub>2</sub> Concentration and Fuel Additives on Soot Reduction in Jet Fuel Diffusion Flames,*” M.S. Thesis, Chemical and Fuels Engineering, June 2005.

William Ciro – “*Heat Transfer at Interfaces of a Container of High-Energy Materials Immersed in a Pool Fire,*” Ph.D. Thesis, Chemical Engineering, Dec. 2004.

Zoran Djuriscic – “*Chemical Kinetics of Nitrogen Fixation in Hydrocarbon Flame Fronts*,” Ph.D. Thesis, Chemical and Fuels Engineering, Dec. 2004.

Jimmy Daghlian – “*Soot Volume Fraction and Temperature Measurement in a Slot Burner Utilizing Laser Extinction and Emission*,” M.S. Thesis, Chemical and Fuels Engineering (w/Adel Sarofim), May, 2002.

Jacob Kingston – “*Construction, Experimental and Computational Analysis of Fluid Flow in a Stoker*,” M.E. project, Mechanical Engineering, 2002.

Marc Wachenhausen – “*The Behavior of Iron Pyrite and Toxic Metals Under Low-NO<sub>x</sub> Firing Conditions in a Wet-Bottom Boiler*”, Diploma Thesis (M.S.) in Mechanical Engineering, RWTH-Aachen, University of Technology, Germany, Oct. 1999 (w/Ulrich Ranz).

#### **POST-DOCTORAL RESEARCH ASSOCIATES SUPERVISED:**

**Current:** Hongzhi Zhang, - Ph.D., Chemical Engineering, University of Utah  
Husam al Gendy, - Ph.D., Physics, University of Utah (w/Milind Deo & Terry Ring)

**Previous:** Nathan D. Marsh, - Ph.D., Mechanical Engineering, Princeton University  
Zhiwei Yang, - Ph.D., Mechanical Engineering, University of Delaware

#### **TEACHING RESPONSIBILITIES:**

##### Ch En 1703 Introduction to Engineering Computing

F03 (35 students), F04 (33 students), F05 (39 students), S06 (17 students)

##### Ch En 3353 Fluid Mechanics

F01 (32 students), F02 (31 students), F03 (30 students), F04 (30 students), F05 (38 students),  
F06 (34 students), F07 (53 students)

##### Ch En 3553 Chemical Reaction Engineering

S07 (30 students), S08 (54 students)

##### Ch En 4905 Senior Projects Laboratory II

S03 (12 students), S04 (21 students), S05 (22 students)

##### Ch En 5305/6305 Air Pollution Control Engineering

F98 (11 students), F99 (17 students), F07 (15 students)

#### **UNIVERSITY SERVICE:**

##### Departmental

Director of Graduate Studies (July 2002 – 2007)

Graduate Committee (July 2001 – present)

Undergraduate Curriculum Committee (July 2005 – present)

College

College Curriculum Committee (July 2001 – present)

University

Academic Senate (2007 – present)

Executive Committee – Academic Senate (2007 - 2008)

Postdoctoral Affairs Advisory Board (2006-present)

Directors of Graduate Studies Council (2002 – 2007)

University Graduate Research Fellowship Selection Committee (2003)

University Funding Incentive Seed Grant Review Committee (2004)

**PROFESSIONAL SERVICE:**

Conference Organization:

Conference Organizer (w/Qiang Yao of Tsinghua University) of the “U.S./China Conference on Applied Combustion Technologies”, Park City, Utah (2007), sponsored by University of Utah, Tsinghua University, CEntry Constructors and Engineers, and China Electricity Council (70 attendees)

Member of Scientific Committee “3<sup>rd</sup> International Congress on the Rational and Efficient Use of Energy,” CIUREE 2008, Medellin, Colombia, November 13-15, 2008.

Session Chair:

Chair - Session on “Oxycombustion of Coal,” 2008 American Institute of Chemical Engineers (AIChE) Annual Meeting, November 16-21, 2008, Philadelphia, PA.

Co-chair (w/ Bill Green, MIT) Session on “Combustion Reaction Engineering,” 2008 American Institute of Chemical Engineers (AIChE) Annual Meeting, November 16-21, 2008, Philadelphia, PA.

Co-chair (w/Arun Bose, U.S. DOE) Three Sessions on “Oxycombustion of Coal – Needs, Challenges and Opportunities,” 2007 American Institute of Chemical Engineers (AIChE) Annual Meeting, November 4-9 (2007), Salt Lake City, Utah.

Session on “Emission Reduction & Boiler Operation”, China-US Workshop on Advanced Technology of Industrial Boilers, Beijing, China (2004), sponsored by U.S. EPA, U.S. DOE.

Session on “NOx Emissions and Control,” Annual Spring Meeting of the American Flame Research Committee, International Flame Research Foundation, Salt Lake City, UT (2004).

Session on “Organic Emissions”, Air & Waste Management Association, Boiler and Industrial Furnaces (BIF) Conference, St. Louis, MO (1997).

Session chair and co-organizer of numerous small local technical conferences and workshops (50 or less participants) (1998 – present).

Invited Panel Forums:

Educational Forum, “Professors Forum – Educating Students about the Cement Industry,” Portland Cement Association, (2002 and 2003).

Technical Forum, “Control of Mercury Emissions from Cement Kilns,” IEEE/PCA Cement Technical Conference, Dallas, TX (2003).

Public Forum, “Environmental Impact of the Construction of St. Lawrence Cement Plant”, City of Hudson, NY (2000). (public question and answer following 1-day review of Air Permit and Environmental Impact documents)

Technical Forum, “Dioxin Emissions from Cement Kilns,” Portland Cement Association, Annual Fall Meeting, Kansas City, KS (1997).

Short Courses:

“Applied Combustion Technology: Problem Solving for the Utility and Process Industries,” co-organized and co-taught three-day short course, Salt Lake City and Provo, UT (2004, 2005, 2007) – 33 participants.

“Principles of Combustion in Cement Kilns,” organized and co-taught two-day short course, preceding IEEE/PCA Cement Technical Conference, Salt Lake City, UT (2002) – 20 participants.

“Fundamentals of Combustion and Pollutant Formation,” organized and taught one-day short course, Detroit Stoker Company, Monroe, MI (2000) – 15 participants.

“Combustion Fundamentals”, co-organized and co-taught three-day short course, Monsanto Chemical Co., Soda Springs, ID (1999). – 24 participants.

**REVIEWER:**

Energy & Fuels

Fuel

Combustion Science & Technology

Proceedings of the Combustion Institute

Environmental Science & Technology

ASME Journal of Heat Transfer

U.S. Department of Energy

National Institutes of Health

U.S. Department of Agriculture

Computers & Chemical Engineering

Journal of Fire Protection Engineering

Journal of the Air and Waste Management Association

Chemical Engineering Science

Environmental Engineering Science

American Chemical Society

## PEER-REVIEWED PUBLICATIONS:

- H.R. Zhang, **E.G. Eddings**, A.F. Sarofim and C.K. Westbrook, "Fuel Dependence of Benzene Pathways", accepted for publication, *Proceedings of the Combustion Institute*, 2008.
- H.R. Zhang, **E.G. Eddings**, and A.F. Sarofim, "Pollutant Emissions from Gasoline Combustion: 1. Dependence on Fuel Structural Functionalities", *Environmental Science & Technology*, 42 (15), 5615-5621, 2008.
- K.J. Whitty, H.R. Zhang and **E.G. Eddings**, "Emissions from Syngas Combustion", *Combustion Science & Technology*, 180 (6), 1117 – 1136, 2008.
- H.R. Zhang, **E.G. Eddings**, and A.F. Sarofim, "A Journey from n-Heptane to Liquid Transportation Fuels. 1. The Role of the Allylic Radicals and Its Related Species in Aromatic Precursor Chemistry", *Energy and Fuels*, 22, 945-953, 2008.
- T.L. Henriksen, G.J. Nathan, T.A. Ring and **E.G. Eddings**, "Puffing Frequency and Soot Extinction Correlation in JP8 and Heptane Pool Fires," *Combustion Science & Technology*, 180, (4), 699-712, 2008.
- A. Santamaria, **E.G. Eddings**, and F. Mondragon, "Effect of ethanol on the chemical structure of the soot extractable material of an ethylene inverse diffusion flame," *Combustion and Flame*, **151**, 235-244, 2007.
- H. Zhang, **E.G. Eddings**, A.F. Sarofim, and C.K. Westbrook, "An Evaluation of the Fuel Consumption Pathways for Normal Heptane in Premixed and Opposed Diffusion Flames," *Energy & Fuels*, 21, 1967-1976, 2007.
- H. Zhang, **E.G. Eddings** and A.F. Sarofim, "Olefin Chemistry in a Premixed n-Heptane Flame," *Energy & Fuels*, 21, 677-685, 2007.
- A. Santamaria, F. Mondragon, W. Quinones, **E.G. Eddings**, A.F. Sarofim, "Average structural analysis of the extractable material of young soot gathered in an ethylene inverse diffusion flame," *FUEL*, **86**, 1908-1917, 2007.
- N.D. Marsh, I. Preciado, **E.G. Eddings**, A.F. Sarofim, A.B. Palotas and J.D. Roberston, "Evaluation of Organo-Metallic Fuel Additives for Soot Suppression," *Combustion Science & Technology*, 179 (5), 987-1001, 2007.
- H.R. Zhang, **E.G. Eddings** and A.F. Sarofim, "Criteria for Selection of Components for Surrogate of Natural Gas and Transportation Fuels," *Proceedings of the Combustion Institute*, 31, 401-409, 2007.
- H. Zhang, **E.G. Eddings** and A.F. Sarofim, "Combustion Reactions of Paraffin Components in Liquid Transportation Fuels Using Generic Rates," *Combustion Science & Technology*, 179 (1-2), 61-89, 2007.
- A. Santamaria, F. Mondragon, A. Mondragon, N.D. Marsh, **E.G. Eddings**, A.F. Sarofim, "FT-IR and <sup>1</sup>H-NMR Characterization of the Products of an Ethylene Inverse Diffusion Flame," *Combustion & Flame*, 146, 52–62, 2006.
- W. Ciro, **E.G. Eddings** and A.F. Sarofim, "Experimental and Numerical Investigation of Transient Soot Buildup on a Cylindrical Container Immersed in a Jet Fuel Pool Fire," *Combustion Science & Technology*, 178 (12), 2199–2218, 2006.

- S. Yan, **E.G. Eddings**, A.B. Palotas, R.J. Pugmire and A.F. Sarofim, "Prediction of Sooting Tendency for Hydrocarbon Liquids in Diffusion Flames," **19** (6) pp 2408 - 2415, *Energy & Fuels*, 2005.
- S. Yan, Y.-J. Jiang, N.D. Marsh, **E.G. Eddings**, A.F. Sarofim, and R.J. Pugmire, "Study of the Evolution of Soot from Various Fuels," **19** (5), 1804-1811, *Energy & Fuels*, 2005.
- E.G. Eddings**, S. Yan, W. Ciro and A.F. Sarofim, "Formulation of a Surrogate for the Simulation of Jet Fuel Pool Fires," *Combustion Science & Technology*, Vol. 177 (4) pp. 715-739, 2005.
- T.L. Henriksen, G. Nathan, Z. Alwahabi, J.P. Spinti, **E.G. Eddings**, P.J. Smith, "Soot Volume Fraction from Extinction in JP-8 and Heptane Pool Fires," *Proceedings of the Fourth Australian Conference on Laser Diagnostics in Fluid Mechanics and Combustion*, Dec.7-9, 2005, Adelaide, Australia.
- A. Vikhansky, E. Bar-Ziv, B. Chudnovsky, A. Talanker, **E.G. Eddings**, M.J. Bockelie and A.F. Sarofim, "Measurements and Numerical Simulations for Optimization of the Combustion Process in a Utility Boiler," *International Journal of Energy Research*, 28:391-401, 2004.
- A. Molina, **E.G. Eddings**, D.W. Pershing and A.F. Sarofim, "Nitric Oxide Destruction during Coal and Char Combustion," *Combustion & Flame*, Vol. 136, No. 3, pp. 303-312, 2004.
- A.B. Palotas, A.F. Sarofim, C.J. Montgomery, **E.G. Eddings**, B. Dunn, "Effects of Fuel Additives on the Smoke Point of Fuels," *Material and Metallurgical Sciences, Publications of the University of Miskolc*, Vol. 31, pp. 55-63 (2003).
- A. Violi, S. Yan, **E.G. Eddings**, A.F. Sarofim, S. Granata, T. Faravelli, E. Ranzi, "Experimental Formulation and Kinetic Model for JP-8 Surrogate Mixtures," *Combustion Science & Technology*, Vol. 174 (11-12) pp. 383-401, 2002.
- A. Molina, **E.G. Eddings**, D.W. Pershing and A.F. Sarofim, "Reduction of Nitric Oxide on the Char Surface at Pulverized Coal Combustion Conditions," *Proceedings of the Combustion Institute*, Vol. 29, pp. 2275-2281, 2002.
- E.G. Eddings**, A.F. Sarofim, C.M. Lee, K.A. Davis and J.R. Valentine, "Trends in Predicting and Controlling Emissions from Coal-Fired Boilers," *Fuel Processing Technology*, Vol. 71, No. 1, pp.39-51, 2001.
- E.G. Eddings**, W. Ciro and A.F. Sarofim, "Transient Heat Transfer in Exploding and Detonating Systems," *Chemical Physics Reports*, Vol.20, No.6, p.108-116, 2001.
- A.F. Sarofim and **E.G. Eddings**, "Mineral Matter Transformation During Pulverized Coal Combustion," *Developments in Chemical Engineering & Mineral Processing*, Vol. 9, pp. 313-327, 2001.
- C. Lee, K.A. Davis, M.P. Heap, **E.G. Eddings** and A.F. Sarofim, "Modeling the Vaporization of Ash Constituents in a Coal-Fired Boiler," *Proceedings of the Combustion Institute*, Vol. 28, pp. 2375-2382, 2000.
- A. Molina, A.F. Sarofim, **E.G. Eddings** and D.W. Pershing, "A General Review of NO-Char Behavior," *Progress in Energy and Combustion Science*, Vol. 26, pages 507-531, 2000.
- W.B. Burton, J.S. Lighty, D.A. Inkley, **E.G. Eddings**, D.W. Overacker, K.A. Davis, C. Lee, A.F.

Sarofim, "Emissions from Biomass Combustion in a Fluidized Bed Combustor and Gas Cleanup System," *Proceedings of the ASME 15th International Conference on Fluidized Bed Combustion*, Savannah, GA, May 16-19, 1999.

**E.G. Eddings**, J.S. Lighty and J. Kozinski, "Determination of Metal Behavior during the Incineration of a Contaminated Montmorillonite Clay" *Environmental Science & Technology*, **28**, pp. 1791-1800, 1994.

**E.G. Eddings** and H.Y. Sohn, "Simplified Treatment of the Rates of Gas-Solid Reactions Involving Multicomponent Diffusion," *Industrial & Engineering Chemistry Research*, **32**, pp. 42-48 (1993).

**E.G. Eddings** and J.S. Lighty, "Evolution of Metal Contaminants from Incinerated Solids," *Proceedings of the ASME Joint Power Generation Conference*, Atlanta, Georgia, Oct. 18-22, 1992.

**E.G. Eddings** and J.S. Lighty, "Fundamental Studies of Metal Behavior During Solids Incineration," *Combustion Science & Technology*, **85**, 1-6, p.375 (1992).

J.S. Lighty, **E.G. Eddings**, E.R. Lindgren, Deng Xiao-Xue, D.W. Pershing, R.M. Winter, and W.H. McClennen, "Rate Limiting Processes in the Rotary-Kiln Incineration of Contaminated Solids," *Combustion Science & Technology*, **74**, pp. 31-46 (1990).

## BOOK CHAPTERS

H.R. Zhang, **E.G. Eddings**, A.F. Sarofim, C.L. Mayne, Z. Yang and R.J. Pugmire "Selection of Surrogates for Jet Fuels," in *Combustion Generated Fine Carbonaceous Particles*, ed. by H. Bockhorn, A. D'Anna, A. Sarofim and H. Wang, Karlsruhe University Press Press, Karlsruhe, Germany, 2008, *in press*.

J.P. Spinti, J.N. Thornock, **E.G. Eddings**, P.J. Smith and A.F. Sarofim, "Heat Transfer to Objects in Pool Fires," in *Transport Phenomena in Fires*, ed. by M. Faghri and B. Senden, Series: Developments in Heat Transfer, Vol 20, WIT Press, Southampton, U.K., 2008.

**E.G. Eddings**, "Combustion," Ch. 16, Mechanical Engineer's Handbook, 3<sup>rd</sup> Edition, *Book 4: Energy and Power*, John Wiley & Sons, New York, 2006.

**E.G. Eddings**, P.J. Smith, M.P. Heap, D.W. Pershing, and A.F. Sarofim, "The Use of Models to Predict the Effect of Fuel Switching on NO<sub>x</sub> Emissions", in Coal Blending and Switching of Western Low-Sulfur Coals, R.W. Bryers and N.S. Harding (Eds.), ASME, New York, pp. 169-184 (1994).

P.J. Smith, **E.G. Eddings**, B.R. Adams and M.P. Heap, "Application of Combustion Computations to Industrial Problems", in Coal Blending and Switching of Western Low-Sulfur Coals, R.W. Bryers and N.S. Harding (Eds.), ASME, New York, pp. 441-452 (1994).

## DIGITAL MEDIA:

**E.G. Eddings**, “Turbulent Pulverized Coal Flames,” video and discussion in Multi-Media Fluid Mechanics, Instructional CD, 2<sup>nd</sup> Edition, G. M. Homsy, editor, Cambridge University Press, *in press*, 2008.

#### **INVITED LECTURES:**

**E.G Eddings**, “The Formation of Soot in Hydrocarbon Flames,” Invited Lecture, Department of Combustion Technology, University of Miskolc, Miskolc, Hungary, September 30, 2008.

**E.G Eddings**, “Oxy-Coal Combustion: One Solution for a Carbon-Constrained Economy,” Invited Lecture, Pusan National University, Pusan, South Korea, and Korean Electric Power Research Institute, Daejeon, South Korea, March 19 and 21, 2008.

**E.G Eddings** and C.A. Wight, “Simulation and Validation of Explosion Violence of Energetic Devices in Fires,” Invited Lecture, Gordon Research Conference on Energetic Materials, Tilton, New Hampshire, June 21, 2006.

**E.G Eddings**, “Use of Oxy-Coal Combustion to Address a Carbon-Constrained Economy,” Invited Lecture, Hungarian Academy of Sciences, Miskolc, Hungary, April 19, 2006.

**E.G Eddings**, “Status of the Incineration of Hazardous Waste in the United States,” Invited Lecture, Tsinghua University, Beijing, China, June 1, 2004.

**E.G Eddings**, “Practical and Theoretical Limitations to Reducing NO<sub>x</sub> Emissions in Pulverized-Coal Fired Utility Boilers,” and “Use of Combustion Simulations to Solve Industrial Problems,” Invited Lectures, University of Miskolc, Miskolc, Hungary, May 10, 2004.

**E.G Eddings**, Constance L. Senior, Adel F. Sarofim, “Simulation of Hg and Other Trace Element Transformations in Coal-Fired Utility Boilers,” Invited Paper, 2002 Yokohama Trace Element Workshop, Yokohama, Japan, July 18, 2002.

**E.G. Eddings**, “Prediction and Control of NO<sub>x</sub> Emissions in Pulverized Coal-Fired Utility Boilers” and “The Formation and Control of Polychlorinated Dibenzo-*p*-Dioxins and Dibenzo-Furans,” presented at the following venues (March/April 2001):

Tsinghua University, Dept. of Thermal Engineering, The State Key Laboratory of Clean Combustion of Coal, Beijing, China

Zhejiang University, Institute for Thermal Power Engineering, Hangzhou, China

Thermal Power Research Institute, State Power Corporation of China, Xi’an, China

Southeast University, Thermoenergy Engineering Research Institute, Nanjing, China

Institute of Engineering Thermophysics, Chinese Academy of Sciences, Beijing, China

**E.G Eddings**, “Validation of Complex, CFD-based Simulations of Large-Scale Fires and Explosions,” Invited Lecture, Research Center for Fire Safety, Dept. of Mechanical Engineering, National Cheng-Kong University, Tainan, Taiwan, October 30, 2000.

**E.G Eddings**, “R&D for the Prevention and Minimization of Dioxin Emissions,” Invited Lecture, Workshop on the Control of Dioxin Emissions sponsored by Combustion Institute of Taiwan, the Taiwan Environmental Science and Technology Association and China Steel Corporation, Kaohsiung, Taiwan, October 26, 2000.

**E.G. Eddings** and A.F. Sarofim, "Transient Heat Transfer in Exploding and Detonating Systems," Invited Paper, International Colloquium on Control of Detonation Processes, Moscow, Russia, July 4-7, 2000.

**E.G. Eddings** and A.F. Sarofim, "Advances in the Use of Computer Simulations for Evaluating Combustion Alternatives," Invited Paper, 3<sup>rd</sup> CREST International Symposium on High Temperature Air Combustion and Gasification, Yokohama Symposia, Yokohama, Japan, March 6-9, 2000.

A.F. Sarofim and **E.G. Eddings**, "Mineral Matter Transformation During Pulverized Coal Combustion," Plenary Paper, 4<sup>th</sup> International Symposium on Coal Combustion, Beijing, China, Aug. 19, 1999.

**E.G. Eddings**, "Use of Computational Fluid Dynamics Based Models in Practical Combustion Applications," Invited Lecture to participants from industry and various universities, Tsinghua University, Beijing, China, August 17, 2000.

#### **TRADE JOURNAL PUBLICATIONS:**

**E.G. Eddings** and T.A. Ring, "Brighteners in Acid Copper Plating Baths," Printed Circuit Fabrication, Vol. 13, No. 12, pp. 34-38 (1990).

#### **CONFERENCE PROCEEDINGS, PAPERS & PRESENTATIONS:**

J. Zhang, **E.G. Eddings** and J.O.L. Wendt "Oxy-Coal Combustion: Effects of P<sub>O2</sub> on Coal Jet Stability In O<sub>2</sub>/CO<sub>2</sub> Environments," paper presented at 2008 Annual AIChE National Meeting, Philadelphia, PA, Nov. 17-21, 2008.

**E.G. Eddings**, A. Sánchez, L. Wang and F. Mondragón, "Oxycoal Firing in Circulating Fluidized Bed Boilers," paper presented at 2008 Annual AIChE National Meeting, Philadelphia, PA, Nov. 17-21, 2008.

K.J. Whitty, **E.G. Eddings** and B. Morrow, "Biomass Gasification in a Stoker Gasifier," paper presented at 2008 Annual AIChE National Meeting, Philadelphia, PA, Nov. 17-21, 2008.

**E.G. Eddings**, A. Sanchez, L. Wang, D. Wagner, F. Mondragon A.F. Sarofim, "Fundamental Studies and Pilot-Scale Evaluation of Oxycoal Firing in Circulating Fluidized Bed Boilers," presented at 3rd IEA OxyCoal Workshop, Yokohama, Japan, March 5-6, 2008.

H.R. Zhang, Z. Cha, **E.G. Eddings** and A.F. Sarofim, "Characterization of Bio-diesels and Fossil Fuels," paper presented at 2007 Annual AIChE National Meeting, Salt Lake City, UT, Nov. 5-9, 2007.

J. Zhang, **E.G. Eddings** and J.O.L. Wendt "Studies on Coal Jet Ignition under Oxy-fuel Combustion Conditions," paper presented at 2007 Annual AIChE National Meeting, Salt Lake City, UT, Nov. 5-9, 2007.

H.R. Zhang, **E.G. Eddings** and A.F. Sarofim, "Correlations between Fuel Structural Features and Benzene Formation," paper presented at 2007 Annual AIChE National Meeting, Salt Lake City, UT, Nov. 5-9, 2007.

A. Sánchez, F. Mondragón and **E.G. Eddings**, "CO<sub>2</sub> Interaction with Char Nitrogen in Oxy-Coal Combustion Systems," paper presented at 2007 Annual AIChE National Meeting, Salt Lake

- City, UT, Nov. 5-9, 2007.
- H.R. Zhang, **E.G. Eddings** and A.F. Sarofim, "Coal Devolatilization at Very Slow Heating Rates," paper presented at 2007 Annual AIChE National Meeting, Salt Lake City, UT, Nov. 5-9, 2007.
- C.A. Wight and **E.G. Eddings**, "Science-Based Simulation Tools for Hazard Assessment and Mitigation," 7<sup>th</sup> International Symposium on Special Topics in Chemical Propulsion, Kyoto, Japan, Sept. 17-21, 2007.
- H.R. Zhang, **E.G. Eddings**, A.F. Sarofim, "The Role of the Allylic Radical and Its Related Species in Aromatic Precursor Chemistry", Fifth International Mediterranean Combustion Symposium, September 9-13th, 2007, Monastir, Tunisia.
- H.R. Zhang, **E.G. Eddings**, A.F. Sarofim, "Correlation of Pollutant Formation And Fuel Structural Composition In A Near Stoichiometric Gasoline Flame", 10th International Congress on Combustion By-Products and Their Health Effects, June 17-20th, 2007, Ischia, Italy.
- H.R. Zhang, Z. Cha, **E.G. Eddings**, and A.F. Sarofim, "Characterization of Bio-diesels and Fossil Fuels and Correlations between Fuel Structures and Combustion Emission", 234th American Chemical Society, Division of Fuel Chemistry (2007), August 19-23rd, Boston, MA, USA.
- H.R. Zhang, **E.G. Eddings**, A.F. Sarofim, C.L. Mayne, Z. Yang and R.J. Pugmire, "Use of Functional Group Analysis for the Selection of Surrogates for Jet Fuels", International Soot Workshop, May 14-16th, 2007, Ana Capri, Italy.
- I. Preciado, **E.G. Eddings** and A. F. Sarofim, "Study of Soot Deposition and its Effect on Heat Transfer from a Pool Fire to an Engulfed Container," 5th U.S. Combustion Meeting, March 25-28th, 2007, San Diego, CA.
- J.S. Lighty, **E.G. Eddings**, N.B. Orton, A. F. Sarofim and Nancy Yang, "Characterization of Young Soot from an Inverse Diffusion Flame," 5th U.S. Combustion Meeting, March 25-28th, 2007, San Diego, CA.
- Z. Yang, H.R. Zhang, **E.G. Eddings**, and A.F. Sarofim, "Selection of Inception Species for Soot Modeling in Premixed Flames", 5th U.S. Combustion Meeting, March 25-28th, 2007, San Diego, CA.
- T.L. Henriksen, T.A. Ring, D. Call, **E.G. Eddings**, A.F. Sarofim, "Determination of Soot Refractive Index as a Function of Height in an Inverse Diffusion Flame," 5th U.S. Combustion Meeting, March 25-28th, 2007, San Diego, CA.
- H.R. Zhang, M.P. Pham, L.K. Huynh, T.N. Truong, **E.G. Eddings**, and A.F. Sarofim, "Kinetics of Ring Closure Reactions and Its Role in Polymerization of Aromatics", 5th U.S. Combustion Meeting, March 25-28th, 2007, San Diego, CA.
- H.R. Zhang, **E.G. Eddings**, and A.F. Sarofim, C.L. Mayne, Z. Yang and R.J. Pugmire, "Use of Functional Group Analysis for the Selection of Surrogates for Jet Fuels", 5th U.S. Combustion Meeting, March 25-28th, 2007, San Diego, CA.
- H.R. Zhang, **E.G. Eddings**, and A.F. Sarofim, "Pollutant formation in premixed and diffusion flames of paraffinic fuels using the reduced Utah Surrogate Mechanisms," Preprints of Symposia – American Chemical Society, Division of Fuel Chemistry (2007), 52(1), 144-147.
- H.R. Zhang, **E.G. Eddings**, and A.F. Sarofim, "Pollutant formation in a near stoichiometric gasoline flame as a function of fuel structural composition," paper presented at 233rd ACS

- National Meeting, Environmental Division, Chicago, IL, March 25-29, 2007.
- H.R. Zhang, M.P. Pham, T.N. Truong, **E.G. Eddings**, and A.F. Sarofim, "Polymerization Reactions of Aromatics in a Fuel-Rich 20-Torr Naphthalene Premixed Flame Enhanced by Ring Closure Steps," Preprints of Symposia – American Chemical Society, Division of Fuel Chemistry (2006), 51(2), 733-735.
- A Santamaria, F. Mondragon, W. Quinones, **E.G. Eddings**, and A.F. Sarofim, "Ethanol Effect on Soot Formation in an Ethylene Inverse Diffusion Flame," paper presented at 231st ACS National Meeting, Atlanta, GA, March 26-30, 2006.
- H.R. Zhang, **E.G. Eddings**, and A.F. Sarofim, "Reactions and Kinetics of Benzene and Enol Formation in a Stoichiometric Cyclohexane Flame," Preprints of Symposia – American Chemical Society, Division of Fuel Chemistry (2006), 51(1), 229-231.
- H.R. Zhang, A. Violi, **E.G. Eddings**, and A.F. Sarofim, "Soot Formation Modeling Using Modified Moments Method," Preprints of Symposia – American Chemical Society, Division of Fuel Chemistry (2006), 51(1), 183-184.
- H.R. Zhang, **E.G. Eddings**, and A.F. Sarofim, "Modeling Naphthalene Formation in a Premixed Propylene Flame," Preprints of Symposia – American Chemical Society, Division of Fuel Chemistry (2006), 51(1), 221-222.
- H.R. Zhang, **E.G. Eddings**, and A.F. Sarofim, "Comprehensive Analysis of Benzene Formation in Premixed Flames Based on Fuel Structures," Preprints of Symposia – American Chemical Society, Division of Fuel Chemistry (2006), 51(1), 351-352.
- H.R. Zhang, **E.G. Eddings**, and A.F. Sarofim, "Combustion Reactions of Natural Gas and Liquid Transportation Fuels Using Generic Rates for Paraffins," Preprints of Symposia – American Chemical Society, Division of Fuel Chemistry (2006), 51(1), 232-233.
- E.G. Eddings**, S. Yan, H. Zhang, N.B. Marsh and A.F. Sarofim, C.J. Montgomery and V. Katta, "Methodology for the Simulation of Complex Hydrocarbon Mixtures," 2005 AIChE Annual Meeting, Cincinnati, OH, Oct. 30 – Nov. 4, 2005.
- H. Zhang, **E.G. Eddings** and A.F. Sarofim, "Modeling Benzene and Naphthalene Formation in a Premixed Propylene Flame," technical paper, Fall Meeting of the Western States Section, Combustion Institute, Stanford University, Oct. 16-18, 2005.
- H. Zhang, **E.G. Eddings** and A.F. Sarofim, "Combustion Reactions of Paraffin Components in Liquid Transportation Fuels Using Generic Rates," technical paper, 4th Mediterranean Combustion Symposium, Lisbon, Portugal, Oct. 6-10, 2005.
- T.L. Henriksen, G. Nathan, Z. Alwahabi, J. P. Spinti, **E.G. Eddings**, P.J. Smith, "Soot Volume Fraction from Extinction in JP8 and Heptane Pool Fires," Fall Meeting of the Western States Section of the Combustion Institute, October 17-18, 2005, Stanford, CA.
- A. Santamaría, A. Molina, F. Mondragón, N.D. Marsh, **E.G. Eddings** and A.F. Sarofim, "Characterization of Soot Produced in an Ethylene Inverse Diffusion Flame," technical paper, International Coal Science and Technology Conference, Okinawa, Japan, October 9-14, 2005.
- A. Santamaría, F. Mondragón, J.J. Fernandez, **E.G. Eddings** and A.F. Sarofim, "Average Structural Analysis of Soot Material Soluble in Chloroform," technical paper, International Coal Science and Technology Conference, Okinawa, Japan, October 9-14, 2005.
- H. Zhang, **E.G. Eddings** and A.F. Sarofim, "The Development and Validation of a Mechanism for Surrogates of Real Fuels," 6th International Conference on Chemical Kinetics, NIST,

Gaithersburg, MD, July 27, 2005.

- C. J. Montgomery, A.F. Sarofim, I. Preciado, N.D. Marsh, **E.G. Eddings**, J.W. Bozzelli, "Experimental and Numerical Investigation of Soot-Reducing Fuel Additives," technical paper, 41st AIAA/ASME/SAE/ASEE Joint Propulsion Conference, Tucson, AZ, July 10-13, 2005.
- E.G. Eddings**, W. Ciro and C.A. Wight, "High Energy Materials in Fires: Influence of Fire Environment on Violence of Reactions," 2005 Joint Army/Navy/NASA/Air Force (JANNAF) Annual Meeting of CS/APS/PSHS Subcommittees, Charleston, SC, June 13-17, 2005.
- E.G. Eddings**, Á.B. Palotás, I. Preciado, N.D. Marsh and A.F. Sarofim, "Development of a Methodology for Screening Multi-Functional Fuel Additives," technical paper, 19<sup>th</sup> microCAD International Scientific Conference, Miskolc, Hungary, March 10-11, 2005.
- J.R. Valentine, K.A. Davis, M.K. Denison, **E.G. Eddings**, D. Cron, R. Morrow, T. Giaier, "A Computational Model Study of NO<sub>x</sub> Reduction Strategies for a Coal-fired Stoker Furnace," technical paper, U.S./China Industrial Boiler Workshop, Beijing, China, June 10-11, 2004.
- C.J. Merrill, J.S. Lighty, **E.G. Eddings** and A.F. Sarofim, "Investigation of the Oxidation and Fragmentation of Soot in a Two-Stage Flat Flame Burner System Utilizing a Scanning Mobility Particle Sizer," Work in Progress Poster, 30<sup>th</sup> International Symposium on Combustion, Chicago, IL, July 25-30, 2004.
- I. Preciado, N.D. Marsh, **E.G. Eddings** and A.F. Sarofim, "Soot Generation from JP-8 and JP-8 Plus Additives at Different Equivalence Ratios in a Drop Tube Furnace," Work in Progress Poster, 30<sup>th</sup> International Symposium on Combustion, Chicago, IL, July 25-30, 2004.
- C.J. Merrill, J.S. Lighty, **E.G. Eddings** and A.F. Sarofim, "Investigation of the Oxidation and Fragmentation of Soot in a Two-Stage Flat Flame Burner System Utilizing a Scanning Mobility Particle Sizer," presented at the Western States Section of the Combustion Institute, Davis, CA, March 29-30, 2004.
- C. Senior, A. F. Sarofim and **E.G. Eddings**, "Behavior and Measurement of Mercury in Cement Kilns," technical paper, 2003 IEEE-IAS/PCA Cement Industry Technical Conference, Dallas, TX, May 4-9, 2003.
- Z.M. Djuriscic and **E.G. Eddings**, "NO<sub>x</sub> Emissions from Intermediate-Temperature Combustion of Steel-Industry By-Product Gases," paper presented at the Third Joint Meeting of the U.S. Sections of the Combustion Institute, March 16-19, 2003.
- P Jiang, J.S. Lighty, A.F. Sarofim and **E.G. Eddings**, "Modeling of the Coagulation of Charged Particles," paper presented at the Third Joint Meeting of the U.S. Sections of the Combustion Institute, March 16-19, 2003.
- W. Ciro, **E.G. Eddings** and A.F. Sarofim, "Thermal Behavior of a High-Energy Material Immersed in a Fire," paper presented at the Third Joint Meeting of the U.S. Sections of the Combustion Institute, March 16-19, 2003.
- S. Yan, W. Ciro, **E.G. Eddings** and A.F. Sarofim, "Experimental Study of Burning Rate in Jet-Fuel Pool Fires," paper presented at the Third Joint Meeting of the U.S. Sections of the Combustion Institute, March 16-19, 2003.
- L. Bool, H. Kobayashi, K. Wu, D. Thompson, **E. Eddings**, R. Okerlund, J. Wendt, M. Cremer, and D. Wang, "Oxygen for NO<sub>x</sub> Control – A Step-Change Technology?," technical paper, 19<sup>th</sup> Annual International Pittsburgh Coal Conference, Pittsburgh, PA, Sept. 2002.
- A.F. Sarofim, J.S. Lighty and **E.G. Eddings**, "Fine Particles: Health Effects, Characterization,

- Mechanisms of Formation, and Modeling,” technical paper, 224<sup>th</sup> ACS National Meeting, August 18-22, 2002, Boston, Massachusetts.
- B. Chudnovsky, A. Talanker, L. Levin, A. Vikhansky, E. Bar-Ziv, **E. Eddings**, A.F. Sarofim, “Prediction of Furnace and Boiler Performance: Coal Quality Factor,” 27<sup>th</sup> International Technical Conference on Coal Utilization and Fuel Systems, March 4-7, Clearwater, Florida, 2002.
- K. Kuehlert, J. Ma, S. Nester, J. Rabovitzer, S. Wohadlo, M. Denison, **E. Eddings**, M. Bockelie, “Development and Validation of a Fluent-Based CFD Model for Combined Wood Waste, Sludge and Natural Gas Combustion in a Stoker Boiler,” 2001 TAPPI Engineering/Finishing & Converting Conference (Pulp & Paper Industry), San Antonio, Texas, Sept. 16-20, 2001.
- B. Sun, A.F. Sarofim, **E.G. Eddings**, and D.J. Paustenbach, “Reducing PCDD/PCDF Formation and Emission from a Hazardous Waste Combustion Facility — Technological Identification, Implementation, and Achievement,” DIOXIN 2001, 21<sup>st</sup> International Symposium on Halogenated Environmental Organic Pollutants and POPS, Kyongju, Korea, Sept. 9-14, 2001.
- A. Violi, X. Chen, G. Lindstrom, **E.G. Eddings**, A.F. Sarofim, “The Validation Website: A Combustion Collaboratory Over the Internet,” proceedings of the 2001 International Conference on Computational Science (ICCS 2001), San Francisco, CA, May 28-30, 2001.
- B. Chudnovsky, A. Talanker, A. Mugenstein, G. Shpon, A. Vikhansky, T. Elperin, E. Bar-Ziv, M. Bockelie, **E.G. Eddings**, A.F. Sarofim, “Reduction of NO<sub>x</sub> and Particulate Emissions from Coal-Fired Boilers by Modification of Coal Nozzles and Combustion Tuning,” proceedings of PowerGen Europe 2001, Brussels, Belgium, May 29-31, 2001.
- A. Molina, **E.G. Eddings**, D.W. Pershing and A.F. Sarofim, “Production of Nitrogen Oxide During Char Oxidation at Pulverized Coal Combustion Conditions,” Paper 210, presented at the Second Joint Meeting of the United States Sections of the Combustion Institute, Oakland, CA, March 25-28, 2001.
- E.G. Eddings**, W. Ciro, A.F. Sarofim and M. Beckstead, “Fast Cook-off Tests of an HMX-based Propellant in Pool Fires,” proceedings of the 2000 Joint Army/Navy/NASA/Air Force (JANNAF) CS/APS/PSHS Joint Meeting, Monterrey, CA, Nov. 13-17, 2000.
- J.S. Lighty, D.W. Pershing, Z.M. Djurjic, **E.G. Eddings**, M. Denison, M.J. Bockelie and M.P. Heap, “Achieving Ultra-Low NO<sub>x</sub> Emissions in Coal-Fired Utility Boilers,” Proceedings of the Third Joint China/USA Chemical Engineering Conference, pages 07-017 to 07-022, Beijing, China, September 25-28, 2000.
- E.G. Eddings**, “Case Studies: Application of Computational Fluid Dynamics to Industrial Problems,” Annual Conference of the National Research Center (CNR) for Italy, Istituto Motori, Naples, Italy, Nov. 20-27, 1999.
- K.A. Davis, J.R. Valentine, **E.G. Eddings** and M.P. Heap, “Evaluating the Effects of Low-NO<sub>x</sub> Retrofits on Carbon in Ash Levels,” proceedings of the EPRI/EPA/DOE Combined Utility Air Pollution Control Symposium: The Mega Symposium, Atlanta, GA, Aug. 16-20, 1999.
- E.G. Eddings**, A. Molina, D.W. Pershing, A.F. Sarofim, K.A. Davis, M.P. Heap, T.H. Fletcher, H. Zhang, “Minimization of NO Emissions from Multi-Burner Coal-Fired Boilers,” DOE Contractor Review Meeting, Pittsburgh, PA, June 2, 1999.
- K.A. Davis, J.R. Valentine, **E.G. Eddings** and M.P. Heap, “Waterwall Corrosion after Combustion Modifications for NO<sub>x</sub> Control,” presented at the 24<sup>th</sup> International Technical Conference on Coal Utilization & Fuel Systems, Clearwater, Florida, March 10, 1999

- D.A. Cacciatore, **E.G. Eddings**, J.S. Lighty, and D.W. Pershing, "Minimizing NO<sub>x</sub> Emissions from By-Product Fuels in Steel Making," Presentation at AIChE Annual Meeting, Miami, Florida, November 18, 1998.
- K.A. Davis, **E.G. Eddings**, M.P. Heap, A. Facchiano, R.R. Hardman, "Computational investigation of carbon-in-ash levels for a wall-fired boiler after low-NO<sub>x</sub> combustion modifications," International Pittsburgh Coal Conference, September, 1998.
- M.J. Bockelie, B.R. Adams, M.A. Cremer, K.A. Davis, **E.G. Eddings**, J.R. Valentine, and P.J. Smith, "Computational simulations of industrial furnaces," Int'l Symp. on Computational Technologies For Fluid/Thermal/Chemical Systems with Industrial Applications, Joint ASME/JSME Conference, San Diego, CA, July, 1998.
- D.A. Cacciatore, **E.G. Eddings**, J.S. Lighty, and D.W. Pershing, Minimizing NO<sub>x</sub> Emissions from By-Product Fuels in Steel Making, Work-In-Progress Poster at The Twenty-Seventh International Symposium on Combustion, Boulder, Colorado, August 2, 1998.
- Cremer, M.A., **Eddings, E.G.**, Martz, T., Muzio, L.J., Quartucy, G., Hardman, R., Cox, J., and Stallings, J., "Assessment of SNCR Performance on Large Coal-Fired Utility Boilers," presented at 1998 DOE Conference on Selective Catalytic and Non-Catalytic reduction for NO<sub>x</sub> Control," Pittsburgh, PA, May, 1998.
- R.R. Hardman, J. Cox, M.A. Cremer, **E.G. Eddings**, L. Muzio, T. Martz, J. Stallings, "Evaluation of SNCR Performance on Large-Scale Coal-Fired Boilers," Institute of Clean Air Companies Forum, Durham, NC, March, 1998.
- K.A. Davis, **E.G. Eddings**, M.P. Heap, A. Facchiano, R.R. Hardman, "Effect of low-NO<sub>x</sub> firing conditions on carbon-in ash," American Flame Research Committee Spring Meeting, March, 1998.
- E.G. Eddings**, D.W. Pershing, "Organic Emissions from Cement Kilns," Technical Mill Session, Fall Annual Meeting of the Portland Cement Association, Chicago, Illinois, Sept. 22-23, 1997.
- E.G. Eddings**, K.A. Davis, M.P. Heap, J.R. Valentine, A. Facchiano, R. Hardman, N. Grigas, "Effect of Low NO<sub>x</sub> Firing Conditions on Increased Carbon-in-Ash and Water-Wall Corrosion Rates," proceedings of the EPRI/EPA/DOE Mega Symposium on NO<sub>x</sub>/SO<sub>x</sub>/Air Toxics, Washington, D.C., Aug. 25-29, 1997.
- H. Krigmont, D. Oehley, F. Spokoyny, J. Hogsett, G. Quartucy, L. Muzio and **E.G. Eddings**, "SNCR Retrofit Experience on Four Gas- and Coal-Fired Boilers in Tchaikovsky, Russia," proceedings of the EPRI/EPA/DOE Mega Symposium on NO<sub>x</sub>/SO<sub>x</sub>/Air Toxics, Washington, D.C., Aug. 25-29, 1997.
- E.G. Eddings**, J Brouwer and F.E. Spokoyny, "Modeling Urea-Based SNCR in a Gas-Fired Utility Boiler," First Conference on Selective Catalytic & Non-Catalytic Reduction for NO<sub>x</sub> Control, Pittsburgh, May 15-16, 1997.
- K.A. Davis, J.R. Valentine, **E.G. Eddings**, J Brouwer, M.P Heap, R.H. Hurt, R. Hardman and N. Grigas, "Advanced Prediction of Unburned Carbon Levels in Two Utility Boilers Retrofitted for In-Furnace NO<sub>x</sub> Reduction," Third Annual Conference on Unburned Carbon in Utility Fly Ash, Pittsburgh, May 13-14, 1997.
- E.G. Eddings** J. Brouwer, M.P. Heap, D.W. Overacker and D.W. Pershing, "Determination of Organic Emissions From Raw Materials and Waste Feedstocks in Cement Kilns," Waste Combustion in Boilers and Industrial Furnaces, Air & Waste Management Association Specialty Conference, St. Louis, April 8-10, 1997.

- E.G. Eddings** and D.W. Pershing, "Hydrocarbon Emissions Due to Raw Materials in the Manufacture of Portland Cement," proceedings of the 89th Annual Meeting of the Air & Waste Management Association, Nashville, TN, June 23-28, 1996.
- M.J. Bockelie, B.R. Adams, **E.G. Eddings** and P.J. Smith, "Simulations of High-Temperature Reacting Flows for Industrial Processes" proceedings of the 5th International Conference on Numerical Grid Generation in Computational Field Simulations, Mississippi State University, Apr. 1-5, 1996.
- R. Beittel, E. Reciker, G. Giolda, J. Brouwer, and **E.G. Eddings**, "U-Fired Test Facility Design and Analysis for the Low Emission Boiler System Development Program", proceedings of the International Joint Power Generation Conference, October , 1995.
- J. Brouwer, **E.G. Eddings**, M.P. Heap, D.W. Pershing and P.J. Smith, "Effects of Mixing and Thermal Quenching on NO Reduction by Selective Non-Catalytic Reduction in the Presence of CO", proceedings of the 1995 American Flame Research Committee Fall International Symposium, October 15-18, 1995, Monterrey, California.
- E.G. Eddings** and D.W. Pershing, "Hydrocarbon Emissions Due to Raw Materials in the Manufacture of Portland Cement," Manufacturing Technical Session, Fall Annual Meeting of the Portland Cement Association, Overland Park, Kansas, Sept. 18, 1995.
- C. Rossi-Lane, B.L. McDonald, E. Ecock, **E.G. Eddings**, G. Norman, L. Radak, P. Strangway, and K. Zammit, "An Assessment of Boiler Impacts from Reduced Air Flow Operation," proceedings of the 1995 Joint Symposium on Stationary Combustion NOx Control, May, 1995.
- D.E. Thornock, J.G. McGowan, N.M. Phyfe, **E.G. Eddings**, M.P. Heap and P.J. Smith, "Scaling NOx Results using CFD-Based Combustion Simulations", proceedings of the Pacific Rim International Conference on Environmental Control of Combustion Processes, October 16-20, 1994, Maui, Hawaii.
- E.G. Eddings**, M.P. Heap, D.W. Pershing, A.F. Sarofim, P.J. Smith, and J.P. Spinti, "The Design of a Coal-Fired High-Temperature Furnace for an Advanced Combined Cycle System", proceedings of the Second International Conference on Combustion Technologies for a Clean Environment, Lisbon, Portugal, July 26-29, 1993.
- E.G. Eddings**, M.P. Heap, D.W. Pershing, A.F. Sarofim, P.J. Smith, and J.P. Spinti, "Coal Combustor for a High Performance Power System - The Influence of Process Design Parameters on NOx Emissions", proceedings of the 1993 Joint Symposium on Stationary Combustion NOx Control, Miami Beach, Florida, May 24-27, 1993.
- P.J. Smith, **E.G. Eddings**, M.P. Heap, D.W. Pershing, and A.F. Sarofim, "An Improved Model for Predicting NOx Formation in Practical Coal Flames", proceedings of the 1993 Joint Symposium on Stationary Combustion NOx Control, Miami Beach, Florida, May 24-27, 1993.
- E.G. Eddings**, M.P. Heap, P.J. Smith, C.L. Senior, D.W. Pershing, J.P. Spinti, A.F. Sarofim, "Combustor Concepts for Advanced, Coal-Fired, High-Performance Power Systems", Seventh Annual Conference on Clean and Efficient Combustion of Fossil Fuels and Toxic Wastes, Park City, Utah, March 2-5, 1993.
- E.G. Eddings** and J.S. Lighty, "A Study of Metal Contaminant Behavior in a Pilot-Scale Rotary Kiln," poster presentation at the Twenty Fourth International Symposium on Combustion, Sydney, Australia, July 5-10, 1992.
- E.G. Eddings** and J.S. Lighty, "Behavior of Metals on Solid Substrates During Incineration," paper #91-57, Western States Section/The Combustion Institute, 1991 Fall Meeting, Los Angeles, California, Oct. 14, 1991.

**E.G. Eddings** and J.S. Lighty, "Fundamental Studies of Metal Behavior During Solids Incineration," The Second International Congress on Toxic Combustion By-products: Formation and Control, Salt Lake City, Utah, March 27, 1991.

McClennen, W.H., N.S. Arnold, J.S. Lighty, **E.G. Eddings**, E.R. Lindgren, K.A. Roberts, H.L.C. Meuzelaar, "Monitoring the Evolution of Organic Compounds from the Thermal Treatment of Contaminated Soil Samples Using Short Column GC/MS," ACS Fuels Division, Incineration Symposium, Miami Beach, Florida, September 1989.

Lighty, J.S., **E.G. Eddings**, Deng Xiao-Xue, L.M. VanOs, D.W. Pershing, "A Fundamental Study of the Rate of Thermal Desorption of Contaminants from Soil Beds," proceedings of the 82nd Annual Air and Waste Management Association Meeting, Anaheim, California, June 1989.

#### **TECHNICAL REPORTS - CONSULTING PROJECTS:**

"Treatment of an Electroplating Sludge Waste from PC Board Fabrication," Final Report to Persee Chemical Company, Taiwan, November 2001.

"Impact of Switching from Fuel Oil Firing to Orimulsion Firing on Lime Kiln Performance," Final Report to Arawak Cement Co. Ltd., June 2001.

"Combustion Modeling of Natural Gas and Oil Firing at LILCO Northport Unit 4," Final Report to Empire State Electric Energy Research Corporation (ESEERCO), May 1999.

"Identification of an Engineering Method for Reducing the Emission and/or Formation of Polychlorinated Dibenzodioxins and Polychlorinated Dibenzofurans," Final Report to Continental Cement Company, March 1999.

"Methyl t-Butyl Ether (MTBE) Oxidation in NAO Vapor Control Unit Size 72C34," Final Report, August 1998.

"Combustion Modeling of High Carbon-in-Ash Levels at Indian River Unit 3," Final Report to Delmarva Power, July 1998.

"Review of Dioxin Emissions from a Thermal Oxidizer," Final Report to Polaroid Corp., April 1997.

"Furnace Uptake and Saturation Tower Modeling at the Hayden, AZ Copper Smelter Plant," Final Technical Report to ASARCO, Inc., February 1997.

"Modeling and Risk Assessment of Air Contaminants from Fires at TRW VSSI Site II," Final Report to City of Mesa, AZ, November 1996.

"Urea Injection in an Opposed-Wall-Fired Boiler in Perm, Russia," Final Report to Wahlco, Inc., October 1996.

"Modeling Selective Windbox Flue Gas Recirculation in a Gas-Fired Boiler," Final Report to Etec, Inc., September 1996.

"Hydrocarbon Emissions Due to Raw Materials in the Manufacture of Portland Cement," Final Report to Portland Cement Association, June 1996.

"On the Matter of COC Metals Feed Rate Limits at the Haverhill Plant," Final Report to Aristech Chemical Corp., July 1995.

"Computer Simulation of a Coker Gas Incinerator," Final Report to Star Enterprise, Delaware Refinery, March 1995.

"Natural Gas and Oil Firing at Reduced Loads in a Tangentially-Fired Boiler," Final Report to Carnot, Inc., October 1994.

“Red Wing Plant Economizer Modeling Study,” Final Report to Northern States Power, July 1994.

“Analysis of Ammonia Injection for ‘Blue Plume’ Control,” Final Report to New York State Electric & Gas (NYSEG), June 1994.

“Model of Cyclone Reactor Tuyere and Turning Drum,” Final Report to ASARCO, Inc., February 1994.

“Development of a Carbon Loss Prediction Tool,” Final Report to ABB/Combustion Engineering, December 1993.