

Eric G. Eddings

Associate Professor, Chemical Engineering
University of Utah

EDUCATION

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

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

ACADEMIC EXPERIENCE

2001-present, Associate Professor, Chemical Engineering, University of Utah

2000-2001, Research Associate Professor, Chemical and Fuels Engineering, University of Utah

1998-2000, Research Assistant Professor, Chemical and Fuels Engineering, University of Utah

INDUSTRIAL EXPERIENCE

2001-present, Technical Advisor, Reaction Engineering International, Salt Lake City, Utah

1998-2001, Vice President, Reaction Engineering International, Salt Lake City, Utah

1995-1998, Manager, Industrial Technologies, Reaction Engineering International, Salt Lake City, Utah

1992-1995, Senior Engineer, Reaction Engineering International, Salt Lake City, Utah

1987-1988, Lead Chemist, Unisys Corporation, Salt Lake City, Utah

1985-1987, Assistant Chemist, Unisys Corporation, Salt Lake City, Utah

1982-1985, Printed Circuit Process Operations, Unisys Corporation, Salt Lake City, Utah

SUMMARY

Prof. Eddings' research interests encompass:

- 1) formation, control and fate of air pollutants, for a variety of solid, liquid and gaseous fuels
- 2) soot formation and large hydrocarbon reaction mechanisms
- 3) heat transfer and fluid dynamics in hydrocarbon fires
- 4) behavior of high-energy materials exposed to fire environments
- 5) characterization of transportation fuels and minimization of particulate emissions in commercial engines

Prof. Eddings has been involved in both experimental and computational work, and these studies have been carried out with a wide variety of solid, liquid and gaseous fuels for a range of industries, which include the electric utility, cement, metallurgical, chemical process and pulp and paper industries. The experimental work encompasses fundamental lab-scale research through pilot-scale verification. Prof. Eddings is Leader of the Validation Team in the Center for the Simulation of Accidental Fires and Explosions (C-SAFE), whose ten-year mission is to develop large-scale, massively-parallel simulations of explosives engulfed in large-scale hydrocarbon pool fires. Prof. Eddings is also Experimental Lead of the Institute for Combustion and Energy Studies at the University of Utah, with responsibility over two laboratory sites, including the 20,000 sq. ft. Industrial Combustion and Gasification Research Facility (ICGRF). The ICGRF houses a wide variety of pilot-scale combustion facilities for use in process evaluation, model validation and technology development.

RECENT PEER-REVIEWED PUBLICATIONS

H. Zhang, **E.G. Eddings** and A.F. Sarofim, "Combustion Reactions of Paraffin Components in Liquid Transportation Fuels Using Generic Rates," accepted for publication, *Combustion Science & Technology*, 2006.

A. Santamaria, F. Mondragon, A. Mondragon, N.D. Marsh, **E.G. Eddings**, A.F. Sarofim, "FT-IR and 1H-NMR Characterization of the Products of an Ethylene Inverse Diffusion Flame," accepted for publication, *Combustion & Flame*, 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," accepted for publication, *Combustion Science & Technology*, 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.
- 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. 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.
- 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.
- 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.

BOOK CHAPTERS

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

SELECTED RECENT PRESENTATIONS

- T.L. Henriksen, G. Nathan, Z. Alwahabi, J.P. Spinti, **E.G. Eddings**, P.J. Smith, "Simultaneous Measurements of LII and LIF (OH) in JP8 and Heptane Pool Fires," Fourth Australian Conference on Laser Diagnostics in Fluid Mechanics and Combustion, Dec.7-9, 2005, Adelaide, Australia.
- 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.
- 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.
- 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.
- 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, 19th 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_x Reduction Strategies for a Coal-fired Stoker Furnace," technical paper, U.S./China Industrial Boiler Workshop, Beijing, China, June 10-11, 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. Djuricic and **E.G. Eddings**, "NO_x 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.

- L. Bool, H. Kobayashi, K. Wu, D. Thompson, **E. Eddings**, R. Okerlund, J. Wendt, M. Cremer, and D. Wang, "Oxygen for NO_x Control – A Step-Change Technology?," technical paper, 19th 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, 224th ACS National Meeting, August 18-22, 2002, Boston, Massachusetts.
- 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, 21st 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_x 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.

RECENT PATENTS

- 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.