

**Alfonso F. Ibarreta, Ph.D., P.E., CFEI
Engineer****Professional Profile**

Dr. Alfonso Ibarreta is an Engineer in Exponent's Thermal Sciences practice. He applies thermodynamics, fluid dynamics, and heat transfer principles to the study of combustion processes in fires, explosions, and a variety of combustion devices. He is a Certified Fire and Explosion Investigator and has investigated fires and explosions involving consumer products, residential and commercial buildings, and industrial facilities. Dr. Ibarreta also analyzes overpressure events caused by the release and subsequent combustion of gases, vapors, and dusts. Dr. Ibarreta is a principal member of the NFPA's Technical Committee on Explosion Protection Systems. This committee is responsible for NFPA documents related to explosion protection systems for buildings and equipment, including NFPA 68 *Standard on Explosion Protection by Deflagration Venting* and NFPA 69 *Standard on Explosion Prevention Systems*. He has evaluated the compliance of industrial facilities with NFPA standards and local codes for the prevention and mitigation of dust and gas explosions. Dr. Ibarreta is specifically interested in vented deflagrations and unconfined vapor cloud explosion overpressures.

Dr. Ibarreta has performed testing involving consumer products, including lighting equipment, electric and gas appliances, and evaluated their compliance with standards and regulations (such as UL, CSA, IEC, ASTM, API, and CFR). He has inspected and tested fuel gas supply equipment. He has researched changes in flammability of polymeric materials with thermal aging, and studied the ignition characteristic of solid and powder fuels.

Prior to joining Exponent, Dr. Ibarreta was a Senior Research Associate at Case Western Reserve University, in Cleveland. During this time at Case, Dr. Ibarreta served as lab manager while simultaneously performing research dealing with hydrocarbon and hydrogen combustion. He has worked on several NASA funded projects conducting studies at NASA Glenn's 2.2 Second Drop Tower facility. During this time, Dr. Ibarreta performed research involving very weak, nearly extinguished flames, in normal gravity and microgravity conditions. He has been involved in combustion research for the past 11 years, starting with his graduate work at the University of Michigan, where he studied premixed flame propagation utilizing high-speed imaging techniques.

Academic Credentials and Professional Honors

Ph.D., Aerospace Engineering, University of Michigan, 2002

M.S., Aerospace Engineering, University of Michigan, 2000

B.S., Aerospace Engineering, University of Maryland (*summa cum laude*), 1997

Recipient of Distinguished Paper Award at the 31st Int. Symposium on Combustion, 2006;

Recipient of Robert M. Rivello scholarship, 1996; Tau Beta Pi Engineering Honor Society, 2005

Licenses and Certifications

Registered Professional Mechanical Engineer, Massachusetts, #48085

Certified Fire and Explosion Investigator (CFEI)

Languages

Spanish

Publications and Conference Proceedings

Myers T, Ibarreta A, Ashcraft R. Dust explosion prevention: Regulations, standards, and mitigation techniques. Proceedings, 43rd AIChE Loss Prevention Symposium, Tampa Bay, FL, April 2009.

Davis S, Ibarreta A, Kessel A, Ellison A. Flammability of nylon used as insulation in electrical connectors. Proceedings, International Symposium on Fire Investigation Science and Technology, Cincinnati, OH, 2008.

Myers T, Ibarreta A. Investigation of the Jahn Foundry and CTA acoustics dust explosions: Similarities and differences. Mary Kay O'Connor Process Safety Center Symposium, 2007.

Rangwala A, Myers T, Ibarreta A. Measurements of the non-dimensional Frank-Kamenetskii number using a standard dust layer ignition testing apparatus. 5th International Seminar on Fire and Explosion Hazards, Edinburgh, UK, 2007.

Davis S, Ibarreta A, Clevenger J. Flammability of electrical crimp connectors subjected to heating. Proceedings, Fire and Materials 10th International Conference, 2007.

Han B, Ibarreta A, Sung CJ, T'ien JS. Structure of low-stretch methane nonpremixed flames. Combust Flame 2007; 149:173–190.

Ibarreta A, Sung CJ, Wang H. Experimental characterization of premixed spherical ethylene/air flames under sooting conditions. Proceedings, Combustion Institute 2006; 31:1047–1054.

Ibarreta A, Sung CJ. Optimization of Jet-A fuel reforming for aerospace applications. Int J Hydrogen Energy 2006; 31:1066–1078.

Mento C, Sung CJ, Ibarreta A, Schneider S. Catalytic ignition of methane/hydrogen/oxygen mixtures for microthruster applications. 42nd AIAA/ASME/SAE/ASEE Joint Propulsion Conference, AIAA Paper No. 2006-4871, 2006.

Mento C, Sung CJ, Ibarreta A, Schneider S. Effects of hydrogen addition on catalytic ignition of rich methane/oxygen mixtures in a platinum microtube. Technical Meeting of the Central

States Section of The Combustion Institute, Case Western Reserve University, NASA Glenn Research Center, Cleveland, OH, 2006.

Ibarreta A, Sung CJ. Flame temperature and location measurements of sooting premixed Bunsen flames using rainbow schlieren deflectometry. *Appl Opt* 2005; 44, No. 14:3565–3575.

Ibarreta A, Sung CJ, Wang H. Burning velocities of sooting premixed ethylene/air flames in microgravity. 4th Joint Meeting US Sections of the Combustion Institute, Paper No. F08, Philadelphia, PA, March 2005.

Han B, Ibarreta A, Sung CJ, T'ien JS. Structure of low stretch methane diffusion flames. 4th Joint Meeting US Sections of the Combustion Institute, Paper No. F21, Philadelphia, PA, March 2005.

Ibarreta A, Sung CJ, Hirasawa T, Wang H. Burning velocity measurements of sooting premixed flames. 42nd AIAA Aerospace Sciences Conference, Reno, NV, January 2004.

Ibarreta A, Sung CJ, Wang H, Hirasawa T. Burning velocity measurements of microgravity spherical sooting premixed flames using rainbow schlieren deflectometry. *Combust Flame* 2005; 140:93–102.

Han B, Ibarreta A, Sung CJ, T'ien JS. Experimental low stretch gaseous diffusion flames in buoyancy-induced flowfields. *Proceedings, Combustion Institute* 2004; 30:527–535.

Ibarreta A, Sung CJ. Temperature measurements in sooting premixed flames using rainbow schlieren deflectometry. 42nd AIAA Aerospace Sciences Conference, Reno, NV, January 2004.

Han B, Ibarreta A, Sung CJ, T'ien J. A study on buoyancy-induced low stretch gaseous diffusion flames. 42nd AIAA Aerospace Sciences Conference, Reno, NV, January 2004.

Han B, Ibarreta A, Sung CJ, T'ien J. Experimental diagnostics on buoyancy-induced low stretch gaseous diffusion flames. *Technical Meeting of Eastern States Sections of the Combustion Institute, University Park, PA*, p. 157, October 2003.

Ibarreta A, Sung CJ. Determination of flame location using rainbow schlieren deflectometry. 3rd Joint Meeting of U.S. Sections of the Combustion Institute, Paper No. PI03, Chicago, IL, March 2003.

Han B, Ibarreta A, Sung CJ, T'ien J. On burner-generated low-stretch diffusion flames in natural-convective flows. 3rd Joint Meeting of U.S. Sections of the Combustion Institute, Paper No. PC03, Chicago, IL, March 2003.

Ibarreta A, Driscoll, J. Effects of negative curvature on the flame structure and burning velocities of laminar premixed flames. 2nd Joint Meeting of US Sections of the Combustion Institute, Oakland, CA, March 2001.

Ibarreta A. An experimental and numerical study of the inwardly-propagating premixed flame. Ph.D. thesis, University of Michigan, Ann Arbor, Michigan, June 2002.

Ibarreta A, Driscoll JF, Feikema DA. Markstein numbers of negatively-stretched flames—Microgravity measurements and computations. Proceedings, Combustion Institute 2002; 29:1435–1443.

Ibarreta A, Driscoll JF. Measured burning velocities of stretched inwardly propagating premixed flames. Proceedings, Combustion Institute 2000; 28:1783–1791.

Presentations and Posters

Myers T, Ibarreta A, Ashcraft R. Dust explosion prevention: Regulations, standards, and mitigation techniques. Presented at the 43rd AIChE Loss Prevention Symposium, Tampa Bay, FL, April 2009.

Myers T, Ibarreta A. Using engineering analysis to investigate explosions. Guest speaker presentation at Worcester Polytechnic Institute, MA, April 2009.

Davis S, Ibarreta A, Kessel A, Ellison A. Flammability of nylon used as insulation in electrical connectors. Proceedings, International Symposium on Fire Investigation Science and Technology, Cincinnati, OH, 2008.

Myers T, Ibarreta A. Case study of a hydrogen explosion in an electrical panel. Poster presented at the AIChE Loss Prevention Symposium, Spring 2008.

Myers T, Ibarreta A. Explosion investigation: Reverse-engineering a blast scene. Guest speaker presentation at Worcester Polytechnic Institute, MA, November 2007.

Myers T, Ibarreta A. Investigation of the Jahn Foundry and CTA acoustics dust explosions: Similarities and differences. Mary Kay O'Connor Process Safety Center Symposium, 2007.

Davis S, Ibarreta A, Clevenger J. Flammability of electrical crimp connectors subjected to heating. Proceedings, Fire and Materials 10th International Conference, 2007.

Ibarreta A, Sung CJ, Wang H. Experimental characterization of premixed spherical ethylene/air flames under sooting conditions. Proceedings, Combustion Institute 2006; 31:1047–1054.

Ibarreta A, Sung CJ, Wang H. Burning velocities of sooting premixed ethylene/air flames in microgravity. 4th Joint Meeting US Sections of the Combustion Institute, Paper No. F08, Philadelphia, PA, March 2005.

Han B, Ibarreta A, Sung CJ, T'ien JS. Structure of low stretch methane diffusion flames. 4th Joint Meeting US Sections of the Combustion Institute, Paper No. F21, Philadelphia, PA, March 2005.

Han B, Ibarreta A, Sung CJ, T'ien JS. Experimental low stretch gaseous diffusion flames in buoyancy-induced flowfields. *Proceedings, Combustion Institute 2004*; 30:527–535.

Ibarreta A, Sung CJ, Hirasawa T, Wang H. Burning velocity measurements of microgravity spherical sooting premixed flames using rainbow schlieren deflectometry. Poster presented at the 30th International Symposium on Combustion, Chicago, IL, July 2004.

Ibarreta A, Sung CJ. Temperature measurements in sooting premixed flames using rainbow Schlieren deflectometry. 42nd AIAA Aerospace Sciences Conference, Reno, NV, January 2004.

Han B, Ibarreta A, Sung CJ, T'ien J. A study on buoyancy-induced low stretch gaseous diffusion flames. 42nd AIAA Aerospace Sciences Conference, Reno, NV, January 2004.

Han B, Ibarreta A, Sung CJ, T'ien J. Experimental diagnostics on buoyancy-induced low stretch gaseous diffusion flames. Technical Meeting of Eastern States Sections of the Combustion Institute, University Park, PA, p. 157, October 2003.

Ibarreta A, Sung CJ. Determination of flame location using rainbow schlieren deflectometry. 3rd Joint Meeting of U.S. Sections of the Combustion Institute, Paper No. PI03, Chicago, IL, March 2003.

Han B, Ibarreta A, Sung CJ, T'ien J. On burner-generated low-stretch diffusion flames in natural-convective flows. 3rd Joint Meeting of U.S. Sections of the Combustion Institute, Paper No. PC03, Chicago, IL, March 2003.

Ibarreta A. An experimental and numerical study of the inwardly-propagating premixed flame. Ph.D. thesis, University of Michigan, Ann Arbor, MI, June 2002.

Ibarreta A, Driscoll JF, Feikema DA. Markstein numbers of negatively-stretched flames—Microgravity measurements and computations. *Proceedings, Combustion Institute 2002*; 29:1435–1443.

Ibarreta A, Driscoll, J. Effects of negative curvature on the flame structure and burning velocities of laminar premixed flames. 2nd Joint Meeting of US Sections of the Combustion Institute, Oakland, CA, March 2001.

Ibarreta A, Driscoll JF. Measured burning velocities of stretched inwardly propagating premixed flames. *Proceedings, Combustion Institute 2000*; 28:1783–1791.

Prior Experience

Senior Research Associate at Case Western Reserve University, 2005

Research Associate at Case Western Reserve University, 2002–2005

Graduate Student Instructor at the University of Michigan, Ann Arbor, 2001–2002

Graduate Student Research Assistant at the University of Michigan, Ann Arbor, 1997–2001

Research Assistant at the University of Maryland, College Park, 1997

Peer Reviewer

- *International Journal of Hydrogen Energy*
- *Combust Flame*
- *Combustion Theory and Modeling*
- *Journal of the Optical Society of America*

Professional Affiliations

- National Fire Protection Association:
 - Principal member: Technical Committee on Explosion Protection Systems.
Responsible for NFPA 68 *Standard on Explosion Protection by Deflagration Venting* and NFPA 69 *Standard on Explosion Prevention Systems*.
- National Association of Fire Investigators (member)
- Massachusetts chapter of the International Association of Arson Investigators (member)
- The Combustion Institute (member)
- American Institute of Aeronautics and Astronautics (member)