

**Daniel W. Mattison, Ph.D., P.E.**  
**Managing Engineer**

**Professional Profile**

Dr. Daniel Mattison is a Managing Engineer in Exponent's Thermal Engineering practice. His responsibilities include the investigation of fire cause and origin, explosions, and detonations. Dr. Mattison has experience investigating product failures in the home appliance and automotive industry. Specializing in experimental techniques for laser-diagnostics for combustion, his background includes a strong foundation in combustion, thermodynamics, heat transfer (micro-scale and classical), gas dynamics, chemistry, spectroscopy, optics, environmental chemistry, experimental methods, and data acquisition and processing. Dr. Mattison studies advanced internal combustion engine strategies and modern air-breathing rocket engines.

Prior to joining Exponent, Dr. Mattison was a Research Assistant in the High Temperature Gas Dynamics Laboratory at Stanford University, where his research focused on the development and application of laser-based sensors for harsh combustion environments such as advanced rocket engines and internal combustion engines. As a part of his graduate studies, he collaborated with and conducted experiments at Sandia National Laboratories (Livermore, CA), The Naval Postgraduate School (Monterey, CA), Wright-Patterson Air Force Base (Dayton, OH), and The University of Michigan (Ann Arbor, MI). Dr. Mattison also served as a Teaching Assistant for a graduate level course. Before joining Stanford, he conducted research at the University of Illinois at Urbana-Champaign on solid propellant combustion instabilities and fuel-droplet vaporization in internal-combustion engines.

**Academic Credentials and Professional Honors**

Ph.D., Mechanical Engineering, Stanford University, 2006  
M.S., Mechanical Engineering, Stanford University, 2002  
B.S., Mechanical Engineering, University of Illinois at U.C. (*with highest honors*), 2000

National Science Foundation, Graduate Research Fellowship, 2000–2003; O.A. Leutwiler Award for Outstanding Senior, UIUC ME department, 2000; Thiokol Award for Outstanding Senior Design Project, UIUC ME department, 2000

**Licenses and Certificates**

Registered Professional Mechanical Engineer, California, #35808

Fire Investigation Training (1A—Cause and Origin) State of California, Office of State Fire Marshal; Hazardous Waste Operations and Emergency Response Training, 29 CFR 1910.120; Confined Space Entry Training

## Publications

Kemal A, Mattison DW, Murray S, Loose M. Degradation and ignition of polyvinyl chloride wire insulation. *Proceeding, Fire and Materials 2007*, San Francisco, CA, 2007.

Hanson RK, Mattison DW, Ma L, Davidson DF, Sanders ST. Laser diagnostics and combustion chemistry for pulse detonation engines. *Combustion Processes in Propulsion*, Chapter 10, pp. 365–376, Roy G (ed), Elsevier Press, 2006.

Mattison DW. Development and application of laser-based sensors for harsh combustion environments. Ph.D. Thesis, Stanford University, March 2006.

Mattison DW, Jeffries JB, Hanson RK, Steeper RR, De Zilwa S, Dec JE, Sjoberg MJ, Hwang W. In-cylinder gas temperature and water concentration measurements in HCCI engines using a multiplexed-wavelength diode-laser system: Sensor development and initial demonstration. *Proceedings, Combustion Institute*, Vol. 31, 2006.

Mattison DW, Oehlschlaeger MA, Morris CI, Owens ZC, Barbour EA, Jeffries JB, Hanson RK. Evaluation of pulse detonation engine modeling using laser-based temperature and OH measurements. *Proceedings, Combustion Institute*, Vol. 30, pp. 2799–2807, 2005.

Owens ZC, Mattison DW, Barbour EA, Morris CI, Hanson RK. PDE flowfield characterization and simulation validation using cesium-based velocimetry. *Proceedings, Combustion Institute*, Vol. 30, pp. 2791–2798, 2005.

Jeffries JB, Schulz C, Mattison DW, Oehlschlaeger MA, Bessler WG, Lee T, Davidson DF, Hanson RK. UV absorption of CO<sub>2</sub> for temperature diagnostics of hydrocarbon combustion applications. *Proceedings, Combustion Institute*, Vol. 30, pp. 1591–1599, 2005.

Mattison DW, Brophy CM, Sanders ST, Ma L, Hinckley KM, Jeffries JB, Hanson RK. Pulse detonation engine characterization and control using tunable diode-laser sensors. *J Prop Power* 2003; 19:568–572.

Sanders ST, Mattison DW, Jeffries JB, Hanson RK. Time-of-flight diode-laser velocimeter using a locally seeded atomic absorber: Application in a pulse detonation engine. *Shock Wave* 2003; 12:435–441.

Sanders ST, Mattison DW, Ma L, Jeffries JB, Hanson RK. Wavelength-agile diode-laser sensing strategies for monitoring gas properties in optically harsh flows: Application in cesium-seeded pulse detonation. *Opt Express* 2002; 10:505–514.

Sanders ST, Mattison DW, Jeffries JB, Hanson RK. Sensors for high-pressure, harsh combustion environments using wavelength-agile diode lasers. *Proceedings, Combustion Institute*, Vol. 29, pp. 161–166, 2002.

Sanders ST, Mattison DW, Jeffries JB, Hanson RK. Rapid temperature-tuning of a 1.4  $\mu\text{m}$  diode laser with application to high-pressure  $\text{H}_2\text{O}$  absorption spectroscopy. *Optics Letters* 2001; 26:1568–1570.

Barbour EA, Mattison DW, Owens ZC, Hanson RK, Morris CI. A pulsed detonation tube with a converging-diverging nozzle. 43<sup>rd</sup> Aerospace Sciences Meeting, Paper AIAA-2005-1307, Reno, NV, January 2005.

Mattison DW, Liu JTC, Jeffries JB, Hanson RK, Brophy CM, Sinibaldi JO. Tunable diode-laser temperature sensor for evaluation of a valveless pulse detonation engine. 43<sup>rd</sup> Aerospace Sciences Meeting, Paper AIAA-2005-0224, Reno, NV, January 2005.

Barbour E, Oehlschlaeger MA, Mattison DW, Davidson DF, Schulz C, Jeffries JB, Hanson RK. UV absorption of  $\text{CO}_2$  for temperature diagnostics. Presented at LACEA, Annapolis, MD, February 2004.

Mattison DW, Oehlschlaeger MA, Jeffries JB, Hanson RK. Pulse detonation tube characterization using laser absorption spectroscopy. 41<sup>st</sup> Aerospace Sciences Meeting, Paper AIAA 2003-0713, Reno, NV, January 2003.

Mattison DW, Oehlschlaeger MA, Jeffries JB, Hanson RK. Pulse detonation tube characterization using laser absorption spectroscopy. 39<sup>th</sup> AIAA/ASME/SAE/ASEE Joint Propulsion Conference, Paper AIAA-2003-4685, Huntsville, AL, July 2003.

Jeffries JB, Sanders ST, Zhou X, Ma L, Mattison DW, Hanson RK. Scanned-wavelength diode sensors for harsh environments. SPIE Conference on Diode Laser Sensors and Applications Vol. 4817, Seattle, WA, July 2002.

Sanders ST, Thurichengode MM, Ma L, Mattison DW, Hanson RK. Diode laser sensors for detonation flows. 23<sup>rd</sup> International Symposium on Shock Waves, July 2001.

Mattison DW, Sanders ST, Jeffries JB, Hanson RK. Diode-laser sensors for pulse detonation engine applications. 40<sup>th</sup> Aerospace Sciences Meeting, Paper AIAA-2002-0471, Reno, NV, January 2002.

Sanders ST, Mattison DW, Ma L, Hanson RK. Diode-laser sensors for pulse detonation engines. 2001 Joint Meeting of Combustion Institute, Paper 2001-143, Oakland, CA, March 2001.

## **Presentations**

Mattison DW. Fiber optic-based tunable diode laser sensors for harsh combustion environments: Internal combustion and pulse detonation engines. Gordon Research Conference on Laser Diagnostics in Combustion, South Hadley, MA, August 2005.

Mattison DW. Tunable diode laser sensors for harsh combustion environments with applications to pulse detonation engines and internal combustion engines. Joint Meeting of US Sections of Combustion Institute, Philadelphia, PA, March 2005.

Mattison DW. Tunable diode-laser temperature sensor for evaluation of a valveless pulse detonation engine. 43<sup>rd</sup> AIAA Aerospace Sciences Meeting and Exhibit, Reno, NV, January 2005.

Mattison DW. Evaluation of pulse detonation engine modeling using laser-based temperature and OH measurements. 30<sup>th</sup> International Symposium on Combustion, Chicago, IL, July 2004.

Mattison DW. UV optical diagnostics for PDE applications. 39<sup>th</sup> AIAA/ASME/SAE/ASEE Joint Propulsion Conference and Exhibit, Huntsville, AL, July 2003.

Mattison DW. Pulse detonation tube characterization using laser absorption spectroscopy. 41<sup>st</sup> AIAA Aerospace Sciences Meeting and Exhibit, Reno, NV, January 2003.

Mattison DW. Diode-laser sensors for pulse detonation engine applications. 40<sup>th</sup> AIAA Aerospace Sciences Meeting, Reno, NV, January 2002.

Mattison DW. Diode-laser sensors for pulse detonation engine characterization and control. 29<sup>th</sup> International Symposium on Combustion, Sapporo, Japan, July 2002.

### **Professional Affiliations**

- The Combustion Institute (member)
- American Institute of Aeronautics and Astronautics (member)
- Pi Tau Sigma Mechanical Engineering Honor Society (member)
- Tau Beta Pi Engineering Honor Society (member)