

## TARIQ SHAMIM, PH.D., P.E.

Associate Professor  
Department of Mechanical Engineering  
The University of Michigan-Dearborn  
Dearborn, MI 48128-1491

E-mail: shamim@umich.edu

Phone: (313) 593-0913

URL: <http://www-personal.engin.umd.umich.edu/~shamim>

Fax: (313) 593-3851

---

### RESEARCH INTERESTS

- Combustion and Advanced Energy Systems (In Cylinder Combustion Modeling; Flamelet Modeling; Flame Dynamics; Fuel Cell Modeling; Thermal Spray)
- Emission Control Techniques for Gasoline, Diesel and Alternative Fuel-Powered Vehicles (Catalytic Converter, NOx Trap, SCR and Diesel Particulate Filter Modeling)
- Computational Heat Transfer and Fluid Flow (CFD)

### EDUCATION

- **Ph.D.**, in Mechanical Engineering, The University of Michigan, Ann Arbor, MI, 1997
- **M.S.**, in Aerospace Engineering, The University of Michigan, Ann Arbor, MI, 1996
- **M.S.**, in Mechanical Engineering, University of Windsor, Ontario, Canada, 1992
- **B.Eng.**, in Mechanical Engineering, N.E.D. Univ. of Eng. & Tech, Karachi, Pakistan, 1988

### POSITIONS HELD

- **Associate Professor (tenured)**, Department of Mechanical Engineering, The University of Michigan-Dearborn, Dearborn, MI (Sep '03 – present)
- **Assistant Professor**, Department of Mechanical Engineering, The University of Michigan-Dearborn, Dearborn, MI (Sep '97 – Aug '03)
- **Visiting Professor**, Department of Automotive Engineering, N.E.D University of Engineering & Technology, Karachi, Pakistan (Dec '08 – Jan '09; Dec '05 – Jan '06)
- **Visiting Professor**, Department of Mechanical Engineering, National University of Singapore, Singapore (Jul '04 – Dec '04)
- **DOE Summer Faculty Fellow**, Oak Ridge National Laboratory, Oak Ridge, TN (Jun '08 – Aug '08; Jul '03 – Aug '03)
- **Faculty Intern**, Engine Simulations Group, Ford Scientific Research Laboratory, Ford Motor Company, Dearborn, MI (Jun '00 – Aug '00)
- **Graduate Student Research Assistant and Instructor**, Department of Mechanical Eng & Applied Mechanics, The University of Michigan, Ann Arbor, MI (Jan '93 – Aug '97)
- **Graduate Teaching Assistant**, Dept of Mechanical Engineering, Michigan State University, East Lansing, MI (Sep '92 – Dec '92)
- **Graduate Research and Teaching Assistant**, Dept of Mechanical Engineering, University of Windsor, Windsor, ON, Canada (Jan '91 – Aug '92)
- **Graduate Research and Teaching Assistant**, Dept of Mechanical Engineering, King Fahd University of Petroleum & Minerals, Dhahran, Saudi Arabia (Sep '89 – Nov '90)
- **Project Engineer**, Fauji Fertilizer Co. Ltd, Rawalpindi, Pakistan (Apr '89 – Aug '89)
- **Trainee Engineer**, Siemens Engineering Co. Ltd, Karachi, Pakistan (Apr '88 – Apr '89)

### RECENT PUBLICATIONS

#### *Journal Articles*

- Noorani, S. and Shamim, T., “Transient Response of a Polymer Electrolyte Membrane Fuel Cell Subjected to Time-Varying Modulating Conditions,” (conditionally accepted) *Journal of Fluid*

- Dynamics and Material Processing*, 2009.
- Shamim, T., "Effect of Oxygen Storage Capacity on the Dynamic Characteristics of an Automotive Catalytic Converter," *Energy Conversion & Management*, 49(11):3292-3300, 2008.
  - Shamim, T., "Effect of Engine Exhaust Temperature Modulations on the Performance of Automotive Catalytic Converters," *ASME Journal of Engineering for Gas Turbines and Power*, 130(1):012801, 2008.
  - Khan, M. R. S., and Shamim, T., "A Numerical Investigation of Regeneration Characteristics of Diesel Particulate Filters under Simulated Transient Exhaust Conditions," *Proc. Inst. Mech. Eng. – Part D: Journal of Automobile Engineering*, 222(12):2469-2485, 2008.
  - Shamim, T., Xia, C., and Mohanty, P., "Modeling and Analysis of Combustion Assisted Thermal Spray Processes," *International Journal of Thermal Sciences*, 46(8):755-767, 2007.
  - Vorobev, A., Zikanov, O., and Shamim, T., "A Computational Model of a PEM Fuel Cell with Finite Vapor Absorption Rate," *Journal of Power Sources*, 166:92-103, 2007.
  - Shamim, T., "Effect of Unequal Fuel and Oxidizer Lewis Numbers on Flame Dynamics," *International Journal of Thermal Sciences*, 45(12):1213-1223, 2006.
  - Gaustad, M. D., and Shamim, T., "A Numerical Study of the Effects of Radiative Heat Losses on Diffusion Flames," *Proc. Inst. Mech. Eng. – Part C: Journal of Mechanical Engineering Science*, 220(8):1189-1199, 2006.
  - Shamim, T., "Dynamic Response of Automotive Catalytic Converters to Modulations in Engine Exhaust Compositions," *International Journal of Engine Research*, 6(6):557-567, 2005.
  - Shamim, T., "The Effect of Space Velocity on the Dynamic Characteristics of an Automotive Catalytic Converter," *SAE Transactions – Journal of Fuels and Lubricants* Vol. 114(4):974-982, 2005 (also presented at 2005 Spring Fuels and Lubricants Meeting & Exposition, Rio de Janeiro, Brazil, SAE 2005-01-2160).
  - Shamim, T., "Effect of Heat and Mass Transfer Coefficients on the Performance of Automotive Catalytic Converters," *International Journal of Engine Research*, 4(2):129-141, 2003.
  - Shamim, T., and Medisetty, V., "Dynamic Response of Catalytic Converters to Changes in Air-Fuel Ratio," *ASME J. of Engineering for Gas Turbines and Power*, Vol. 125 (2):547-554, 2003.
  - Shamim, T., and Shen, H., "Effect of Geometric Parameters on the Performance of Automotive Catalytic Converters," *International Journal of Science and Technology*, 14:15-22, 2003.
  - Shamim, T., Shen, H., Sengupta, S., Son, S., and Adamczyk, A. A., "A Comprehensive Model to Predict a Three-Way Catalytic Converter Performance," *ASME Journal of Engineering for Gas Turbines and Power*, 124:421-428, 2002.
  - Shamim, T., "Effect of Lewis Number on Radiative Extinction and Flamelet Modeling," *International Journal of Heat and Mass Transfer*, 45(6):1249-1259, 2002.
  - Shamim, T., Shen, H., and Sengupta, S., "Comparison of Chemical Kinetic Mechanisms in Simulating the Emission Characteristics of Catalytic Converter," *SAE Transactions – Journal of Fuels and Lubricants* Vol. 109(4):1700-1708, 2000 (also presented at 2000 International Spring Fuels and Lubricants Meeting & Exposition, Paris, France, SAE 2000-01-1953).
  - Shamim, T., and Atreya, A., "The Effect of Time Dependent Partial Premixing in Radiating Flamelets," *Combustion & Flame*, 123:241-251, 2000.
  - Shamim, T., and Atreya, A., "Transient Response of a Radiating Flamelet to Changes in Global Stoichiometric Conditions," *Combustion & Flame*, 121:59-74, 2000.
  - Atreya, A., Zhang, C., Kim, H.K., Shamim, T., and Suh, J., "The Effect of Changes in the Flame Structure on the Formation and Destruction of Soot and NO<sub>x</sub> in Radiating Diffusion Flames," *Proceedings of Combustion Institute*, 26:2181-2189, 1996.
  - Shamim, T., and McDonald, T.W., "An Experimental Study of Heat Transfer through Liquid Foam," *ASHRAE Transactions*, Vol. 101, Part I, pp. 150-157, 1995.

### Book Chapters

- Shamim, T., "Modeling of Three-Way Catalytic Converter System," in: *Technologies for Near-Zero-Emission Gasoline-Powered Vehicle*, Zhao, F. (editor), SAE, Warrendale, PA, 2006.
- Shamim, T., "Catalytic Converter System Modeling," in: *Advanced Developments in Ultra-Clean Gasoline-Powered Vehicles*, Zhao, F. (editor), SAE, Warrendale, PA, 2004.

### Refereed Conference Proceedings

- Noorani, S. and Shamim, T., "Transient Response of a Polymer Electrolyte Membrane Fuel Cell Subjected to Time-Varying Modulating Conditions," *Proceedings of the Fourth International Conference on Thermal Engineering: Theory and Applications ICTEA 2009*, Abu Dhabi, UAE, Jan 12 – 14, 2009.
- Shamim, T., "Effect of Oxygen Storage Capacity on the Dynamic Characteristics of an Automotive Catalytic Converter," *Third International Conference on Thermal Engineering: Theory and Applications ICTEA 2007*, Amman, Jordan, May 20 – 23, 2007.
- Shamim, T., "Control of Cold Start Emissions through Modulation of Engine Exhaust Gases," *SAE 2006 World Congress*, Detroit, MI, SAE Paper 2006-01-0627, 2006.
- Shamim, T., "Effect of Engine Exhaust Temperature Modulations on the Performance of Automotive Catalytic Converters," *Proceedings of the 2006 ASME Internal Combustion Engine Division Conference*, Aachen, Germany, Paper ICES2006-1413, 2006.
- Khan, M. R. S., and Shamim, T., "Regeneration Characteristics of Diesel Particulate Filters under Transient Exhaust Conditions," *Proceedings of the 2005 ASME Internal Combustion Engine Division Conference*, Chicago, Illinois, Paper ICES2005-1069, 2005.
- Xia, C., Shamim, T., and Mohanty, P., "Modeling of Combustion Assisted Thermal Spray Processes," *Proceedings of the International Thermal Spray Conference 2005*, Basel, Switzerland, pp. 1324-1329, 2005.
- Shamim, T., "Modeling and Simulations of Automotive Catalytic Converters," *Proceedings of the IEEE-INMIC 2004 Eighth International Multitopic Conference*, Lahore, Pakistan, Paper # 1114, 2004.
- Shamim, T., "Dynamic Response of Automotive Catalytic Converters to Modulations in Engine Exhaust Compositions," *Proceedings of the 2003 ASME Internal Combustion Engine Division Conference*, Salzburg, Austria, Paper ICES2003-669, 2003.
- Shamim, T., and Medisetty, V., "Dynamic Response of Catalytic Converters to Changes in Air-Fuel Ratio," *Proceedings of the 2001 Fall Technical Conference, ICE Division of the ASME*, Vol. 37-3:1-8, ASME, New York, 2001.
- Shamim, T., and Medisetty, V. C., "Prediction of the Dynamic Response of Automotive Catalytic Converters with the Simplified Chemical Kinetics," *Proceedings of the Thirty-Seventh Heat Transfer and Fluid Mechanics Institute*, Sacramento, CA, 37:1-8, 2001.
- Sengupta, S., Shen, H., and Shamim, T., "Emission Characteristics of Catalytic Converters during Various Test Cycles," *Fourth ISHMT/ASME Heat and Mass Transfer Conference*, Pune, India, Jan 12-14, 2000.
- Shen, H., Shamim, T., and Sengupta, S., "An Investigation of Catalytic Converter Performance during Cold Starts," *1999 International Fall Fuels and Lubricants Meeting & Exposition*, Toronto, Canada, SAE Paper 1999-01-3473, 1999.
- Shen, H., Shamim, T., and Sengupta, S., Son, S., Adamczyk, A. A., "Performance Simulations of Catalytic Converters During the Federal Test Procedure," *Proceedings of the ASME National Heat Transfer Conference*, Albuquerque, NM, Aug 15-17, Paper NHTC99-230, 1999.
- Shen, H., Shamim, T., and Sengupta, S., "Performance Analysis and Design Optimization of Catalytic Converters," *Proceedings of the Thirty-Sixth Heat Transfer and Fluid Mechanics Institute*, Sacramento, 36:133-142, 1999.

- Shamim, T., and Atreya, A., "Numerical Simulations of Radiative Extinction of Unsteady, Strained Diffusion Flames," *Proceedings of the ASME Heat Transfer Division*, ASME IMECE, San Francisco, CA, HTD Vol.317-2, pp. 69-74, 1995.

*Non-Refereed Conference Proceedings*

- Kapas, N., Shamim, T., and Laing, P., "Effect of Mass Transfer on the Performance of Selective Catalytic Reduction (SCR) Systems," *Proceedings of the 2008 Technical Meeting of the Central States Section of The Combustion Institute*, Tuscaloosa, AL, paper # C1-2, 2008.
- Shamim, T., "The Effect of Oxygen Storage Capacity on the Dynamic Characteristics of an Automotive Catalytic Converter," *Proceeding of the Fifth Joint Technical Meeting of the United States Sections of the Combustion Institute*, San Diego, CA, paper # D-24, 2007.
- Xia, C., Shamim, T., and Mohanty, P., "Gas Phase Dynamics of Combustion Assisted Thermal Spray Processes," *Proceeding of the Fourth Joint Technical Meeting of the United States Sections of the Combustion Institute*, Philadelphia, PA, paper # 1101, March 20-23, 2005.
- Khan, M. R. S., and Shamim, T., "Effect of Transient Exhaust Condition on Thermal Regeneration of Diesel Particulate Filters," *Proceedings of the 2004 Technical Meeting of the Central States Section of the Combustion Institute*, Austin, TX, paper # C1-7, March 21-23, 2004.
- Shamim, T., "Dynamic Response of Automotive Catalytic Converters to Modulations in Engine Exhaust Compositions," *Proceeding of the Third Joint Technical Meeting of the United States Sections of the Combustion Institute*, Chicago, IL, paper # PM08, 2003.
- Shamim, T., and Khan, M. R. S., "Computational Modeling of Diesel Particulate Filters," *Proceeding of the Third Joint Technical Meeting of the United States Sections of the Combustion Institute*, Chicago, IL, paper # PM07, 2003.
- Shamim, T., "Effect of Lewis Number on Radiative Extinction and Flamelet Modeling," *Proceedings of the Meeting of the Central States Section of the Combustion Institute*, Knoxville, TN, paper # B2.3, 2002.
- Shamim, T., and Medisetty, V. C., "Dynamic Response of Automotive Catalytic Converters: The Role of Chemical Kinetic Mechanisms," *Proceeding of the Second Joint Technical Meeting of the United States Sections of the Combustion Institute*, Oakland, CA, paper # 274, 2001.
- Shamim, T., Medisetty, V. C., and Shen, H., "Dynamic Response of Catalytic Converters Subjected to Changes in Air-Fuel Ratio," *Proceedings of the Meeting of the Central States Section of the Combustion Institute*, Indianapolis, IN, pp. 389-394, 2000.
- Shamim, T., "Effect of Lewis Number on Radiative Extinction and Flamelet Modeling," *Fifth International Micro-Gravity Workshop*, Cleveland, OH, NASA Conference Publication 1999-208917, pp. 365-368, 1999.
- Shen, H., Shamim, T., and Sengupta, S., "A Numerical Study of Catalytic Converter Performance During the Federal Test Procedure," *Proceedings of the First Joint Technical Meeting of the United States Sections of the Combustion Institute*, Washington, DC, pp. 777-780, 1999.
- Shamim, T., "The Effect of Lewis Number on Radiative Extinction and Flamelet Modeling," *Spring Technical Meeting of the Central States Section of the Combustion Institute*, Lexington, KY, pp. 333-338, 1998.
- Shamim, T., and Atreya, A., "The Effect of Time Dependent Partial Premixing in Radiating Flamelets," *Proceedings of the Spring Technical Meeting of the Central States Section of the Combustion Institute*, Point Clear, AL, pp. 279-284, 1997.
- Zhang, C., Atreya, A., Kim, H.K., Suh, J., and Shamim, T., "The Effect of Flame Structure on Soot Inception, Growth and Oxidation in Counterflow Diffusion Flames," *Proceedings of the 1996 Technical Meeting of the Central States Section of the Combustion Institute*, Thirtieth Section Anniversary Technical Meeting, St. Louis, MO, pp. 151-156, 1996.
- Zhang, C., Atreya, A., Shamim, T., Kim, H.K., and Suh, J., "Measurements of OH, CH, C<sub>2</sub> and

- PAH in Laminar Counterflow Diffusion Flames," *Proceedings of the 1996 Technical Meeting of the Central States Section of the Combustion Institute*, Thirtieth Section Anniversary Technical Meeting, St. Louis, MO, pp. 157-162, 1996.
- Shamim, T., and Atreya, A., "Dynamic Response of Radiating Flamelets Subject to Variable Reactant Concentrations," *Proceedings of the 1996 Technical Meeting of the Central States Section of the Combustion Institute*, St. Louis, MO, pp. 503-508, 1996.
  - Shamim, T., and Atreya, A., "A Study of the Effects of Radiation on Transient Extinction of Strained Diffusion Flames," *Joint Technical Meeting of Combustion Institute*, San Antonio, TX, pp.553-558, 1995.
  - Atreya, A., Agrawal, S., Shamim, T., Pickett, K., Sacksteder, K.R., and Baum, H.R., "Radiant Extinction of Gaseous Diffusion Flames," *Third International Micro-Gravity Workshop*, Cleveland, OH, NASA Conference Publication 10174, pp. 319-325, 1995.

## RECENT FUNDING SOURCES

- National Science Foundation (NSF)
- US Department of Defense (DOD)
- Ford Motor Company
- Nissan Motor Company
- Oak Ridge National Laboratory
- Visteon
- Ameritech
- Center for Engineering Education & Practice (CEEP)
- University of Michigan, Ann Arbor and Dearborn

## PROFESSIONAL ACTIVITIES

- *Member Editorial Board*, Proceedings of the Combustion Institute Volume 28
- *Member Editorial Board*, JP Journal of Heat and Mass Transfer
- *Member Editorial Board*, The Open Fuels and Energy Science Journal
- *Member*, Board of Associates of the ASME Internal Combustion Engine Division, ASME K-11 Committee on Combustion and K-20 Committee on Computational Heat Transfer, SAE Transactions Committee on Diesel Combustion
- *Journal Reviewer*, Combustion & Flame, Combustion Science & Technology, Applied Catalysis, SAE Transactions, Advances in Chemical Engineering, Chemical Engineering Communications, Industrial & Engineering Chemistry Research, ASME Journal of Engineering for Gas Turbines and Power, ASME Journal of Dynamic Systems, ASME Journal of Heat Transfer, Measurement and Control, Transactions of ASABE, International Journal of Thermal Sciences, International Journal of Heat and Mass Transfer, International Journal of Hydrogen Energy, Proceedings of the Combustion Institute Volumes 29-31
- *Book Reviewer*, McGraw Hill, John Wiley, Kluwer Academic Publishers
- *Proposal Reviewer*, National Science Foundation (NSF), International Science Center for the US State Department, The Netherlands Research Council for Chemical Sciences (CW), Ontario Center of Excellence, University of California Energy Institute
- *External Reviewer for Promotion & Tenure*, Department of Mechanical Engineering, Indiana University-Purdue University Indianapolis
- *Presenting Panelist*, Workshop on "Computational Catalysis for the Automotive Industry: The Scientific Research Needs and Agenda," Sponsored by the US DOE Office of Science, Dearborn, MI, June 7-8, 1999
- *Workshop Host*, Eighth, Ninth, Tenth and Eleventh DOE Crosscut Workshops on Lean Emissions Reduction Simulation, Dearborn, MI, May 2005, 2006, 2007, and 2008

- *Session Organizer and Chair*, “Aftertreatment Systems Modeling and Testing” at the ASME Internal Combustion Engine Division 2006 Spring Technical Conference, Aachen, Germany
- *Session Organizer and Chair*, “Aftertreatment Technologies” at the ASME Internal Combustion Engine Division 2005 Fall Technical Conference, Ottawa, Canada
- *Session Chair and Organizer*, “Internal Combustion Engines” at the 2000 Central States Combustion Institute Meeting; “EGR and Emission Control” at the ASME Internal Combustion Engine Division 2002 Fall Technical Conference New Orleans, “Heterogeneous Combustion III” at the 4th Joint Meeting of the Combustion Institute
- *Member*, American Society of Mechanical Engineers (ASME), Society of Automotive Engineers (SAE), Combustion Institute (CI), American Society for Engineering Education (ASEE), Sigma Xi, The Scientific Research Society

## HONORS AND SPECIAL ACHIEVEMENTS

- US Department of Energy (DOE) Summer Faculty Fellowship (2008 and 2003)
- Selected as the Editorial Board Member of The Open Fuels and Energy Science Journal (2008)
- Selected as the Michigan Memorial Phoenix Energy Institute’s Faculty Affiliate (2007)
- Selected as the Editorial Board Member of JP Journal of Heat and Mass Transfer (2006-09)
- Elected Chair of the University of Michigan-Dearborn Faculty Senate (2008-09; 2006-07)
- Elected Vice Chair of the University of Michigan-Dearborn Faculty Senate (2005-06)
- N.E.D. University of Eng. & Tech., Karachi, Visiting Faculty Fellowship (2005)
- Society of Automotive Engineers (SAE) Ralph Teetor Award (2004)
- National University of Singapore, Visiting Faculty Fellowship (2004)
- Elected to the Board of Associates of ASME I.C. Engine Division (2002)
- Registered Professional Engineer, State of Michigan (2002)
- Rackham Faculty Fellowship, The University of Michigan, Ann Arbor (2000)
- Listed in *Who's Who in Science and Engineering*, and *International Who's Who of Professionals* (2000); *Who's Who in America 2001* (2001)
- Completed graduate education with a GPA between A and A+, The University of Michigan, Ann Arbor (1997)
- NASA/DOE Research Assistantship, The University of Michigan, Ann Arbor (1993–97)
- Graduate Fellowship, Michigan State University, East Lansing, MI (1992)
- University of Windsor Postgraduate Scholarship, Ontario, Canada (1991–92)
- Offered Quaid-e-Azam Aligarh Trust Scholarship, Karachi, Pakistan (1989)
- Career Forum Scholarship, Karachi, Pakistan (1988)
- Graduated from N.E.D. University in top 2% rank, Karachi, Pakistan (1988)
- Fauji Foundation Merit Scholarship, Rawalpindi, Pakistan (1982–86)