

Joseph P. Feser

**Assistant Professor
University of Delaware
Mechanical Engineering Department**

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Areas of Expertise

Microscale thermal transport phenomena, experimental characterization of thermal properties, thermoelectric materials, experimental fluid mechanics, microfabrication, PEM fuel cells, ultrafast lasers.

Education

University of California – Berkeley Berkeley, CA
Ph.D. Mechanical Engineering December 2010
GPA: 3.7/4.0
Thesis: *Scalable Routes to Efficient Nanostructured Thermoelectrics*
Advisors: Arun Majumdar and Rachel Segalman

University of Delaware Newark, DE
M.S. Mechanical Engineering August 2005
GPA: 3.9/4.0
Thesis: *Convective Flow Through Polymer Electrolyte Fuel Cells*
Advisors: Ajay Prasad and Suresh Advani

Honors Bachelor of Mechanical Engineering May 2003
GPA: 3.6/4.0
Minor: Mathematics

Post-Doctoral Experience

Post-Doctoral Researcher Jan 2011- Aug 2013
University of Illinois. Urbana-Champaign
Department of Materials Science and Engineering
Advisor: Department Head, Prof. David Cahill
Accomplishments:

- Ultrafast high-throughput measurements of thermal materials properties
- Designed and built 2 time-domain thermorefectance systems worth ~\$400K
- Method to measure in-plane thermal properties of sub-20nm thick metal films
- Experimental measurements of roughening induced thermal interface resistance

Technical Skills:

Advanced Experimental Techniques: Time domain thermoreflectance/Picosecond acoustics (TDTR), 3ω thermal conductivity, thin film thermoelectric characterization, Particle Image Velocimetry (PIV), Hot-wire anemometry, Laser Doppler anemometry.

Instrumentation/Automation: Data acquisition/programming via LABVIEW, circuit design, lockin detection, cryogenics

Computational: FORTRAN 77/90/95, C++, MATLAB, ABAQUS, Maple, Mathematica, HTML, Microsoft Office, AutoCADD, parallelization techniques.

Microfabrication: Optical Lithography, Sputtering, Evaporation, CVD, ALD, plasma etching, ion milling, growth furnaces.

Analytical Tools: SEM/EDS, TGA, DSC, XRD, XRR, UV-VIS Spectroscopy, Raman Spectroscopy, RBS, femtosecond lasers & optics.

Publications (reverse chronological order)

Feser JP, DG Cahill, [Time domain thermoreflectance of multilayers with arbitrary thermal conductivity tensors and beam intensity profiles](#), in preparation

Hohensee GT, Wilson RB, Feser JP, Cahill DG, [Magnon-phonon coupling in Ca₉La₅Cu₂₄O₄₁ Spin Ladders Measured by Time-Domain Thermoreflectance](#), in preparation

[16] Wilson RB, Feser JP, Hohensee GT, Cahill DG, [Two-channel model for nonequilibrium thermal transport in pump-probe experiments](#), *Physical Reviews B*, 88, pg 144305 (2013)

[15] Chen P, Katcho, NA, Feser JP, Li W, Glaser M, Schmidt OG, Cahill DG, Mingo N, Rastelli A, [Role of Surface-Segregation-Driven Intermixing on the Thermal Transport through Planar Si/Ge Superlattices](#), *Physical Review Letters*, 111, pg 115901 (2013)

[14] Feser JP*, Xu D*, Lu H, Shakouri A, Gossard A, Majumdar A [Reduced thermal conductivity in Er-doped epitaxial In_xGa_{1-x}Sb alloys](#), *Applied Physics Letters*, 103, pg 103102 (2013) (* contributed equally)

[13] Weisensee PB, Feser JP, Cahill DG, [Effect of Ion Irradiation on the Thermal Conductivity of UO₂ and U₃O₈ epitaxial layers](#), *Journal of Nuclear Materials*, 443(1), pg 212-217 (2013).

[12] Feser JP, Chan E., Majumdar A, Segalman RA, Urban JJ, [Ultralow Thermal](#)

[Conductivity in Polycrystalline CdSe Thin Films with Controlled Grain Size](#), *Nano Letters*, 13(5), 2122 (2013)

[11] Feser JP, Hsu KH, Sadhu J.S., Azeredo BP, Hsu KH, Ma J, Kim J, Seong M, Fang NX, Li X, Ferreira PM, Sinha S, Cahill DG, [Thermal Conductivity of Silicon Nanowire Arrays with Controlled Roughness](#), *Journal of Applied Physics*, 112, 114306 (2012)

[10] Feser JP, Cahill DG, [Probing Anisotropic Heat Transport using Time-Domain Thermoreflectance with Offset Laser Spots](#), *Review of Scientific Instruments*, 83, 104901 (2012).

[9] See K, Feser JP, Chen C, Majumdar A, Segalman RA, Urban JJ, [Water-Processable Polymer-Nanocrystal Hybrids for Thermoelectrics](#), *Nano Letters*, 10(11), (2010).

[8] Zide, JMO, Bahk J-H, Singh R, Zebarjadi M, Zeng G, Lu H, Feser JP, Xu D, Singer SL, Bian ZX, Majumdar A, Bowers JE, Shakouri A, Gossard AC, [High Efficiency Semimetal/Semiconductor Nanocomposite Thermoelectric Materials](#), *Journal of Applied Physics*, 108(12), 123702, (2010)

[7] Wang R, Feser JP, Gu X, Yu K.M., Segalman RA, Majumdar A, Milliron D.J., Urban JJ, [A Universal and Solution-Processable Precursor to Bismuth Chalcogenide Thermoelectrics](#), *Chemistry of Materials*, 22(6): 1943-1945 (2010)

[6] Bahk J-H, Bian ZX, Zebarjadi M, Zide JMO, Lu H, Xu D, Feser JP, Zeng G, Majumdar A, Gossard AC, Shakouri A, Bowers JE, [Thermoelectric Figure of Merit of \$\(\text{In}_{0.52}\text{Ga}_{0.47}\text{As}\)_{0.8}\(\text{In}_{0.52}\text{Ga}_{0.48}\text{As}\)_{0.2}\$ III-V Semiconductor Alloys](#), *Physical Review B*, 235209 (2010)

[5] Sun J, Yeh M, Jung BJ, Feser JP, Majumdar A, Katz HE, [Simultaneous Increase in Seebeck Coefficient and Conductivity in a Doped Poly\(alkylthiophene\) Blend with Defined Density of States](#), *Macromolecules*, 43 (6): pp2897-2903 (2010)

[4] Wang R, Feser JP, Lee JS, Talapin DV, Segalman RA, Majumdar A, [Enhanced Thermopower in PbSe Nanocrystal Quantum Dot Superlattices](#), *Nano Letters*, 8(8): 2283-2288 (2008)

[3] Feser JP, Prasad AK, Advani SG. [Particle Image Velocimetry Measurements In a Model Proton Exchange Membrane Fuel Cell](#). *Journal of Fuel Cell Science and Technology*, 4(3): 328-335 (2007)

[2] Feser JP, Prasad AK, Advani SG. [Experimental Characterization of In-Plane Permeability of Gas Diffusion layers](#). *Journal of Power Sources*, 162(2): 1226-1231 (2006)

[1] Feser JP, Prasad AK, Advani SG. [On the Relative Influence of Convection in Serpentine Flow Fields of PEM Fuel Cells](#). *Journal of Power Sources*, 161(1): 404-412

(2006)

Invited Presentations

- 1st Workshop on thin film nanostructured thermoelectrics, Linz, Austria, 2012.
- "Measuring the In-Plane Thermal Conductivity of Thin Metallic Layers," Seagate Technology Conclave 2013.

Conference Presentations

- "Analysis and measurement of in-plane flow in PEM fuel cells," 3rd International Fuel Cell Science, Engineering and Technology Conference, 2005.
- "Solution processable routes to nanostructured thermoelectric materials," American Physics Society, March Meeting, 2009
- "Thermal Transport in (Hf,Zr)N-(Sc,Y)N Superlattices," Materials Research Society, Spring Meeting, 2010.
- "Uncertainty Characteristics and Optimization of Thin-Film Thermal Metrology Techniques," ASME Congress, 2011.
- "Heat Transport through CdSe Colloidal Nanocrystal Composites," ASME Congress, 2011.
- "High Throughput Thermal Measurements of Rough Silicon Nanowire Arrays," Materials Research Society, Fall, 2011.
- "High Throughput Thermal Measurements of Rough Silicon Nanowire Arrays," 7th US-Japan Meeting on Nanoscale Transport Phenomena, Shima, Japan, December 2011.
- "Probing anisotropic heat transport using time-domain thermoreflectance with offset laser spots," ASME Congress, 2012.
- "Reduced Thermal Conductance near Surfaces Roughened by Metal Assisted Chemical Etching," Material Research Society, Spring 2012.

Professional Development

- ASME Short Course on Rheology, University of Delaware, 2005.
- 11th National School on Neutron & X-ray Scattering, Oak Ridge and Argonne National Laboratories, 2009.
- Advanced Materials Characterization Workshop, University of Illinois, Urbana-Champaign, 2011.

Professional Engineering Licensure Progress

Engineer in Training (passed Fundamentals of Engineering Exam, Delaware, 2002)

Proposals

- Department of Energy, Molecular Foundry User Facility (2010), "Metal-Semiconductor Nanocomposites for Thermoelectric Applications."
- Department of Energy, Molecular Foundry User Facility (2009), "Solution processing of inorganic nanocomposites for thermoelectric applications using II-VI matrix materials."
- Department of Energy, Molecular Foundry User Facility (2008), "Thermoelectric

Studies of Indium based III-V Semiconducting Quantum Dot Superlattices

- Contributed to Department of Energy, Office of Basic Science, Energy Frontier Research Centers (EFRC) proposal, "Thermal Energy Research Center" (2008).

Active Memberships

American Society of Mechanical Engineers (ASME)

Materials Research Society (MRS)

Honors and Awards

Helwig Graduate Fellowship, 2004

Redden Mechanical Engineering Scholarship, 2002

University of Delaware Honors Program Scholarship, 2002

University of Delaware Scholar Award, 1999-2003