

# Stephen L. Hodson

Curriculum Vitae

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## Education

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**Ph.D. Mechanical Engineering, Purdue University** 2016

Dissertation Title: Carbon Nanotube Thermal Interface Materials and Related Applications

**M.S. Mechanical Engineering, Purdue University** 2011

Thesis Title: Optimization of Carbon-Graphitic Thermal Interface Materials

**B.S. Mechanical Engineering, University of California, Berkeley** 2005

## Professional Experience

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### Senior Lead Engineer

*West Lafayette, IN*

PC Krause and Associates, Inc. **(Request not to contact current employer)**

*2016-present*

- Primarily developed software toolsets for transient modeling of complex thermodynamic power generating and energy transferring systems. Both low and high-level coding languages were mastered to create lean, versatile, high fidelity, and robust predictive tools that design and hardware engineers utilize to efficiently and effectively prototype complex physical systems or explore more extensive design spaces in a clickable, intuitive, and easily paramaterizable software environment.
- Parallel tasks included establishing and executing critical verification studies as well as performing validation on transient, instrumented data in order to assess the model or toolset's predictive capabilities in dynamic environments and provide clients with valuable information or helpful recommendations on system design.
- A diverse and solid understanding of fundamentals across a wide range of disciplines (e.g, chemical, electrical, hydraulic, mechanical, thermodynamic, and computer science) enabled development and execution of creative and versatile approaches in order to meet customer needs.
- Required efficient organizational skills to understand, maintain, and improve hierarchical filesystems associated with a given toolset or model. The efficient work flow was balanced with meticulous attention to detail that was required at every level of model development.
- Client based and team oriented work flow was driven by aggressive deadlines to update clients weekly and provide monthly or quarterly reported documents.

### Doctoral Research Intern

*Albuquerque, NM*

Thermal/Fluid Experimental Sciences

*2014 - 2016*

Sandia National Laboratories

- Built, modified, and maintained a custom measurement system to determine thermal properties of various materials in extreme temperature regimes or other abnormal ambient conditons.
- Established software capability to acquire instrumented data and perform nonlinear regression in real-time with a black box model. A robust statistical tool was built as an auxiliary feature to track error propagation in the fitted parameters and report statistical metrics.
- Fostered resourceful and professional connections with vendors to maintain continuous functionality of measurement system.

- Composed technical documentation for quarterly-reviewed phases.
- Served as an engaged contributor on a multi-disciplinary team by providing measurement results and conveying technical interpretation.
- Mentored undergraduate student intern on engineering practices and principles within the scopes of the projects.

#### **Graduate Research Assistant**

Nanoscale Transport Research Group  
Birk Nanotechnology Center, Purdue University

*West Lafayette, IN  
2008 - 2016*

- Developed characterization and fabrication methods for graphitic nanostructures and evaluated their performance when integrated with current and emerging electronic, mechanical, and thermal devices.
- Built and refined metrology techniques to accurately measure key material properties and improve the synergy between measured and simulated values.
- Consulted on logistical and technical planning of the design of a manufacturing process for scalable production of graphitic materials.
- Simulated system-level thermal behavior of scalable manufacturing technology.
- Collaborated in multi-disciplinary efforts to further the fundamental understanding of nanomaterials.
- Heavily contributed to projects driven by academic, governmental, and industrial collaboration with quarterly-reviewed metrics and timelines.
- Led project-specific technical teams comprised of graduate students and post-doctoral appointees.

#### **Teaching Assistant**

Birk Nanotechnology Center, Purdue University

*West Lafayette, IN  
2013 – 2014*

- Guided and instructed graduate students on the fundamentals of microelectronic practices and principles.
- Laboratory instruction was conducted in a cleanroom environment.

#### **Design Engineer**

Automated Services and Products

*Emeryville, CA  
2005 – 2007*

- Designed and reviewed automatic door equipment and installations to meet customer specifications.
- Developed and implemented a software technique that increased the company's time efficiency at processing preliminary installation logistics and planning by a factor of 20.
- Communicated with project managers on preliminary design and logistics.

#### **Undergraduate Research Intern**

Lawrence Livermore National Laboratory

*Livermore, CA  
2004*

- Performed field tests on radiation detectors for the Department of Homeland Security.
- Trained U.S. National Coast Guard personnel on the usage of radiation detectors.

#### **Publications**

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- C. V. Manzano, B. Abad, M. M. Rojo, Y. R. Koh, **S. L. Hodson**, A. M. Lopez Martinez, X. Xu, A. Shakouri, T. D. Sands, T. Borca-Tasciuc, and M. Martin-Gonzalez, "Anisotropic effects on the thermoelectric properties of highly oriented electrodeposited Bi<sub>2</sub>Te<sub>3</sub> films," *Scientific Reports*, 6, 19129, 2016.
- S. Sadasivam, **S. L. Hodson**, M. R. Maschmann, and T. S. Fisher, "Combined microstructure and heat transfer modeling of carbon nanotube thermal interface materials," *J. of Heat Transfer*, 138(4), 2015.

- B. Abad, M. Rull-Bravo, **S. L. Hodson**, X. Xu, and M. Martin-Gonzalez, "Thermoelectric properties of electrodeposited tellurium films and the sodium lignosulfonate effect," Electrochimica Acta, 169, pp. 37-45, 2015.
- A. Kumar, M. R. Maschmann, **S. L. Hodson**, J. Baur, and T. S. Fisher, "Carbon nanotube arrays decorated with multi-layer graphene-nanopetals enhance mechanical strength and durability," Carbon, 84, pp. 236-245, 2015.
- P. T. McCarthy, K. R. Saviers, **S. L. Hodson**, and T. S. Fisher, "Thermally driven squeezed-film cooling with carbon nanotube-coated gadolinium shuttles," International J. of Heat and Mass Transfer, 78, pp. 1199-1207, 2014.
- K. R. Saviers, **S. L. Hodson**, J. R. Salvador, L. S. Kasten, and T. S. Fisher, "Carbon nanotube arrays for enhanced thermal interfaces to thermoelectric devices," J. Thermophys. Heat Tr., 27(3), pp. 474-481, 2013.
- P. Jha, T. D. Sands, P. Jackson, C. Bomberger, T. Favaloro, **S. L. Hodson**, J. Zide, X. Xu, and A. Shakouri, "Cross-plane thermoelectric transport in p-type  $\text{La}_{0.67}\text{Sr}_{0.33}\text{MnO}_3/\text{LaMnO}_3$  oxide metal/semiconductor superlattices," J. of Applied Physics, 113(19), 2013.
- J. L. Wasniewski, D. H. Altman, **S. L. Hodson**, T. S. Fisher, A. Bulusu, S. Graham, and B. A. Cola, "Characterization of metallically bonded carbon nanotube-based thermal interface materials using a high accuracy 1D steady-state technique," J. of Electronic Packaging, 134(2), 2012.
- L. Guo, **S. L. Hodson**, T. S. Fisher, and X. Xu, "Heat transfer across metal-dielectric interfaces during ultrafast-laser heating," J. of Heat Transfer, 134(4), 2012.
- A. Snyder, Z. Y. Bo, **S. L. Hodson**, T. S. Fisher, and L. A. Stanciu, "The effect of heating rate and composition on the properties of spark plasma sintered zirconium diboride based composites," Materials Sci. and Eng. A – Structural Mat. Prop. Microstructure and Processing, 538, pp. 98-102, 2012.
- **S. L. Hodson**, T. Bhuvana, B. A. Cola, X. Xu, G.U. Kulkarni, and T. S. Fisher, "Palladium thiolate bonding of carbon nanotube thermal interfaces," J. of Electronic Packaging, 133(2), 2011.
- A. Snyder, D. Quach, J. R. Groza, T. S. Fisher, **S. L. Hodson**, and L. A. Stanciu, "Spark plasma sintering of  $\text{ZrB}_2\text{-SiC-ZrC}$  ultra-high temperature ceramics at  $1800^\circ\text{C}$ ," Materials Sci. and Eng. A – Structural Mat. Prop. Microstructure and Processing, 528(18), pp. 6079-6082, 2011.
- R. A. Sayer, **S. L. Hodson**, T. S. Fisher, "Improved efficiency of dye-sensitized solar cells using a vertically aligned carbon nanotube counter electrode," J. of Solar Energy Engineering, 132(2), 2010.

## Book Chapters

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- X. Wang, B. A. Cola, T. L. Bougher, **S. L. Hodson**, T. S. Fisher, and X. Xu. Photoacoustic Technique for Thermal Conductivity and Thermal Interface Measurements. Chapter in *Annual Review of Heat Transfer*, Issue 16:135-157, 2013.

## Conference and Symposium Activities

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- SAE Aerotech Americas Conference - Charleston, SC 2019
  - *Paper and Presentation:* **S. Hodson**, K. McCarthy, P. McCarthy, and I. Mudawar, "A Dynamic Two-Phase Component Model Library for High Heat Flux Applications"
- 47<sup>th</sup> Power Sources Conference – Orlando, FL 2016
  - *Paper and Presentation:* **S. L. Hodson**, E.S. Piekos, R. A. Sayer, S. A. Roberts, C. C. Roberts, "Thermal characterization of molten salt battery materials"
- HI TEMP Conference – Santa Fe, NM 2014
  - *Presentation:* **S. L. Hodson**, R. A. Sayer, and T. W. Grasser, "Thermal contact resistance measurements at elevated temperatures"

- ASME International Mechanical Engineering Congress and Exposition – San Diego, CA 2013
  - *Paper and Presentation:* **S. L. Hodson**, R. A. Sayer, T. P. Koehler, J. R. Serrano, S. M. Dalton, and T. S. Fisher, “Effect of gamma-ray irradiation on the thermal contact of carbon nanotube thermal interface materials”
- 10<sup>th</sup> International Energy Conversion Engineering Conference – Atlanta, GA 2012
  - *Paper and Presentation:* K. R. Saviers, **S. L. Hodson**, J. R. Salvador, L. S. Kasten, and T. S. Fisher, “Carbon nanotube arrays for enhanced thermal interfaces to thermoelectric devices”
- Symposium on Nanomaterials for Energy – West Lafayette, IN 2012
  - *Poster Display:* K. R. Saviers, R. Paul, **S. L. Hodson**, J. R. Salvador, and T. S. Fisher, “Enhanced thermal interfaces to thermoelectric elements for high temperature applications”
- Materials Research Society – San Francisco, CA 2011
  - *Poster Display:* **S. L. Hodson**, C. Rout, K.P.S.S. Hembram, and T. S. Fisher, “Chemical and plasma treatment of carbon nanotube interface materials for improved metal contact”
- ASME Pacific Rim Technical Conference and Exposition on Packaging and Integration of Electronic and Photonics, MEMS, and NEMS - InterPACK – Portland, OR 2011
  - *Paper and Presentation:* J. L. Wasniewski, D. H. Altman, **S. L. Hodson**, T. S. Fisher, A. Bulusu, S. Graham, and B. A. Cola, “Characterization of metallically bonded carbon nanotube-based thermal interface materials using a high accuracy 1D steady-state technique”
- ASME International Heat Transfer Conference – Washington, DC 2010
  - *Paper and Presentation:* P. T. McCarthy, **S. L. Hodson**, T. D. Sands, and T. S. Fisher, “Carbon nanotube interfaces for magneto thermoelectric actuation”
- ASME InterPACK Conference – San Francisco, CA 2009
  - *Paper and Presentation:* **S. L. Hodson**, T. Bhuvana, B. A. Cola, X. Xu, G. U. Kulkarni, and T. S. Fisher, “Palladium thiolate bonding of carbon nanotube thermal interfaces for high-temperature electronics”
- ASME 3<sup>rd</sup> International Conference on Energy Sustainability – San Francisco, CA 2009
  - *Paper and Presentation:* R. A. Sayer, **S. L. Hodson**, and T. S. Fisher, “Improved efficiency of dye sensitized solar cells using aligned carbon nanotubes”
- ASME Summer Heat Transfer Conference – Jacksonville, FL 2008
  - *Paper and Presentation:* B.A. Cola, **S. L. Hodson**, X. Xu, and T.S. Fisher, “Carbon nanotube array thermal interfaces enhanced with paraffin wax”

### **Honors and Awards**

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- Nominated for Employee Recognition Award at Sandia National Laboratories 2015
- Indiana Next Generation Manufacturing Competitiveness Center (IN-MAC) Fellowship 2013
- Best Paper Award - 10<sup>th</sup> International Energy Conversion Engineering Conference 2012
- Best Paper Award - ASME Pacific Rim Technical Conference and Exposition on Packaging and Integration of Electronic and Photonics, MEMS, and NEMS - InterPACK 2011

### **Professional and Voluntary Activities**

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**Laboratory Manager** 2013 – 2014  
 Nanoscale Transport Research Group, Birck Nanotechnology Center, Purdue University

**Assistant Youth Soccer Coach** 2014  
 West Lafayette, IN

- NanoDays** 2011, 2013  
Birck Nanotechnology Center, Purdue University
- Introduced nanotechnology concepts to K-12 students through interactive cleanroom activities.
- Graduate Student Ambassador** 2011 – 2012  
Birck Nanotechnology Center, Purdue University
- Graduate Mentor for Summer Undergraduate Research Fellowship (SURF)** 2011  
SURF Program, Birck Nanotechnology Center, Purdue University
- Distinguished Trainer and User of Cleanroom Equipment** 2010 – 2014  
Birck Nanotechnology Center, Purdue University
- Guided and instructed new users on semiconductor device fabrication equipment.

## References

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**Timothy S. Fisher**  
**Chair of Mechanical and Aerospace Engineering, UCLA**  
Academic/Research Advisor at Purdue University  
Phone: 310-206-8113  
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**Robert A. Sayer**  
**Senior Mechanical Engineer, R&D**  
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**Senior Chemical Engineer, R&D**  
Mentor at Sandia National Laboratories  
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