

# THOMAS E. BEECHEM III

tbeechem@purdue.edu

765-494-0492

**Statistics**      Google: 01/09/23      h-Index: 36      i10-Index: 76      Total Citations: 4597      Journal Publications: 95

## Education

- 2005-2008      **THE GEORGIA INSTITUTE OF TECHNOLOGY**      **ATLANTA, GA**  
Ph.D. in Mechanical Engineering (4.0/4.0)      Adviser: Samuel Graham, Ph.D.      December 2008  
Thesis: Metrology of GaN Electronics Using Micro-Raman Spectroscopy
- 2003-2005      **THE UNIVERSITY OF DAYTON**      **DAYTON, OH**  
Masters of Science in Materials Engineering (4.0/4.0)      Adviser: Khalid Lafdi, Ph.D.      May 2005  
Thesis: Growth Mechanism and Properties of Novel Carbon Nanocomposite Foams
- 1999-2003      **THE UNIVERSITY OF DAYTON**      **DAYTON, OH**  
Bachelor of Science in Mechanical Engineering (3.99/4.0), *summa cum laude*, Ranked 1<sup>st</sup> in class      May 2003

## Experience

- 2021-Present      **Purdue University**      **WEST LAFAYETTE, IN**  
**Associate Professor of Mechanical Engineering**  
Tenured professor and lead of Specere Laboratory focusing on infrared physics for thermal, sensing and spectroscopic solutions.
- 2019-2021      **Center for Integrated Nanotechnologies (CINT)**      **ALBUQUERQUE, NM**  
**Affiliate Scientist**  
Responsible for attracting collaborators from academia and industry to the Department of Energy's CINT user facility as part of the nanophotonics and optical nanomaterials research thrust.
  - Established 4 separate user projects in 1<sup>st</sup> year resulting in multiple publications.
  - Expanded CINT's infrared spectroscopy capabilities to enable enhanced thin-film examination.
- 2013-2021      **SANDIA NATIONAL LABORATORIES**      **ALBUQUERQUE, NM**  
**Principal Member of the Technical Staff – Optical and Plasma Sciences Department**  
Leading Sandia's Specere Laboratory, I pursue investigations furthering materials understanding enabling new micro/nanosystems for applications ranging from optics to high power electronics, sensors, and plasmonics.
  - Lead of group with expenditures of >\$800K annually (PI for >\$700K/year)
  - PI of programs developing tunable optical devices using two-dimensional and ferroelectric materials
  - PI of thermal physics projects centering on interfacial boundaries, size effects, and non-crystalline solids.
- 2009-2013      **SANDIA NATIONAL LABORATORIES**      **ALBUQUERQUE, NM**  
**Senior Member of the Technical Staff – Nanoscale Sciences Department**  
Created Specere Laboratory to extend characterization of low-dimensional, biological, and wide bandgap materials via Raman, photoluminescence, and infrared methodologies.
  - Discovered Raman techniques for 2D material characterization and thermal property deduction
  - Created methods to more accurately quantify and predict thermal transport at interfacial boundaries
- 2005-2008      **THE GEORGIA INSTITUTE OF TECHNOLOGY**      **ATLANTA, GA**  
**Presidential Fellow - Graduate Research Assistant**  
Lead student investigator of research program focusing on the thermomechanical response and metrology of next generation MEMS and wide bandgap semiconductor devices through the use of Raman spectroscopy
  - Developed a technique capable of simultaneously measuring temperature and stress in microelectronics
  - Deduced the decay pathways of the optical phonons in gallium nitride
- 2003-2005      **THE UNIVERSITY OF DAYTON**      **DAYTON, OH**  
**Ohio Space Grant Fellow - Graduate Research Assistant**  
Examined carbon foam nanocomposites linking processing and performance characteristics.
  - Fabricated nanocomposite carbon foams having exemplary mechanical properties while identifying relevant morphological and fracture characteristics responsible for increased capability

# THOMAS E. BEECHEM III

tbeechem@purdue.edu

## Service

Associate Editor. Journal of Heat Transfer. 2017-  
Track Organizer. Electronic Materials Conference. 2015-  
Committee Member. Nanoscale Thermal Transport. ASME. 2012-

## Awards

2022 Mallott Innovation Award (Mentor of Winning Team)  
2019 R&D 100 Award “High-Performance Nanoantenna Enhanced Detectors”  
2017 R&D 100 Award “Ultra-Wide Bandgap Power Electronic Devices”  
2016 Sandia National Laboratories “Up & Coming Innovator” Award  
2014 Defense Programs Award of Excellence  
2012 Sandia National Laboratories “Outstanding Mentor” Award  
2011 WiTec Best Paper Award  
2008 Woodruff School Student Advisory Committee Best TA Award  
2007 ASME INTERPACK07 Best Student Poster award  
2006 Woodruff School of Mechanical Engineering top qualifying examination score  
2003 Hollenkamp Memorial Award for outstanding senior in mechanical engineering at The University of Dayton  
2002 Kuntz Award for outstanding junior in mechanical engineering at The University of Dayton  
2002-2004 NCAA Academic All-American baseball team  
2002-2004 Atlantic-10 Conference Student Athlete of the Year for baseball

## Advised Students and Post-Doctoral Researchers

### Post-Doctoral Researchers

2020-2021 Zachary Piontkowski (Post-Doctoral Fellow)  
2019-2021 Amun Jarzembski (Post-Doctoral Fellow)  
2016-2018 Christopher Saltonstall (Post-Doctoral Fellow)  
2015-2017 Michael Goldflam (Post-Doctoral Fellow)  
2014-2015 Colin Landon (Post-Doctoral Fellow)

### Graduate Students

2023- Fernando Vega  
2022- Abdulaziz Alkandari  
2022- Mira Welner  
2022- Jacob Minyard  
2022- Walter Smith  
2020 James Spencer Lundh (NSF Industry Intern)  
2017-2018 Josephine McBreyer (Master’s Student University of New Mexico)  
2015-2016 Chelsea Snyder (Doctoral Student Rensselaer Polytechnic Institute)  
2013-2015 Ryan Shaffer (Master’s Student, University of New Mexico)  
2011-2013 Christopher Saltonstall (Doctoral Student University of Virginia)

### Undergraduate Students

2022 Chih-Yi (Jane) Chen (SURF, Purdue Undergraduate Research)  
2022- Jenna Smith (Purdue Undergraduate Research)  
2022 Dylan Balter (Purdue Undergraduate Research)  
2022 Walter Smith (Purdue Undergraduate Research)  
2021- Arihant Kaul (Purdue Undergraduate Research)  
2021- Suraj Kumar Raja Ratnam (Purdue Undergraduate Research)  
2017 Vivian Nguyen (Undergraduate Student, Univ. Texas-Austin)  
2017 Christopher von Hoene (Undergraduate Student, Purdue University)  
2011-2013 Luke Yates (Undergraduate Student, University of New Mexico)

## Book Contributions

J. Timlin, A. Collins, M. Shumskaya, E. Wurtzel, **T. Beechem**, “Localization of Carotenoids inside Intact Cells and Tissues,” in Carotenoids, D. Cvetkovic and G. Nikolic, Editors. Intech. 2017.

**T. Beechem** and S. Graham, “Temperature Measurement of Microdevices using Thermorefectance and Raman Thermometry,” in BioNanoFluidic MEMS, P. Hesketh, Editor. 2007, Springer. p. 375.

## THOMAS E. BEECHEM III

tbeechem@purdue.edu

### Patents

**T. Beechem**, M. Goldflam, A. Tauke-Pedretti, I. Ruiz, D. Peters, S. Howell. Tunable infrared pixels having unpatterned graphene layer and conductive metasurface. US Patent 11,482,560. October 2022.

S. Howell, D. Peters, **T. Beechem**, I. Ruiz, R. Harrison, J. Martin. Radiation detector using a graphene amplifier layer. US Patent 11,287,536. March 2022.

**T. Beechem**, M. Goldflam, S. Howell, D. Peters, I. Ruiz, P. Davids. Tunable graphene-based infrared reflectance filter having patterned nanoantenna layer and unpatterned graphene layer. US Patent 10,877,194. December 2020.

**T. Beechem**, K. Hattar, J. Ihlefeld, E. Piekos, D. Medlin, L. Yates, P. Hopkins. Ion Implanted Thermal Barrier. US Patent 10,418,304. September 2019.

J. Ihlefeld, M. Sinclair, **T. Beechem**, Tunable infrared reflectance by phonon modulation. US Patent 9,909,233. March 2018.

R. Polsky, X. Xiao, D.B. Burkel, D.R. Wheeler, S. Brozik, **T. Beechem**. Patterned structures of graphene and graphitic carbon and methods for their manufacture. US Patent 9,533,887. January 2017.

**T. Beechem**, S. Howell, D. Peters, P. Davids, T. Ohta. Sub-wavelength antenna enhanced bilayer graphene tunable photodetector. US Patent 9,293,627. March 2016.

### Selected Invited Presentations

**T. Beechem**. Polaritonic Energy Transport: Tailoring Carriers Made for the Nano. Stanford Photonics Research Center & Stanford Optical Society Seminar. February 2021.

**T. Beechem**. Phonon Sculpting: Infrared Functionality via Vibration. MRS Fall (Virtual). Nov. 2020.

**T. Beechem**. Size Dictated Thermal Conductivity of GaN and AlGaN. MRS Fall. Boston, MA. Nov. 2019.

**T. Beechem**. Phonon Sculpting: Infrared Functionality via Vibration. SERMACS. Savannah, GA. Oct. 2019.

**T. Beechem**. Beyond Heat: Phonons for Infrared Functionality. Mechanical Engineering Graduate Seminar. Vanderbilt University. September 2019.

**T. Beechem**. Phonon Light Switches: Leveraging Vibrations for Tunable Infrared Filters. Pennsylvania State University. State College, PA. March 2018.

**T. Beechem**. Defining Boundaries: Designing 2D-systems using the materials surrounding them. Texas A&M University. College Station, TX. September 2017.

**T. Beechem**. Infrared Chameleon: Graphene, Phonons, & the Impact of their Interplay on Photodetection. Mechanical Engineering Graduate Seminar. Carnegie Mellon University. Pittsburgh, PA. January 2017.

**T. Beechem**. "Infrared Chameleon: Graphene, Surrounding Materials, and the Primacy of Their Interaction on Photodetection". UNM Optical Sciences and Engineering Seminar. University of New Mexico. Albuquerque, NM. December 2016.

**T. Beechem**. "The Flat Chameleon: Graphene & the Primacy of Interlayer Interactions." Georgia Institute of Technology Materials Science Graduate Recruiting Event. Atlanta, GA. June 2016.

**T. Beechem**. "Beyond Identification: Probing Band Structure, Strain, and Layer Interactions in Bilayer Graphene via Raman Imaging". 9<sup>th</sup> Annual Confocal Raman Imaging Symposium. September 2012. Ulm, Germany.

**T. Beechem**. "Beyond Identification: Confocal Raman Spectroscopy and Imaging for Graphene Development." Microscopy and Microanalysis 2012. July 2012. Phoenix, Az.

**T. Beechem**. "Twist and Stack: Rotational Disorder in Twisted Bilayer Graphene." UNM Optical Sciences and Engineering Seminar. University of New Mexico. Albuquerque, NM. April 2013.

## THOMAS E. BEECHEM III

tbeechem@purdue.edu

**T. Beechem**, “Top Side Cooling Via Integrated Thermal Circuits.” DARPA Embedded Thermal Management Workshop. Mar. 2011. Arlington, Va.

**T. Beechem**, “Beyond Identification: Raman Spectroscopy and Imaging for Materials Development, Process Improvement, and Thermal Transport.” U. of Virginia Graduate Engineering Seminar. May. 2011. Charlottesville, Va.

**T. Beechem**, “The Flattening of Characterization: GaN Device Analysis with Implications for Future Systems and Techniques.” MINE Graduate Seminar. University of Cincinnati. April 2009.

### Journal Publications (Chronological Order, Names of Mentored Students/Post-Docs Also Underlined)

95. S. Nasir, W. Smith (G), **T. Beechem**, S. Law. Growth of ultrathin Bi<sub>2</sub>Se<sub>3</sub> films by molecular beam epitaxy. Journal of Vacuum Science and Technology A. (41) 012202. 2023.
94. I. Ruiz, G. Vizkelethy, A. McDonald, S. Howell, P. Thelen, M. Goldflam, **T. Beechem**. Detection of high energy ionizing radiation using deeply depleted graphene-oxide-semiconductor junction. Journal of Applied Physics (132) 184503. 2022.
93. Y. Song, C. Zhang, J.S. Lundh, H. Luang, Y. Zheng, Y. Zhang, M. Park, T. Mirabito, R. Beaucejour, N. McIlwaine, G. Esteves, **T. Beechem**, C. Moe, R. Dargis, J. Jones, J. Leach, R. Lavelle, D. Snyder, J.P. Maria, R. Olsson, J. Redwing, A. Ansari, J. Hwang, X. Wang, B. Foley, S. Trolrier-McKinstry, S. Choi. Growth-microstructure-thermal property relations in AlN thin films. Journal of Applied Physics (132) 175108. 2022.
92. **T. Beechem**, S. Smith, R.G. Copeland, F. Liu, T. Ohta. Spectral and polarization-based imaging in deep ultraviolet excited photoelectron microscopy. Review of Scientific Instruments (93) 053701. 2022.
91. E. Hoglund, D. Bao, A. O'Hara, S. Makarem, Z. Piontkowski (PD), J. Matson, A. Yadav, R. Haisimaier, R. Engel-Herbert, J. Ihlefeld, J. Ravichandran, R. Ramesh, J. Caldwell, **T. Beechem**, J. Tomko, J. Hachtel, S. Pantelides, P. Hopkins, J. Howe. Emergent Interface Vibrational Structure of Oxide Superlattices. Nature (601) 556. 2022.
90. Z. Piontkowski (PD), E. Runnerstrom, A. Cleri, A. McDonald, J. Ihlefeld, C. Saltonstall, J.P. Maria, **T. Beechem**. Effects of strain, disorder, and Coulomb screening on free-carrier mobility in doped cadmium oxide. Journal of Applied Physics (130) 195105. 2021. Selected as an “Editor’s Pick.”
89. M. He, L. Lindsay, **T. Beechem**, T. Folland, J. Matson, K. Watanabe, A. Zavalin, A. Ueda, W. Collins, T. Taniguchi, J. Caldwell. Phonon engineering of boron nitride via isotopic enrichment. Journal of Materials Research. (36) 4394. 2021.
88. M. Jones, F. Del Rio, **T. Beechem**, A. McDonald, T. Babuska, M. Dugger, M. Chandross, N. Argibay, J. Curry. Stress- and Time-Dependent Formation of Self-Lubricating In-Situ Carbon (SLIC) Films on Catalytically-Active Noble Alloys. JOM. (73) 3658. 2021.
87. Y. Song, C. Perez, G. Esteves, J.S. Lundh (G), C. Saltonstall (PD), **T. Beechem**, J. Yang, K. Ferri (G), J. Brown, Z. Tang, J.P. Maria, D. Snyder, R.H. Olsson, B. Griffin, S. Trolrier-McKinstry, B. Foley, S. Choi. Thermal Conductivity of Aluminum Scandium Nitride for 5G Mobile Applications and Beyond. ACS Applied Materials and Interfaces. (13) 19031. 2021.
86. E. Scott (G), E. Ziade, C. Saltonstall (PD), A. McDonald, M. Rodriguez, P. Hopkins, **T. Beechem**, D. Adams. Thermal Conductivity of (Ge<sub>2</sub>Sb<sub>2</sub>Te<sub>5</sub>)<sub>1-x</sub>C<sub>x</sub>. Journal of Applied Physics. (128) 15, 155106. 2020.
85. A. Jarzembski (PD), M. Goldflam, I. Ruiz, A. Siddiqui, **T. Beechem**. Enhancing graphene plasmonic device performance via its dielectric environment. Physical Review Applied (14) 3 034044. 2020.
84. S. Subramanian, Q. Campbell, S. Moser, J. Kiemle, P. Zimmerman, P. Siefert, F. Sigger, D. Sharma, H. Al-Sadeg, M. Labella, D. Waters, R. Feenstra, R. Koch, C. Jozwiak, A. Bostwick, E. Rotenberg, I. Dabo, A. Holleitner, **T. Beechem**, U. Wurstbauer, J. Robinson. Photo-physics and electronic structure of lateral graphene/MoS<sub>2</sub> and metal/MoS<sub>2</sub> junctions. ACS Nano. (14) 16663. 2020.

## THOMAS E. BEECHEM III

tbeechem@purdue.edu

83. C. Melton, M. Noack, T. Ohta, **T. Beechem**, J. Robinson, X. Zhang, A. Bostwick, C. Jozwiak, R. Koch, P. Zwart. K-Means-Driven Gaussian Process data collection for Angle-Resolved Photoemission Spectroscopy. Machine Learning: Science and Technology. (1) 4, 045015. 2020.
82. **C. Saltonstall (PD)**, Z. McClure, M. Abere, D. Guzman, S. Reeve, A. Strachan, P. Kotula, D. Adams, and **T. Beechem**. Complexion dictated thermal resistance with interface density in reactive metal multilayers. Physical Review B (101) 245422. 2020.
81. **M. Goldflam (PD)**, I. Ruiz, S. Howell, A. Tauke-Pedretti, E. Anderson, J. Wendt, P. Finnegan, S. Hawkins, W. Coon, T. Fortune, E. Shaner, C. Kadlec, J. Olesberg, J. Klem, P. Webster, M. Sinclair, J. K. Kim, D. Peters, and **T. Beechem**. Monolithically fabricated tunable long-wave infrared detectors based on dynamic graphene metasurfaces. Applied Physics Letters (116) 191102. 2020.
80. B. Chatterjee, J. Lundh, Y. Song, D. Shoemaker, A. Baca, R. Kaplar, T. Beechem, C. Saltonstall, A. Allerman, A. Armstrong, B. Klein, A. Bansal, H. Seyf, D. Talreja, A. Pogrebnyakov, E. Heller, V. Gopalan, A. Henry, J. Redwing, B. Foley, S. Choi. Interdependence of Electronic and Thermal Transport in  $\text{Al}_x\text{Ga}_{1-x}\text{N}$  Channel HEMTs. IEEE Electron Device Letters (41) 461. 2020.
79. B. Chatterjee, J. Lundh, Y. Song, D. Shoemaker, A. Baca, R. Kaplar, **T. Beechem**, **C. Saltonstall (PD)**, A. Allerman, A. Armstrong, B. Klein, A. Bansal, H. Seyf, D. Talreja, A. Pogrebnyakov, E. Heller, V. Gopalan, A. Henry, J. Redwing, B. Foley, S. Choi. Interdependence of Electronic and Thermal Transport in  $\text{Al}_x\text{Ga}_{1-x}\text{N}$  Channel HEMTs. IEEE Electron Device Letters (41) 461. 2020.
78. B. Chatterjee, C. Dunder, **T. Beechem**, E. Heller, D. Kendig, H. Kim, N. Donmez, S. Choi. Nanoscale electro-thermal interactions in AlGaIn/GaN high electron mobility transistors. Journal of Applied Physics (127) 044502. 2020. *Selected as a "Featured Article"*
77. M. Berg, F. Liu, S. Smith, R. G. Copeland, C. Chan, A. Mohite, **T. Beechem**, T. Ohta. Imaging Atomically Thin Semiconductors Beneath Dielectrics via Deep Ultraviolet Photoemission Electron Microscopy. Physical Review Applied (12) 6, 064064. 2019.
76. **T. Beechem**, **C. Saltonstall (PD)**, T. Gilbert (G), J. Matson (G), F. Ugwu, R. Kasica, F. Bezares, J. Valentine, J. Caldwell. Influence of spatial dispersion on spectral tuning of phonon-polaritons. Physical Review B (100) 20. 205419. 2019.
75. I. Ruiz, **T. Beechem**, S. Smith, P. Dickens, E. Paisley, J. Shank, S. Howell, R. Sarma, B. Draper, **M. Goldflam**. Interface Defect Engineering for Improved Graphene-Oxide- Semiconductor Junction Photodetectors. ACS Applied Nano Materials. In Press. 2019.
74. J. Lundh, B. Chatterjee, Y. Song, A. Baca, R. Kaplar, **T. Beechem**, A. Allerman, A. Armstrong, B. Klein, A. Bansal, D. Talreja, A. Pogrebnyakov, E. Heller, V. Gopalan, J. Redwing, B. Foley, S. Choi. Multidimensional thermal analysis of an ultrawide bandgap AlGaIn channel high electron mobility transistor. Applied Physics Letters (115) 153503. 2019.
73. M. DeCoster, X. Chen, K. Zhang, C. Rost, E. Hoglund, J. Howe, **T. Beechem**, P. Hopkins. Thermal Conductivity and Phonon Scattering Processes of ALD Grown PbTe–PbSe Thermoelectric Thin Films. Advanced Functional Materials. 1904073. 2019.
72. K. Coleman, J. Walker, **T. Beechem**, S. Trolier-McKinstry. Effect of Stresses on the dielectric and piezoelectric properties of  $\text{Pb}(\text{Zr}_{0.52}\text{Ti}_{0.48})\text{O}_3$  thin films. Journal of Applied Physics (126) 034101. 2019. *Selected as an "Editor's Pick"*
71. **C. Saltonstall (PD)**, **T. Beechem**, J. Amatya, J. Floro, P. Norris, P. Hopkins. Uncertainty in Linewidth Quantification of Overlapping Raman Bands. Review of Scientific Instruments (90) 013111. 2019.
70. I. Montano, S. Campione, J. Klem, **T. Beechem**, O. Wolf, M. Sinclair, T.S. Luk. Semiconductor Hyperbolic Metamaterials at the Quantum Limit. Scientific Reports (8) 16694. 2018.
69. **T. Beechem**, **M. Goldflam (PD)**, M. Sinclair, D. Peters, A. McDonald, E. Paisley, D.B. Burckel, P. Finnegan, A. Kitahara, D. Drury, J.W. Kim, Y. Choi, P. Ryan, J. Ihlefeld. Tunable Infrared Devices via Ferroelectric Domain Reconfiguration. Advanced Optical Materials. 1800862. 2018.
68. K. Freedy, **T. Beechem**, P. Litwin, M. Gabriela Sales, M. Huang, R. Ruoff, S. McDonnell. Unraveling Chemical Interactions between Titanium and Graphene for Electrical Contact Applications. ACS Applied Nano Materials (1) 4828. 2018.

## THOMAS E. BEECHEM III

tbeechem@purdue.edu

67. J. McBreyer (G), T. Beechem, C. Appblet, F. Garzon. Polysulfide Speciation in the Bulk Electrolyte of a Lithium Sulfur Battery. *Journal of the Electrochemical Society* (165) A876. 2018.
66. M. Goldflam (PD), I. Ruiz, S. Howell, J. Wendt, M. Sinclair, D. Peters, T. Beechem. Tunable dual-band graphene-based infrared reflectance filter. *Optics Express* (26) 8532. 2018.
65. A. Rice, A. Allerman, M. Crawford, T. Beechem, T. Ohta, C. Spataru, J. Figiel, M. Smith. Effects of deposition temperature and ammonia flow on metal-organic chemical vapor deposition of hexagonal boron nitride. *Journal of Crystal Growth* (485) 90. 2018.
64. J. Vigil, T. Lambert, J. Duay, C. Delker, T. Beechem, B. Swartzentruber. Nanoscale Carbon Modified  $\alpha$ -MnO<sub>2</sub> Nanowires: Highly Active and Stable Oxygen Reduction Electrocatalysts with Low Carbon Content. *ACS Applied Materials and Interfaces*. (10) 2040 2017.
63. S. Howell, I. Ruiz, P. Davids, R. Harrison, S. Smith, M. Goldflam (PD), J. Martin, N. Martinez, T. Beechem. Graphene-Insulator-Semiconductor junction for hybrid photodetection modalities. *Scientific Reports*. (7) 14651. 2017.
62. K. Keyshar, M. Berg, X. Zhang, R. Vajtai, G. Gupta, C. Chan, T. Beechem, P. Ajayan, A. Mohite, T. Ohta. Experimental determination of the ionization energies of MoSe<sub>2</sub>, WS<sub>2</sub>, and MoS<sub>2</sub> on SiO<sub>2</sub> using photoemission electron microscopy. *ACS Nano*. (11) 8223. 2017.
61. I. Ruiz, M. Goldflam (PD), T. Beechem, A. McDonald, B. Draper, S. Howell. Visibility of dielectrically passivated graphene films. *Optics Letters*. (42) 2850. 2017.
60. M. Goldflam (PD), Z. Fei, I. Ruiz, S. Howell, P. Davids, D. Peters, T. Beechem. Designing graphene absorption in a multispectral plasmon-enhanced infrared detector. *Optics Express*. (25) 12400. 2017.
59. F. Leonard, C. Spataru, M. Goldflam (PD), D.W. Peters, T. Beechem. Dynamic Wavelength-Tunable Photodetector Using Subwavelength Graphene Field-Effect Transistors. *Scientific Reports* (7) 45873. 2017.
58. T. Beechem, A. McDonald, E. Fuller, A. Talin, C. Rost, J-P. Maria, J. Gaskins, P. Hopkins. Size Dictated Thermal Conductivity of GaN. *Journal of Applied Physics* (120) 095104. 2016.
57. T. Beechem, R. Shaffer (G), J. Nogan, A. Hamilton, A. McDonald, T. Ohta, S. Howell. Self-Heating Induced Failure in Scalable Graphene Devices. *Scientific Reports* (6) 26457. 2016.
56. A. Ahmed, H. Wen, T. Ohta, I. Pinchuk, T. Beechem, R. Kawakami. Molecular beam epitaxy growth of SrO buffer layers on graphite and graphene for the integration of complex oxides. *Journal of Crystal Growth* (447) 5. 2016.
55. S. Choi, G. Peake, G. Keeler, G. Geib, R. Birggs, T. Beechem, R. Shaffer, J. Clevenger, G. Patrizi, J. Klem, A. Tauke-Pedretti, C. Nordquist. Thermal Design and Characterization of Heterogeneously Integrated InGaP/GaAs HBTs. *IEEE Transactions on Components, Packaging, and Manufacturing Technology* (6) 740. 2016.
54. C. Snyder (G), C. Appblett, A. Grillet, T. Beechem, D. Duquette. Measuring Li<sup>+</sup> Inventory Losses in LiCoO<sub>2</sub>/Graphite Cells using Raman Microscopy. *Journal of the Electrochemical Society*. (163) A1036. 2016.
53. J. Braun, C. Baker, M. Elahi, K. Artyushova, T. Beechem, P. Norris, Z. Leseman, J. Gaskins, P. Hopkins. Size effects on the thermal conductivity of amorphous silicon thin films. *Physical Review B Rapid Communications*. (93) 140201. 2016.
52. T. Beechem, B. Kowalski, M. Brumbach, A. McDonald, C. Spataru, S. Howell, T. Ohta, J. Pask, N. Kalugin. Oxidation of Ultrathin GaSe. *Applied Physics Letters* (107) 173103. 2015.
51. M. Bauer, C. Saltonstall (G), Z. Leseman, T. Beechem, P. Hopkins, P. Norris. Thermal Conductivity of Turbostratic Carbon Nanofiber Networks. *Journal of Heat Transfer*. (138) 061302. 2016.
50. C. Landon (PD), H.T. Wilke, M. Brumbach, G. Brennecka, M. Blea-Kirby, J. Ihlefeld, M. Marinella, T. Beechem. Thermal transport in tantalum oxide films for memristive applications. *Applied Physics Letters* (107) 023108. 2015.

## THOMAS E. BEECHEM III

tbeechem@purdue.edu

49. T. Lambert, J. Vigil, S. White, D. Davis, S. Limmer, P. Burton, E. Coker, **T. Beechem**, M. Brumbach. Electrodeposited  $\text{Ni}_x\text{Co}_{3-x}\text{O}_4$  nanostructured films as bifunctional oxygen electrocatalysts. *Chemical Communications*. DOI: 10.1039/C5CC02262B. 2015.
48. **T. Beechem**, L. Yates (UG), S. Graham. Invited Review Article: Error and Uncertainty in Raman Thermal Conductivity Measurements. *Review of Scientific Instruments* (86) 041101. 2015. **Selected as Cover Article**
47. R. Cheaito, K. Hattar, J. Gaskins, A. Yadav, J. Duda, **T. Beechem**, J. Ihlefeld, E. Piekos, J. Baldwin, A. Misra, P. Hopkins. Thermal flux limited electron Kapitza conductance in copper-niobium multilayers. *Applied Physics Letters* (106) 093114. 2015
46. C. Rochford, S.J. Limmer, S. Howell, **T. Beechem**, M. Siegal. Untangled planarized arrays of aligned multiwall carbon nanotubes with Ohmic back contacts. *Journal of Materials Research*. 2014. DOI: 10.1557/jmr.2014.359
45. C. Gorham, K. Hattar, R. Cheaito, J. Duda, J. Gaskins, **T. Beechem**, J. Ihlefeld, L. Biedermann, E. Piekos, D. Medlin, P. Hopkins. Evidence of defects increasing the thermal boundary conductance across aluminum/silicon interfaces subjected to proton irradiation. *Physical Review B* (90) 024301. 2014.
44. X. Zhou, R. E. Jones, P. Hopkins, **T. Beechem**. Thermal Boundary Conductance between Al films and GaN nanowires investigated with molecular dynamics. *Phys. Chem. Chem. Phys.* (16) 9403. 2014.
43. **T. Beechem**, T. Ohta, B. Diaconescu, J.T. Robinson. Rotational Disorder in Twisted Bilayer Graphene. *ACS Nano* (8) 1665. 2014.
42. X. Xiao, **T. Beechem**, D.R. Wheeler, D. B. Burkel, R. Polsky. Lithographically Defined Porous Ni-carbon nanocomposite Supercapacitors. *Nanoscale* (6) 2629. 2014. **Selected as Cover Article**
41. C. Saltonstall (G), J. Serrano, P. Norris, P. Hopkins, **T. Beechem**. Single Element Raman Thermometry. *Review of Scientific Instruments* (84) 064903. 2013.
40. C. Rodenbeck, D. Bryant, R. Eye, C. Sandoval, N. Young, **T. Beechem**, R. Knudson, D. Allen, G. Brehm, K. Peterson, T. Mendenhall. Design of Robust On-Chip Drain Modulators for Monolithic Pulsed Power Amplifiers. *IEEE Microwave and Wireless Components Letters* (23) 267. 2013.
39. C. Chan, **T. Beechem**, M. Brumbach, D. R. Wheeler, K. Stevenson. Self-Limiting Monomolecular Electrochemical Surface Functionalization of Graphene with Trifluoromethylphenylene. *Journal of Physical Chemistry C*. (117) 12038. 2013.
38. **T. Beechem**, J. Serrano, A. McDonald, S. Mani. Assessing Thermal Damage in Silicon PN-Junctions Using Raman Thermometry. *Journal of Applied Physics*. (113) 123106. 2013.
37. J.T. Robinson, S. Schmucker, C.B. Diaconescu, J. P. Long, J. Culbertson, T. Ohta, A. Friedman, **T. Beechem**. Electronic Hybridization of Large-Area Stacked Graphene Films. *ACS Nano* (7) 637. 2013. **Selected as "Editor's Choice in Science (339) Issue 6118.**
36. T. Ohta, P. Feibelman, J.T. Robinson, A. Bostwick, E. Rotenberg, **T. Beechem**. Evidence for interlayer coupling and moiré periodic potentials in twisted bilayer graphene. *Physical Review Letters* (109) 186807. 2012.
35. R. Cheaito, J. Duda, **T. Beechem**, K. Hattar, J. Ihlefeld, D.L. Medlin, M. Rodriguez, M. Campion, E. Piekos, P. Hopkins. Experimental investigation of size effects on the thermal conductivity of silicon-germanium alloy thin films. *Physical Review Letters* (109) 195901. 2012.
34. J. Duda, T. English, E. Piekos, **T. Beechem**, T. Kenny, P. Hopkins. Bidirectionally tuning Kapitza conductance through the inclusion of substitutional impurities. *Journal of Applied Physics* (112) 073519. 2012.
33. X. Xiao, J. Michael, **T. Beechem**, A. McDonald, M. Rodriguez, M. Brumbach, T. Lambert, C. Washburn, J. Wang, S. Brozik, D.R. Wheeler, D. B. Burkel, and R. Polsky. Three Dimensional Nickel-Graphene/Core -Shell Electrodes. *Journal of Materials Chemistry*. DOI: 10.1039/c2jm35506j. September 2012. **Featured on Cover.**
32. T. Ohta, **T. Beechem**, J. Robinson, G. Kellogg. Long-range atomic ordering and variable interlayer interactions in two overlapping graphene lattices with stacking misorientations. *Physical Review B* (85) 075415. 2012.

## THOMAS E. BEECHEM III

tbeechem@purdue.edu

31. X. Xiao, **T. Beechem**, M. Brumbach, T. Lambert, D. Davis, J. Michael, C. Washburn, J. Wang, S. Brozik, D.R. Wheeler, D.B. Burkel, R. Polsky. Lithographically Defined Three-Dimensional Graphene Nanostructures. *ACS Nano*. (6) 3573. 2012.
30. N. Le, J. Duda, T. English, P. Hopkins, **T. Beechem**, P. Norris. Strategies for tuning phonon transport in multilayered structures using a mismatch-based particle model. *Journal of Applied Physics* (111) 084310. 2012.
29. P. Hopkins, M. Baraket, E. Barnat, **T. Beechem**, S. Kearney, J. Duda, J.T. Robinson, S. Walton. Manipulating Thermal Conductance at Metal-Graphene Contacts via Chemical Functionalization. *NanoLetters* (12) 590. 2012.
28. D. Schmidt, T. Ohta, **T. Beechem**. Strain and charge carrier coupling in epitaxial graphene. *Physical Review B* (84) 235422. 2011. *2011 WiTec Paper Award*
27. **T. Beechem**, J. Serrano. Raman Thermometry of Microdevices: Comparing Methods to Minimize Error. *Spectroscopy*. (26) 36. 2011. *Featured on Cover*.
26. P. Hopkins, **T. Beechem**, J. Duda, K. Hattar, J. Ihlefeld, M. Rodriguez, E. Piekos. Influence of anisotropy on thermal boundary conductance at solid interfaces; *Physical Review B* (84) 125408. 2011.
25. A. Collins, H. Jones, **T. Beechem**, J. Timlin, Q. Hu, D. Han. Carotenoid distribution in living cells of *Haematococcus pluvialis* (Chlorophyceae). *Plos One*; 2011.
24. X. Xiao, J. Nogan, **T. Beechem**, G. Montano, C. Washburn, J. Wang, S. Brozik, D. Wheeler, B. Burkel, R. Polsky. Lithographically-defined 3D porous networks as active substrates for surface enhanced Raman scattering. *Chem Commun*. 47 9858. 2011.
23. K. Lee, S. Kim, M. S. Points, **T. Beechem**, T. Ohta, E. Tutuc. Magnetotransport Properties of Quasi-Free-Standing Epitaxial Graphene Bilayer on SiC: Evidence for Bernal Stacking. *Nanoletters* (11) 3624. 2011.
22. P. Hopkins, K. Hattar, **T. Beechem**, J. Ihlefeld, D. Medling, E. Piekos. Reduction in thermal boundary conductance due to proton implantation in silicon and sapphire. *Applied Physics Letters* (98) 231901. 2011.
21. **T. Beechem**, J. Duda, P. Hopkins, P. Norris, Contribution of optical phonons to thermal boundary conductance. *Applied Physics Letters* (97) 061907. 2010.
20. J. Duda, **T. Beechem**, J. Smoyer, P. Norris, P. Hopkins, Role of dispersion on phononic thermal boundary conductance. *Journal of Applied Physics* (108) 073515. 2010.
19. L. Biedermann, **T. Beechem**, A. J. Ross III, T. Ohta, S. Howell. Electrostatic transfer of patterned epitaxial graphene from SiC(0001) to glass. *New Journal of Physics* (12) 125016. 2010.
18. P. Hopkins, L. Phinney, JR Serrano, **T. Beechem**. Effects of surface roughness and oxide layer on the thermal boundary conductance at aluminum/silicon interfaces. *Physical Review B* (82) 085307. 2010.
17. P. Hopkins, M. Bauer, J. Duda, J. Smoyer, T. English, P. Norris, **T. Beechem**, D. Stewart. Ultrafast thermoelectric properties of gold under conditions of strong electron-phonon nonequilibrium. *Journal of Applied Physics* (108) 104907. 2010.
16. P. Hopkins. **T. Beechem**. Phonon scattering and velocity considerations in the minimum phonon thermal conductivity of layered solids above the plateau. *Nanoscale and Microscale Thermophysical Engineering* (14) 51. 2010.
15. J. Duda, P. Hopkins, **T. Beechem**, J. Smoyer, P. Norris. Inelastic phonon interactions at solid-graphite interfaces. *Superlattices and Microstructures* (47) 550. 2010.
14. P. Hopkins, **T. Beechem**, J. Duda, J. Smoyer, and P. Norris. Effects of sub-conduction band excitations on thermal conductance at metal-metal interfaces. *Applied Physics Letters* (96), 011907. 2010.
13. **T. Beechem** and P. Hopkins. Predictions of thermal boundary conductance for disordered systems of solids and interfaces. *Journal of Applied Physics* (106) 124301. 2009.
12. **T. Beechem**, A. Christensen, D.S. Green, and S. Graham. Assessment of stress contributions in GaN high electron mobility transistors using Raman spectroscopy. *Journal of Applied Physics* (106) 114509. 2009.



## THOMAS E. BEECHEM III

tbeechem@purdue.edu

11. **T. Beechem** and S. Graham. Temperature and doping dependence of phonon lifetimes and decay pathways in GaN. *Journal of Applied Physics* (103) 093507. 2008.
10. **T. Beechem**, A. Christensen, D.S. Green, and S. Graham. Micro-Raman Thermometry in the Presence of Complex Stresses in GaN Devices. *Journal of Applied Physics* (103) 124501. 2008.
9. **T. Beechem**, S. Graham, S. Kearney, L. Phinney, and J. Serrano. Simultaneous Measurement of Temperature and Stress in Micro-Devices Using Micro-Raman Spectroscopy. Invited Paper. *Review of Scientific Instruments* (78) 061301. 2007. ***Featured on Cover***
8. **T. Beechem**, S. Graham, P. Hopkins, and P. Norris. Role of interface disorder on thermal boundary conductance using a virtual crystal approach. *Applied Physics Letters* (90) 054104. 2007.
7. P. Hopkins, P. Norris, R. Stevens, **T. Beechem**, and S. Graham. Influence of Interfacial Mixing on Thermal Boundary Conductance Across a Cr/Si Interface. *Journal of Heat Transfer* (130) 062402. 2008.
6. D.S. Green, B. Vembu, D. Hepper, S. Gibb, D. Jin, R. Vetry, J.R. Shealy, **T. Beechem**, and S. Graham. GaN HEMT thermal behavior and implications for reliability testing and analysis. *Physica status solidi (c)* (5) 2026. 2008.
5. S. C. Hsu, B. J. Pong, W. H. Lee, C. Y. Liu, **T. Beechem** and S. Graham. Stress Relaxation in GaN by Transfer Bonding on Si Substrates. *Applied Physics Letters* (91) 251114. 2007.
4. J. Lee, **T. Beechem**, T. L. Wright, B. A. Nelson, S. Graham, and W. P. King. Electrical, Thermal, and Mechanical Characterization of Silicon Microcantilever-Heaters. *Journal of Microelectromechanical Systems* (15) 1644-1655. 2006.
3. **T. Beechem** and K. Lafdi. Novel high strength graphitic foams. *Carbon* (44) 1548. 2006.
2. **T. Beechem**, K. Lafdi, and A. Elgafy. Bubble growth mechanism in carbon foams. *Carbon* (43) 1055-1064. 2005.
1. G. Rosebrock, A. Elgafy, **T. Beechem**, and K. Lafdi. Study of the growth and motion of graphitic foam bubbles. *Carbon* (43) 3075-3087. 2005.