

John W. Murphy
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EDUCATION:

University of Texas at Dallas
Doctorate of Philosophy, Materials Science and Engineering
Graduated, December 2014
Dissertation Title: Material Evaluation for Large Area Neutron Detectors

University of Texas at Dallas
Masters of Science, Materials Science and Engineering
Graduated, August 2011
G.P.A. 3.88/4.0

Drexel University
Bachelors of Science, Materials Science and Engineering
Graduated with Second Honors, June 2007
G.P.A. 3.61/4.0

RESEARCH EXPERIENCE:

Nuclear Analyst at Holtec International Camden, NJ Jan 2021-May 2021

- Software development of tools for use in the preparation and verification of spent nuclear fuel assembly loading plans for the removal of assemblies from a reactor spent fuel pool into long terms storage casks.
- Perform modeling and simulation of radiation dose and criticality of spent nuclear fuel loaded in storage and transport casks, using MCNP, CASMO, SCALE, and other simulation packages.

Technical Staff at Lawrence Livermore National Laboratory Livermore, CA Mar 2018-Dec 2020

- Co-PI on R&D project to develop high-power density radioisotope batteries, including high aspect ratio three-dimensional semiconductor structures, liquid semiconductors, and scintillation concepts – including device modeling, fabrication, and performance characterization.
- Assist in design, characterization, and testing of novel materials for mid-IR sensing, compact neutron detectors, and corrosion sensors.

Postdoctoral Researcher at Lawrence Livermore National Laboratory Livermore, CA Mar 2015-Mar 2018

- Performed research and analysis of advanced semiconductor radiation detectors and detector systems.
- Assisted in the development and testing of novel types of radioisotope batteries, including liquid semiconductor-based devices.

Research Assistant University of Texas at Dallas Richardson, TX Jun 2008-Mar 2015

- Performed modeling and data analysis using MCNP and Python to determine the optimum thickness for the semiconductor diode in a thin film neutron detector.
- Identified polycrystalline CdTe as a novel and economical material for thin film charged particle and neutron detectors, fabricated, and tested thin film CdTe sensors using an alpha and neutron source.
- Procured a ²⁵²Cf neutron source for the University of Texas at Dallas and led the installation and calibration.

TEACHING EXPERIENCE:

Guest Lecturer University of Texas at Dallas, 2013-2015

- MSEN 6324 – Electronic, Optical and Magnetic Materials (Fall 2013)
- MSEN 7V80 – Special Topics in Radiation Detection (Spring 2014)
- CHEM 1312 – General Chemistry II (Fall 2014)

Undergraduate Mentor University of Texas at Dallas, 2010-2015

- Trained and assisted over 12 undergraduates in research, data analysis, and presentation.

Graduate Mentor Lawrence Livermore National Lab, 2015-2020

- Mentored graduate students and postdocs as a staff member at LLNL.

SELECTED PUBLICATIONS:

1. **J. W. Murphy**, C. D. Frye, R. A. Henderson, M. A. Stoyer, L. F. Voss, and R. J. Nikolic, Demonstration of a three-dimensionally structured betavoltaic. *Journal of Electronic Materials*, 2021, 50, 1380-1385.

2. C. D. Frye, Q. Shao, **J. W. Murphy**, S. E. Harrison, L. F. Voss, J. H. Edgar, and R. J. Nikolic, α Irradiation Response on the Electronic Transport Properties of p-B₁₂P₂. *Journal of Electronic Materials*, 2021, 50, 75-79.
3. C. D. Frye, **J. W. Murphy**, Q. Shao, L. F. Voss, S. E. Harrison, J. H. Edgar, R. J. Nikolic, Hall Effect Characterization of α -Irradiated p-Type 4H-SiC, *physica status solidi (b)*, 2020, 1900781.
4. **J. W. Murphy**, L. F. Voss, C. D. Frye, Q. Shao, K. Kazkaz, M. A. Stoyer, R. A. Henderson, and R. J. Nikolic, Design considerations for three-dimensional betavoltaics. *AIP Advances*, 2019, 9(6), 065208.
5. L. F. Voss, **J. W. Murphy**, Q. Shao, R. A. Henderson, C. D. Frye, M. A. Stoyer, and R. J. Nikolic, Selenium-iodide: A low melting point eutectic semiconductor. *Applied Physics Letters*, 2018, 113(24), 242103.
6. **J. W. Murphy**, Q. Shao, L. F. Voss, P. L. Kerr, L. Fabris, A. M. Conway, R. J. Nikolic, Pillar-structured Neutron Detector Based Multiplicity System. *Nuclear Instruments and Methods in Physics Research A: Accelerators, Spectrometers, Detectors, and Associated Equipment*, 2018, 877, 355-358.
7. L. Smith, **J. W. Murphy**, J. Kim, S. Rozhdestvensky, I. Mejia, H. Park, D. R. Allee, M. Quevedo-Lopez, B. E. Gnade. Thin film CdTe based neutron detectors with high thermal neutron efficiency and gamma rejection for security applications. *Nuclear Instruments and Methods in Physics Research A: Accelerators, Spectrometers, Detectors, and Associated Equipment*, 2016, 838, 117-123.
8. P. Huang, J. Du, S. S. Gunathilake, E. A. Rainbolt, **J. W. Murphy**, K. T. Black, D. Barrera, J. W. P. Hsu, B. E. Gnade, M. C. Stefan, M. C. Biewer. Benzodifuran and benzodithiophene donor-acceptor polymers for bulk heterojunction solar cells. *Journal of Materials Chemistry A*, 2015, 3,
9. J. C. Ramos, I. Mejia, **J. W. Murphy**, M. A. Quevedo-Lopez, P. Garcia, C. A. Martinez. Synthesis of titanium oxide nanoparticles using DNA-complex as template for solution-processable hybrid dielectric composites. *Journal of Alloys and Compounds*, 2015, 643, S84-S89.
10. J. Metcalfe, I. Mejia, **J. W. Murphy**, M. Quevedo, L. Smith, J. Alvarado, B. Gnade, H. Takai. Potential of thin films for use in charged particle tracking detectors. *arXiv preprint arXiv:1411.1794*, 2014.
11. **J. W. Murphy**, L. Smith, G. R. Kunnen, I. Mejia, K. D. Cantley, R. A. Chapman, J. Sastré-Hernández, R. Mendoza-Pérez, G. Contreras-Puente, D. R. Allee, M. Quevedo-Lopez, B. E. Gnade. Thin film cadmium telluride charged particle sensors for large area neutron detectors. *Applied Physics Letters*, 2014, 105, 112107.
12. H. D. Magurudeniya, R. S. Kularatne, E. A. Rainbolt, M. P. Bhatt, **J. W. Murphy**, E. E. Sheina, B. E. Gnade, M. C. Biewer, M. C. Stefan. Benzodithiophene homopolymers synthesized by grignard metathesis (GRIM) and stille coupling polymerizations. *Journal of Materials Chemistry A*, 2014, 2, 8773.
13. R. S. Kularatne, F. J. Taenzler, H. D. Magurudeniya, J. Du, **J. W. Murphy**, E. E. Sheina, B. E. Gnade, M. C. Biewer, M. C. Stefan. Structural variation of donor-acceptor copolymers containing benzodithiophene with bithienyl substituents to achieve high open circuit voltage in bulk heterojunction solar cells. *Journal of Materials Chemistry A*, 2013, 1, 15535.
14. **J. W. Murphy**, G. R. Kunnen, I. Mejia, M. A. Quevedo-Lopez, D. R. Allee, B. E. Gnade. Optimizing diode thickness for thin-film solid state thermal neutron detectors. *Applied Physics Letters*, 2012, 101, 143506.
15. **J. W. Murphy**, I. Mejia, B. E. Gnade, M. A. Quevedo-Lopez. Evaluation of CdS interfacial layers in ZnO nanowire/poly(3-Hexylthiophene) solar cells. *Journal of Nanomaterials*, 2012, 2012, 192456.
16. P. Sista, H. Nguyen, **J. W. Murphy**, J. Hao, D. K. Dei, K. Palaniappan, J. Servello, R. S. Kularatne, B. E. Gnade, B. Xue, P. C. Dastoor, M. C. Biewer, M. C. Stefan. Synthesis and electronic properties of semiconducting polymers containing benzodithiophene with alkyl phenylethynyl substituents. *Macromolecules*, 2010, 43 (19), 8063.
17. N. Hundt, K. Palaniappan, P. Sista, **J. W. Murphy**, J. Hao, H. Nguyen, E. Stein, M. C. Biewer, B. E. Gnade, M. C. Stefan. Synthesis and characterization of polythiophenes with alkenyl substituents. *Polymer Chemistry*, 2010, 1, 1624.
18. F. C. Krebs, S. A. Gevorgyan, B. Gholamkhash, ..., **J. W. Murphy**, et al. A round robin study of flexible large-area roll-to-roll processed polymer solar cell modules. *Solar Energy Materials and Solar Cells*, 2009, 93 (11), 1968.
19. K. Palaniappan, **J. W. Murphy**, N. Khanam, J. Horvath, H. Alshareef, M. A. Quevedo-Lopez, M. C. Biewer, S. Y. Park, M. J. Kim, B. E. Gnade, M. C. Stefan. Poly(3-hexylthiophene)-CdSe quantum dot bulk heterojunction solar cells: influence of the functional end-group of the polymer. *Macromolecules*, 2009, 42 (12), 3845.

CONFERENCE PROCEEDINGS:

1. Q. Shao, L. F. Voss, **J. W. Murphy**, C. D. Frye, R. A. Henderson, M. A. Stoyer, D. Qu, R. J. Nikolic. Accelerated Aging in 4H-SiC as a Betavoltaic Semiconductor Using an Electron Beam System. *IEEE Nuclear Science Symposium and Medical Imaging Conference (Atlanta, GA)*, 2017.
2. **John W Murphy**, Alexander Eddy, George R Kunnen, Israel Mejia, Kurtis D Cantley, David R Allee, Manuel A Quevedo-Lopez, Bruce E Gnade. Sol gel ZnO films doped with Mg and Li evaluated for charged particle detectors, *SPIE Defense, Security, and Sensing*, 2013.
3. Israel Mejia, Ana L Salas-Villasenor, **John W Murphy**, George R Kunnen, Kurtis D Cantley, David R Allee, Bruce E Gnade, Manuel A Quevedo-Lopez, High-performance logic circuits using solution-based low-temperature semiconductors for flexible electronics, *SPIE Defense, Security, and Sensing*, 2013.
4. George R Kunnen, Daniel Pressler, Edward H Lee, David R Allee, **John W Murphy**, Israel Mejia, Manuel Quevedo-Lopez, Bruce Gnade, Large area sensing arrays for detection of thermal neutrons, *Nuclear Science Symposium and Medical Imaging Conference (NSS/MIC)*, 2012.

CONFERENCE PRESENTATIONS:

1. **John W Murphy**, Lars F Voss, Clint D Frye, Qinghui Shao, Mark A Stoyer, Roger A Henderson, Rebecca J Nikolic, Selenium-iodine as a Liquid Semiconductor, MRS Fall Meeting, Boston, MA, 2017.
2. **John W Murphy**, Israel Mejia, Lindsey Smith, George R Kunnen, Kurtis D Cantley, Richard Chapman, David Allee, Manuel Quevedo-Lopez, Bruce Gnade, Polycrystalline Thin-film Semiconductor Materials for Charged Particle and Neutron Detectors, Academic Research Initiative Project Review, Leesburg, VA, 2013.
3. **John W Murphy**, Kevin LaRosa, George R Kunnen, Kurtis D Cantley, Israel Mejia, David Allee, Bruce Gnade, Manuel Quevedo-Lopez, Polycrystalline Zinc Oxide as a Material for Radiation Detectors, MRS Spring Meeting, San Francisco, CA, 2013.
4. **John W Murphy**, Israel Mejia, Manuel Quevedo-Lopez, Bruce Gnade, Novel Materials and Device Structures for Solid-State Charged Particle Detectors, 58th Annual AVS International Symposium, Nashville, TN, 2011.

PATENTS AND APPLICATIONS

1. Patent US10685758B2. C. D. Frye, R. A. Henderson, **J. W. Murphy**, R. J. Nikolic, D. Qu, Q. Shao, M. A. Stoyer, and L. F. Voss, Radiation Tolerant Microstructured Three Dimensional Semiconductor Structure, 2020.
2. Patent application US20180145187A1. L. F. Voss, C. D. Frye, R. A. Henderson, **J. W. Murphy**, R. J. Nikolic, D. Qu, Q. Shao, M. A. Stoyer, Liquid Semiconductor-halogen Based Electronics, 2018.

SKILLS:

- Proficient operating NIM electronics for nuclear radiation counting and spectroscopy
- Extensive cleanroom experience in device fabrication, mask layout, and photolithographic processing
- Experience with thin-film deposition utilizing such techniques as ALD, PECVD, rf-sputtering, e-beam
- Knowledgeable about I-V and C-V electrical characterization of semiconductor devices, including solar cells
- Strong background in Python and Matlab for data processing, analysis, and storage
- Well practiced with SEM and TEM for imaging and EDX chemical analysis
- Extensive experience with MCNP for nuclear transport simulations and proficient with Silvaco and COMSOL modeling tools

PROFESSIONAL MEMBERSHIPS:

Member of the American Nuclear Society
Member of the Materials Research Society
Member of the Institute of Electrical and Electronic Engineers

HONORS AND AWARDS:

Global Security Silver award for contributions to the organization of 2020 Nuclear Battery Workshop at LLNL
Silver award for Excellent Contribution to 2016 LLNL Postdoc Poster Symposium
Certificate of Recognition for Inventive Contribution, 2011 & 2012
Excellence in Education Fellowship, 2009
Drexel Pennoni Honors College Graduate, 2007
Kevin J. O'Hara and Michael J. Koczak Endowment Scholarships, 2005

TECHNICAL REVIEWER:

Journal of Electronic Materials