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EDUCATION

- B.M.E. Mechanical Engineering, University of Delaware, Newark, Delaware 2002
- A.A.S. Mechanical Engineering Technology, Delaware Technical and Community College, Stanton, Delaware 1997
- B.A. Physics, Frostburg State University, Frostburg, Maryland 1991

CERTIFICATIONS

Professional Engineer, Delaware License #15527

National Instruments' Certified LabVIEW Associate Developer

EXPERIENCE

- 2010– Research Associate II, Institute of Energy Conversion, University of Delaware, Newark, Delaware 19716
- Design, engineer, fabricate, and validate new experimental systems and processes to meet contract goals.
 - Maintain, operate, repair, and upgrade systems and facilities including multiple sputtering and evaporation deposition systems, laser scribing system, mechanical scribing system, machine shop, and associated laboratory facilities.
 - Instruct research staff and students on use of this equipment.
- 2004-2010 Research Associate I, Institute of Energy Conversion, University of Delaware, Newark, Delaware 19716
- 2000-2004 Senior Research Technician, Institute of Energy Conversion, University of Delaware, Newark, Delaware 19716
- 1995-2000 Research Technician, Institute of Energy Conversion, University of Delaware, Newark, Delaware 19716

1992-1995 Lab Technician, Institute of Energy Conversion, University of Delaware, Newark, Delaware 19716

PROFESSIONAL SOCIETIES

- American Society of Mechanical Engineers
- Delaware Association of Professional Engineers
- Society of Vacuum Coaters

PUBLICATIONS

1. "Vapor Transport Deposition of Cadmium Telluride Films," Brian E. McCandless, Robert W. Birkmire, Wayne A. Buchanan, Shannon Fields, Gregory M. Hanket, Proc. 29th IEEE PVSC, 547 (2002).
2. "Processing Improvements for Roll-to-Roll Deposition of Cu(InGa)Se₂," E. Eser, S. Fields, G. Hanket, R.W. Birkmire, W. Shafarman, *Proc. DOE Solar Energy Prog. Review Mtg.*, 32, (2004).
3. Cu(InGa)Se₂ Solar Cells on a Flexible Polymer Web," R.W. Birkmire, E. Eser, S. Fields and W.N. Shafarman, *Progress in Photovoltaics* 13, 141 (2005).
4. "Critical Issues in Vapor Deposition of Cu(InGa)Se₂ on Polymer Web: Source Spitting and Back Contact Cracking," Erten Eser, Shannon Fields, Gregory Hanket, Robert W. Birkmire, Jeffrey Doody, Proc. 31st IEEE PVSC, 515 (2005).
5. "Critical Issues for Cu(InGa)Se₂ Solar Cells on Flexible Polymer Web," Erten Eser, Shannon Fields, William Shafarman, Robert Birkmire, submitted to the 19th Space Photovoltaic Research and Technology Conference (SPRAT XIX), Sept. 2005.
6. "Design Strategy for Scale-Up of Physical Vapor Deposition of Cu(InGa)Se₂ on Flexible Substrates," Kapil Mukati, Babatunde A. Ogunnaike, Erten Eser, Shannon Fields, Robert W. Birkmire, Proc. 32nd IEEE PVSC and WCPEC-4, 1842 (2006).
7. "Design of a Vapor Transport Deposition Process for Thin Film Materials," G.M. Hanket, B.E. McCandless, W.A. Buchanan, S. Fields, R.W. Birkmire, *J. Vac. Sci. and Technol. A*, **24**, 1695 (2006).
8. "Scaleup of Cu(InGa)Se₂ Thin Film Coevaporative Physical Vapor Deposition Process, 1. Evaporation Source Model Development," Kapil Mukati, Babatunde A. Ogunnaike, Erten Eser, Shannon Fields, and Robert W. Birkmire, *Ind. Eng. Chem. Res.* 48, 5975-5991 (2009).
9. "Scaleup of Cu(InGa)Se₂ Thin-Film Coevaporative Physical Vapor Deposition Process, 2. Evaporation Source Design", Kapil Mukati, Babatunde A. Ogunnaike, Erten Eser, Shannon Fields, and Robert W. Birkmire, *Ind. Eng. Chem. Res.* 48, 5992-5999 (2009).
10. "Cu(InGa)Se₂ Photovoltaics on Insulated Stainless Steel Web Substrate," Erten Eser, Shannon Fields, Woo K. Kim, Elizabeth McQuiston, Kihwan Kim, and William N. Shafarman, Proc. 35th IEEE Photovoltaic Specialists Conference, 661 (2010).

11. "Commercial-Scale Sources for the Evaporation of Elemental Cu, Ga, and In: Modeling, Design and Validation," Gregory M. Hanket, Robert W. Birkmire, Shannon Fields, and Erten Eser, Proc. , Proc. 35th IEEE Photovoltaic Specialists Conference, 770 (2010).
12. "Design and testing of pilot-scale Cu and mixed-vapor Ga-In evaporation sources", Gregory M. Hanket, Shannon L. Fields, and John R. Elliott, Proc. IEEE 40th Photovoltaic Specialist Conference (2014).
13. "Bandgap gradients in (Ag,Cu)(In,Ga)Se₂ thin film solar cells deposited by three-stage co-evaporation" Christopher P. Thompson, Lei Chen, William N. Shafarman, Jinwoo Lee, Shannon Fields, Robert W. Birkmire, Proc. 42nd IEEE Photovoltaic Spec. Conf. (New Orleans, 2015)
14. "Quantifying Bulk and Surface Recombination in CdTe Solar Cells Using Time-Resolved Terahertz Spectroscopy" Mohammad M. Taheri, Triet M. Truong, Shannon Fields, William N. Shafarman, Brian E. McCandless, Jason B. Baxter, Proc. 48th IEEE Photovoltaic Specialists Conference, 648 (2021).
15. "Pyrolyzer Assisted Vapor Transport Deposition of Antimony-doped Cadmium Telluride", Du, Bin; Dobson, Kevin; McCandless, Brian; Nahar, Aayush; Das, Ujjwal; Fields, Shannon; Arehart, Aaron; Shafarman, William, Proc. 50th IEEE Photovoltaic Specialists Conference, 648 (2023).