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EDUCATION

The University of Tennessee Knoxville, TN
Doctor of Philosophy in Materials Science and Engineering
December 2002 GPA: 3.88/4.00
Dissertation: *Self Assembly of Nanostructures in Silicon*

The University of Tennessee Knoxville, TN
Master of Science in Materials Science and Engineering
August 1999 GPA: 4.00/4.00
Thesis: *Growth of Silicon Microcone/Microcolumn Arrays by Nanosecond Pulsed Laser Irradiation*

The University of Tennessee Knoxville, TN
Bachelor of Science in Materials Science and Engineering
May 1997 GPA: 3.75/4.00
Senior Projects: *Room Temperature Fatigue Study of Cold-Worked 304 Stainless Steel* and *Tool Steel Failure in Heat Treatment*

The University of Alabama Tuscaloosa, AL
Coursework in Metallurgical Engineering
Fall 1992 – Spring 1994 GPA: 3.88/4.00

HONORS

Tau Beta Pi National Honor Society, Alpha Lambda Delta National Honor Society, Phi Eta Sigma National Honor Society, ASM Oak Ridge Chapter Scholarship, President's List (UA) spring 1994, Summa Cum Laude (UT) fall 1994, 96, and 97, Outstanding Senior Materials

Science and Engineering (UT) 1997, Sigma Xi Competition Winner 2000, Outstanding Graduate Student Materials Science and Engineering 2002, Big Brothers & Big Sisters of America (3 years)

RESEARCH

December 2007 – Present
Staff Scientist
Nanofabrication Research Laboratory Research Staff Member, Center for Nanophase Materials Sciences, Oak Ridge National Laboratory (subcontract assignment)

- Nanofabrication techniques including electron beam lithography, focused ion beam etching/deposition, electron beam induced etching/deposition, sub–micron soft lithography and standard microfabrication procedures.
- Additional skills include experience with the electron beam lithography technique to define, pattern, and integrate nanoscale features, nanoscale thin film editing using electron and ion beams to affect thin film catalytic properties, and a maskless lithography technique using focused electron beam deposition of the multiple material layers to define ultrafine features (< 20 nm)
- Microfabrication skills integrating multiple processes including physical vapor deposition, chemical vapor deposition, photolithography, and reactive ion etching. Experience with soft lithography template preparation for patterning sub–micron molecular layers and monolayers.
- Developed simulation packages to help predict and understand multiple nanofabrication techniques including electron beam lithography, electron beam induced deposition, combinatorial sputtering, and diffusive transport in micro/nanofluidic structures.
- Extensive experience interacting with users including on–site training, providing design aid to best reach a user's final device, preparing specific user work plans per visit, and troubleshooting hardware and software problems as they arise. Played an active role in helping to refine and execute the Nanofabrication Research Laboratory's plan for handling user load.

November 2004 – December 2007
Research Assistant Professor, The University of Tennessee, Knoxville
Molecular – Scale Engineering and Nanoscale Technologies Research Group (MENT) member

- Cellular mimetic research integrating standard lithography patterning techniques to produce structures mimicking passive, diffusion based, molecular transport across membrane structures on the nanoscale
- Cell mimic simulation software for Monte Carlo simulations to complement all passive diffusion experiment configurations including fluorescence recovery after photobleaching, enzyme functionalized CNF membrane experiments, and fluorescence microscopy characterization based techniques
- Intracellular, carbon nanofiber based probe fabrication for cell impalefection for the delivery of tethered, functional DNA delivery into the intracellular cytoplasm and nucleus.

- Control of catalyst nanoparticle crystallographic texture by rf magnetron sputtering to deterministically control vertically aligned carbon nanofiber growth over macroscopic, silicon wafer dimensions

August 2002 – October 2004
Post – Graduate Research Assistant

- Electron beam – induced, nanoscale etching in semiconductor and oxide materials for future use in EUV mask repair and integrated circuit repair.
- Developed a detailed 3D computer simulation of electron – beam stimulated deposition and etching including localized precursor gas delivery, surface diffusion, electron stimulated deposition, and beam rastering.
- Film crystal structure and morphology via x – ray diffraction to determine the effects of these properties on the ultraviolet luminescence of magnetron sputtered gadolinium doped yttrium oxide thin films and gadolinium doped yttrium – aluminum garnet thin films
- Developed a numerical simulation to aide in the interpretation of cathodoluminescence characterization results
- Combinatorial deposition, using magnetron sputtering, of binary alloy systems for rapid material properties determination

May 1997 – August 2002
Graduate Research Assistant
Laboratory Preparation

- Assembled several vacuum chamber systems for pulsed – laser deposition processing and laser surface modification experiments
- General laboratory maintenance on chambers, pumping systems, vacuum gauges, excimer laser, etc.
- Knowledge of optical components for laser beam delivery

Research Work

- Experiments and theory development of the catalyst – free vapor – liquid – solid process of silicon microcone/microcolumn growth via laser irradiation
- Photoluminescent silicon and silicon – oxide nanoparticles grown via laser irradiation of silicon microcone/microcolumn morphologies
- Characterized silicon nanoparticle morphology and properties using AFM, HRSEM, and HRTEM
- Self – organization of silicon nanostructures over microscopic dimensions
- Pulsed – laser deposition of silicon nanoparticle films
- Laser – assisted chemical vapor deposition of silicon nano –tips

Current Research Synopsis

1. *Charged Particle Beam-Induced, Direct-Write Deposition/Etching*
   Nanoscale direct-write assembly methods, such as focused particle beam processing, require precise understanding and control of the relevant electron/ion–vapor precursor–solid interactions where energy beams on the order of 1–10 nm dictate the assembly/removal of material at the confluence of the particle beam, adsorbed precursor and substrate. We determine precursor–substrate interaction parameters

relevant for the electron/ion beam induced deposition methods through a combination of experiments and simulations. Monte Carlo simulations of the electron–substrate interaction are combined with finite difference simulations of precursor–substrate interactions to unravel the parameters by fitting to experimental results.

2. *Self and Directed Assembly of Thin, Liquid Metallic Films*
   Physical vapor deposition combined with nanolithography methods are used to deposit metallic materials with highly non-equilibrium shapes. Capillary, inertial and viscous forces dictate the mass transport of the metal once liquefied. The initial shape of the metallic feature is used to harness liquid surface instabilities for the self assembly of metallic nanoparticles. Pulsed laser irradiation is used to liquefy the metal features where rapid heating and cooling rates and nanosecond melt lifetimes are achievable. Directed assembly is possible by imposing periodic fluctuations onto the initial metal geometry which translates into highly precise arrays of metallic nanoparticles/nanocaps.

3. *Solute Diffusion in Crowded Environments*
   Biomolecular transport in cellular environments occurs in crowded surroundings where molecular reactivity and diffusion can be significantly altered when compared with dilute solution conditions. By the prescribed design of spatially restricted environments, micro- and nanofabrication techniques can be used to replicate specific features of such systems. We implement Monte Carlo, Brownian based simulation methods to design, and fabricate, micro- and nano- size containers and crowding features intended to control the reaction and diffusion of matter at biologically relevant length and time scales.

Peer-Reviewed Publications

1. C. Hartnett, K. Mahady, J. D. Fowlkes, S. Afkhami, L. Kondic and P. D. Rack, “Instability of Nano – and Microscale Liquid Metal Filaments: Transition from Single Droplet Collapse to Multidroplet Breakup”, *Langmuir* (accepted) (2015)
2. M. G. Stanford, B. B. Lewis, J. H. Noh, **J. D. Fowlkes** and P. D. Rack, “Inert Gas Enhanced Laser–Assisted Purification of Platinum Electron-Beam-Induced-Deposits”, *ACS Applied Materials and Interfaces* 7, 19579-19588 (2015)
3. **J. D. Fowlkes**, B. Geier, B. Lewis, P. D. Rack, M. Stanford, R. Winkler and H. Plank, “Electron nanoprobe induced oxidation: a simulation of direct–write purification”, *Physical Chemistry and Chemical Physics* 17, 18294 (2015)
4. B. B. Lewis, M. G. Stanford, **J. D. Fowlkes**, K. Lester, H. Plank and P. D. Rack, “Electron Stimulated Purification of Platinum Nanostructures Grown Via Focused Electron Beam Induced Deposition”, *Beilstein Journal of Nanotechnology* 6, 907 (2015)
5. J. H. Noh, **J. D. Fowlkes**, R. Timilsina, M. Stanford, B. Lewis and P. D. Rack, “Pulsed laser assisted focused electron beam induced etching of titanium with XeF_2: enhanced reaction rate and precursor transport”, *ACS Applied Materials and Interfaces* 7, 4179 (2015)
6. R. Winkler, A. Szkudlarek, **J. D. Fowlkes**, P. D. Rack, I. Utke and H. Plank, “Toward Ultrafast Surface Morphologies During Focused Electron Beam Induced

Nanosynthesis: Disruption Origins and Compensation", *ACS Applied Materials and Interfaces* 7, 2389 (2015)

7. R. Schmied, **J. D. Fowlkes**, R. Winkler, P. D. Rack and H. Plank, "Fundamental edge broadening effects during focused electron beam induced nanosynthesis", *Beilstein Journal of Nanotechnology* 6, 462 (2015)
8. J. T. McKeown, Y. Wu, **J. D. Fowlkes**, P. D. Rack and G. H. Campbell, "Simultaneous In Site Synthesis and Characterization of Co@Cu Core–Shell Nanoparticle Arrays", *Advanced Materials* 27, 1060 (2015)
9. C. Durand, X. –G. Zhang, **J. D. Fowlkes**, S. Najmaei, J. Lou and A. –P. Li, "Defect – mediated transport and electronic irradiation effect in individual domains of CVD – grown monolayer MoS_2", *Journal of Vacuum Science & Technology B* 33, 02B110 (2015)
10. M. G. Stanford, B. B. Lewis, J. H. Noh, **J. D. Fowlkes**, N. A. Roberts, H. Plank and P. D. Rack, "Purification of nanoscale electron beam induced platinum deposits via pulsed laser induced oxidation reaction", *ACS Applied Materials and Interfaces* 6, 21256 – 21263 (2014)
11. L. Kondic, N. Dong, Y. Wu, **J. D. Fowlkes** and P. D. Rack, "Instabilities of nanoscale patterned metal films", *European Physics Journal Special Topics* 224, 369 (2015)
12. B. Geier, C. Gspan, R. Winkler, R. Schmied, **J. D. Fowlkes**, Harald Fitzek, S. Rauch, J. Rattenberger, P. D. Rack and H. Plank, "Rapid and highly compact purification for focused electron beam induced deposits: a low temperature approach using electron stimulated H_2O reactions", *Journal of Physical Chemistry C* 118, 14009 (2014)
13. J. H. Noh, M. G. Stanford, B. B. Lewis, **J. D. Fowlkes**, H. Plank and P. D. Rack, "Nanoscale electron beam induced deposition and purification of ruthenium for extreme ultraviolet lithography mask repair", *Applied Physics A* 117, 1705 (2014)
14. D. C. Skigin, **J. D. Fowlkes**, N. A. Roberts, L. Scaffardi, D. Schinca and M. Lester, "Experimental demonstration of the ability of dual–period wire gratings to control the optical response", *Optics Letters 39*, 5693 (2014)
15. T. D. Nguyen, M. Fuentes–Cabrera, **J. D. Fowlkes** and P. D. Rack, "Coexistence of spinodal instability and thermal nucleation in thin film rupture: Insights from molecular levels", *Physical Review E* 89, 032403 (2014)
16. Y. Wu, S. Fu, J. D. Fowlkes, N. Dong, L. Kondic, M. A. Vincenti, D. de Cegia and P. D. Rack, " Directed liquid phase assembly of highly ordered metallic nanoparticle arrays", *ACS Applied Materials & Interfaces* 6, 5835 (2014)
17. G. Arnold, R. Timilsina, J. Fowlkes, A. Orthacker, G. Kothleitner, P. D. Rack and H. Plank, "Fundamental resolution limits during electron-induced direct-write synthesis", *ACS Applied Materials & Interfaces* 6, 7380 (2014)
18. R. Winkler, **J. D. Fowlkes**, A. Szkudlarek, I. Utke, P. D. Rack and H. Plank, "The Nanoscale Implications of a Molecular Gas Beam during Electron Beam Induced Deposition", *ACS Applied Materials & Interfaces* 6, 2987 (2014)
19. **J. D. Fowlkes**, N. A. Roberts, Y. Wu., J. A. Diez, A. G. Gonzalez, C. Hartnett, K. Mahady, S. Afkhami, L. Kondic and P. D. Rack, "Hierarchical nanoparticle ensembles synthesized by liquid phase directed self–assembly", *Nano Letters* 14, 774 (2014)

20. H. Plank, J. H. Noh, **J. D. Fowlkes**, B. Lewis, K. Lester and P. D. Rack, "Electron beam assisted oxygen purification at low temperatures of electron beam induced Pt deposits: towards pure and pore–free structures", *ACS Applied Materials & Interfaces* 6, 1018 (2014)
21. W. Siemons, C. Beekman, **J. D. Fowlkes**, N. Balke, J. Z. Tischler, R. Xu, W. Liu, C. M. Gonzalez, J. D. Budai and H. M. Christen, "*Focused–Ion–Beam induced damage in thin films of complex oxide $BiFeO_3$*", *APL Materials* 2, 022109 (2014)
22. N. A. Roberts, C. M. Gonzalez, **J. D. Fowlkes** and P. D. Rack, "Enhanced By – product Desorption via Laser Assisted Electron Beam Induced Deposition of $W(CO)_6$ with Enhanced Conductivity and Resolution", *Nanotechnology* 24, 415301 (2013)
23. N. P. Mortensen, N. Boisen, S. Carey, S. J. Kennel, **J. D. Fowlkes**, M. J. Doktycz, J. P. Nataro and D. P. Allison, "Enteroaggregative Escherichia coli: Surface Protein Dispersin Increases Bacterial Uptake of Ciprofloxacin", *International Journal of Antimicrobial Agents* 42, 462 (2013)
24. A. G. Gonzalez, J. A. Diez, Y. Wu, **J. D. Fowlkes**, P. D. Rack and L. Kondic, "Instability of Liquid Cu Films on a SiO_2 Substrate", *Langmuir* 29, 9378 (2013)
25. N. A. Roberts, **J. D. Fowlkes**, K. Mahady, S. Afkhami, L. Kondic and P. D. Rack, "Directed assembly of one – and two – dimensional nanoparticle arrays from pulsed laser induced dewetting of square waveforms", *ACS Applied Materials & Interfaces* 5, 4450 (2013)
26. **J. D. Fowlkes** and P. C. Collier, "Single-molecule mobility in confined and crowded femtoliter chambers", *Lab on a Chip* 13, 877 (2013)
27. N. A. Roberts, **J. D. Fowlkes**, G. A. Magel and P. D. Rack, "Enhanced materials purity and resolution via synchronized laser assisted electron beam induced deposition of platinum", *Nanoscale* 5, 410 (2013)
28. J. T. McKeown, N. A. Roberts, **J. D. Fowlkes**, Y. Wu, T. LaGrange, B. W. Reed, G. H. Campbell and P. D. Rack, "Real-time observation of nanosecond liquid-phase assembly of nickel nanoparticles via pulsed-laser heating", *Langmuir* 28, 17168 (2012)
29. **J. D. Fowlkes**, L. Kondic, J. A. Diez, A. G. Gonzalez, Y. Wu, N. A. Roberts, C. E. McCold and P. D. Rack, "Parallel assembly of particles and wires on substrates by dictating instability evolution in liquid metal films", *Nanoscale* 4, 7376 (2012)
30. T. D. Nguyen, M. Fuentes–Cabrera, **J. D. Fowlkes**, J. A. Diez, A. G. Gonzalez, L. Kondic and P. D. Rack, "Competition between Collapse and Breakup in Nanometer – Sized Thin Rings Using Molecular Dynamics and Continuum Modeling", *Langmuir* 28, 13960 (2012)
31. **J. D. Fowlkes**, S. Horton, M. Fuentes–Cabrera and P. D. Rack, "Signatures of the Rayleigh–Plateau Instability Revealed by Imposing Synthetic Perturbations on Nanometer–Sized Liquid Metals on Substrates", *Angewandte Chemie International Edition* 51, 8768 (2012)
32. W. Wang, Z. Gai, M. Chi, **J. D. Fowlkes**, J. Yi, L. Zhu, X. Cheng, D. J. Keavney, P. C. Snijders, T. Z. Ward, J. Shen and X. Xu, "Growth diagram and magnetic properties of hexagonal LuFe2O4 thin films", *Physical Review B* 85, 155411 (2012)
33. N. A. Roberts, G. A. Magel, C. D. Hartfield, T. M. Moore, **J. D. Fowlkes** and P. D. Rack, "In situ laser processing in a scanning electron microscope", *Journal of Vacuum Science and Technology A* 30, 041404 (2012)

34. Y. Wu, **J. D. Fowlkes**, N. A. Roberts, J. A. Diez, L. Kondic, A. G. Gonzalez and P. D. Rack, “Competing liquid phase instabilities during pulsed laser induced self–assembly of copper rings into ordered nanoparticle arrays on SiO_2”, *Langmuir* 27, 13314 (2011)
35. M. Fuentes–Cabrera, B. R. Rhodes, M. I. Baskes, H. Terrones, **J. D. Fowlkes**, M. L. Simpson and P. D. Rack, “Controlling the Velocity of Jumping Nanodroplets via Their Initial Shape and Temperature”, *ACS Nano* 5, 7130 (2011)
36. N. P. Mortensen, **J. D. Fowlkes**, M. Maggart, M. J. Doktycz, J. P. Nataro, G. Drusano and D. P. Allision, “Effects of sub–minimum inhibitory concentrations of ciprofloxacin on enteroaggregative Escherichia Coli and the role of the surface protein dispersin”, *International Journal of Antimicrobial Agents* 38, 27 (2011)
37. **J. D. Fowlkes**, L. Kondic, J. Diez, Y. Wu and P. D. Rack, “Self–Assembly versus Directed Assembly of Nanoparticles via Pulsed Laser Induced Dewetting of Patterned Metal Films”, *Nano Letters* 11, 2478 (2011)
38. M. Fuentes–Cabrera, B. H. Rhodes, **J. D. Fowlkes**, A. Lopez–Benzanilla, H. Terrones, M. L. Simpson and P. D. Rack, “Molecular dynamics study of the dewetting of copper on graphite and graphene: Implications for nanoscale self – assembly”, *Physical Review E* 83, 041603 (2011)
39. Y. Wu, **J. D. Fowlkes** and P. D. Rack, “The optical properties of Cu–Ni nanoparticles produced via pulsed laser dewetting of ultrathin films: The effect of nanoparticle size and composition on the Plasmon response”, *Journal of Materials Research* 26, 277 (2011)
40. R. Clearfield, J. G. Railsback, R. C. Pearce, D. K. Hensley, **J. D. Fowlkes**, M. Fuentes–Cabrera, M. L. Simpson, P. D. Rack and A. V. Melechko, “Reactive solid–state dewetting of Cu–Ni films on silicon”, *Applied Physics Letters* 97, 253101 (2010)
41. B. R. Srijanto, S. T. Retterer, **J. D. Fowlkes** and M. J. Doktycz, “Nanostructured silicon membranes for control of molecular transport”, *Journal of Vacuum Science and Technology B* 28, C6P48 (2010)
42. **J. D. Fowlkes**, Y. Wu and P. Rack, “Directed Assembly of Bi–Metallic Nanoparticles by Pulsed Laser Induced Dewetting: a Unique Time and Length Scale Regime”, *ACS Applied Materials & Interfaces* 2, 2153 (2010)
43. Y. Wu, **J. D. Fowlkes**, P. D. Rack, J. A. Diez and L. Kondic, “On the Breakup of Patterned Nanoscale Copper Rings into Nanoparticles: Competing Instability and Transport Mechanisms”, *Langmuir* 26, 11972 (2010)
44. C. K. Choi, **J. D. Fowlkes**, S. T. Retterer, P. Siuti, S. Iyer and M. J. Doktycz, “Surface Charge- and Space-Dependent Transport of Proteins in Crowded Environments of Nanotailored Posts”, *ACS Nano* 4, 3345 (2010)
45. **J. D. Fowlkes**, M. J. Doktycz and P. D. Rack, “An optimized nanoparticle separator enabled by electron beam induced deposition”, *featured article*, *Nanotechnology* 21, 165303 (2010)
46. **J. D. Fowlkes** and P. D. Rack, “Fundamental Electron–Precursor–Solid Interactions Derived from Time–Dependent Electron–Beam–Induced–Deposition Simulations and Experiments”, *ACS Nano* 4, 1619 (2010)
47. A. Dhawan, M. Gerhold, A. Madison, **J. Fowlkes**, P. E. Russell, T. Vo–Dinh and D. N. Leonard, “Fabrication of Nanodot Plasmonic Waveguide Structures Using FIB Milling and Electron Beam – Induced Deposition”, *Scanning* 31, 1 (2009)

48. B. L. Fletcher, J. T. Fern, K. Rhodes, T. E. McKnight, **J. D. Fowlkes**, S. T. Retterer, D. J. Keffer, M. L. Simpson and M. J. Doktycz, “Effects of ultramicroelectrode dimensions on the electropolymerization of polypyrrole”, *Journal of Applied Physics* 105, 124312 (2009)
49. N. P. Mortensen, **J. D. Fowlkes**, C. J. Sullivan, D. P. Allison, N. B. Larsen, S. Molin, and M. J. Doktycz, “Effects of Colistin on Surface Ultrastructure and Nanomechanics of Pseudomonas aeruginosa Cells”, *Langmuir* 25, 3728 (2009)
50. L. Kondic, J. A. Diez, P. D. Rack, Y. Guan and **J. D. Fowlkes**, “Nanoparticle assembly via the dewetting of patterned thin metal lines: Understanding the instability mechanisms”, *Physical Review E* 79, 026302 (2009)
51. Y. Guan, **J. D. Fowlkes**, S. T. Retterer, M. L. Simpson, and P. D. Rack, “Nanoscale lithography via electron beam induced deposition”, *Nanotechnology* 19, 505302 (2008)
52. **J. D. Fowlkes**, B. L. Fletcher, S. T. Retterer, A. V. Melechko, M. L. Simpson, and M. J. Doktycz, “Size–Selectivity and Anomlaous Subdiffusion of Nanoparticles through Carbon Nanofiber–Based Membranes”, *Nanotechnology* 19, 415301 (2008)
53. D. A. Smith, **J. D. Fowlkes** and P. D. Rack, ”Simulating the effects of surface diffusion on electron beam induced deposition via a three – dimensional Monte Carlo simulation”, *Nanotechnology* 19, 415704 (2008)
54. P. D. Rack, Y. Guan, **J. D. Fowlkes**, A. V. Melechko and M. L. Simpson, “Pulsed laser dewetting of patterned thin metal films: A means of directed assembly”, *Applied Physics Letters* 92, 223108 (2008)
55. K. L. Klein, S. J. Randolph, **J. D. Fowlkes**, L. F. Allard, H. M. Meyer III, M. L. Simpson and P. D. Rack, “Single–crystal nanowires grown via electron–beam–induced deposition”, *Nanotechnology* 19, 345705 (2008)
56. K. D. Sorge, K. L. Klein, A. V. Melechko, C. L. Finkel, O. Malkina, Th. Leventouri, **J. D. Fowlkes**, P. D. Rack, and M. L. Simpson, “Magnetic Properties of Fe–Co Catalysts used for Carbon Nanofiber Synthesis”, *Journal of Applied Physics* 104, 033909 (2008)
57. D. A. Smith, **J. D. Fowlkes**, and P. D. Rack, “Understanding the Kinetics and Nanoscale Morphology of Electron Beam Induced Deposition via a Three Dimensional Monte Carlo Simulation: The Effects of the Precursor Molecule and the Deposited Material”, *Small* 4, 1382 (2008)
58. K. L. Klein, A. V. Melechko, T. E. McKnight, S. T. Retterer, P. D. Rack, **J. D. Fowlkes**, D. C. Joy, and M. L. Simpson, “Surface characterization and functionalization of carbon nanofibers”, *Journal of Applied Physics* 103, 061301 (2008)
59. B. L. Fletcher, S. T. Retterer, T. E. McKnight, A. V. Melechko, **J. D. Fowlkes**, M. L. Simpson, and M. J. Doktycz, “Actuatable Membranes Based on Polypyrrole – Coated Vertically Aligned Carbon Nanofibers”, *ACS Nano*, 2, 247 (2008)
60. A. V. Melechko, K. L. Klein, **J. D. Fowlkes**, D. K. Hensley, I. A. Merkulov, T. E. McKnight, P. D. Rack, J. A. Horton, and M. L. Simpson, “Control of carbon nanostructure: From nanofiber towards nanotube and back”, *Journal of Applied Physics* 102, 074314 (2007)

61. P. D. Rack, **J. D. Fowlkes**, and S. J. Randolph, “In-situ probing of the growth and morphology in electron-beam-induced deposited nanostructures”, *Nanotechnology*, 18, 465602 (2007)
62. B. L. Fletcher, T. E. McKnight, **J. D. Fowlkes**, D. P. Allison, M. L. Simpson and M. J. Doktycz, “Controlling the dimensions of carbon nanofiber structures through the electropolymerization of pyrrole”, *Synthetic Metals* 157, 282 (2007)
63. S. J. Randolph, **J. D. Fowlkes**, A. V. Melechko, K. L. Klein, H. M. Meyer III, M. L. Simpson, and P. D. Rack, “Controlling thin film structure for the dewetting of catalyst nanoparticle arrays for subsequent carbon nanofiber growth”, *Nanotechnology*, 18, 465304 (2007)
64. D. A. Smith, **J. D. Fowlkes**, and P. D. Rack, “A Nanoscale Three Dimensional Monte-Carlo Simulation of Electron Beam Induced Deposition with Gas Dynamics”, *Nanotechnology*, 18, 265308 (2007)
65. **J. D. Fowlkes**, J. M., Fitz–Gerald, and P. D. Rack, “Ultraviolet emitting $(Y_{1-x}Gd_x)_2O_{3-\delta}$ thin films deposited by radio frequency magnetron sputtering: structure–property–thin film processing relationships”, *Thin Solid Films* 515, 3488 (2007)
66. Y. Deng, **J. D. Fowlkes**, J. M. Fitz – Gerald, and P. D. Rack, “Thin Film rf Magnetron Sputtering of Gadolinium Doped Yttrium Aluminum Garnet Ultraviolet Emitting Materials”, *Optical Mat.* 29, 183 (2006)
67. **J. D. Fowlkes**, J.– M., Fitz–Gerald, and P. D. Rack, “Ultraviolet emitting $(Y_{1-x}Gd_x)_2O_{3-\delta}$ thin films deposited by radio frequency magnetron sputtering: Combinatorial modeling, synthesis, and rapid characterization”, *Thin Solid Films* 510, 68 (2006)
68. **J. D. Fowlkes**, E. D. Hullander, B. L. Fletcher, S. T. Retterer, A. V. Melechko, D. K. Hensley, M. L. Simpson, and M. J. Doktycz, “Molecular Transport in a Crowded Volume Created from Vertically–Aligned Carbon Nanofibers: A Fluorescence Recovery after Photobleaching Study”, *Nanotechnology* 17, 5659 (2006)
69. M. S. Dhindsa, N. R. Smith, J. Heikenfeld, P. D. Rack, **J. D. Fowlkes**, M. J. Doktycz, A. V. Melechko, and M. L. Simpson, “Reversible Electrowetting of Vertically Aligned Superhydrophobic Carbon Nanofibers”, *Langmuir* 22, 9030 (2006)
70. S. J. Randolph, **J. D. Fowlkes**, and P. D. Rack, “Focused, Nanoscale Electron–Beam–Induced Deposition and Etching”, *Critical Reviews in Solid State and Materials Sciences* 31, 1–35 (2006)
71. **J. D. Fowlkes**, A. V. Melechko, K. L. Klein, P. D. Rack, D. A. Smith, D. K. Hensley, M. J. Doktycz, and M. L. Simpson, “Control of catalyst particle crystallographic orientation in vertically aligned carbon nanofiber synthesis”, *Carbon* 44, 1503 (2006)
72. K. L. Klein, A. V. Melechko, **J. D. Fowlkes**, P. D. Rack, D. K. Hensley, H. M. Meyer III, L. F. Allard, T. E. McKnight, and M. L. Simpson, “Formation of Ultrasharp Vertically Aligned Cu–Si Nanocones by a DC Plasma Process” *Journal of Physical Chemistry B*. 110, 4766 (2006)
73. T. E. McKnight, C. Peeraphatdit, S. W. Jones, **J. D. Fowlkes**, B. L. Fletcher, K. L. Klein, A. V. Melechko, M. J. Doktycz, and M. L. Simpson, “Site–Specific Biochemical Functionalization along the Height of Vertically Aligned Carbon Nanofiber Arrays”, Chemical Materials 18, 3203 (2006)
74. T. Leventouri, A. V. Melechko, K. D. Sorge, K. L. Klein, **J. D. Fowlkes**, P. D. Rack, I. M. Anderson, J. R. Thompson, T. E. McKnight, and M. L. Simpson, “Magnetic alloys

in nanoscale biomaterials", *Metallurgical and Materials Transactions A – Physical Metallurgy and Materials Science* 37A, 3424 (2006)

75. **J. D. Fowlkes**, B. L. Fletcher, E. D. Hullander, K. L. Klein, D. K. Hensley, A. V. Melechko, M. L. Simpson, and M. J. Doktycz, "Tailored transport through vertically aligned carbon nanofibre membranes; controlled synthesis, modelling, and passive diffusion experiments", *Nanotechnology* 16, 3101 (2005)
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PRINCIPAL INVESTIGATOR

Oak Ridge National Laboratory, Laboratory Directed Research and Development (LDRD), Seed money fund
“Laser Enhanced Nanoscale Focused Electron Beam Induced Processing”, $150k (2008)

Department of Energy, Basic Energy Sciences, Field Work Proposal
Design and Synthesis of Nanomaterials, $470k/yr (2011–2013)

ACTIVITES IN PROFESSIONAL MEETINGS AND CONFERENCES

American Chemical Society (ACS) Member

SPIE Photonics West 2014
J. D. Fowlkes, P. D. Rack, Y. Wu, N. Roberts, J. Diez, A. Gonzalez, and L. Kondic, “The Liquid Phase Assembly of Metallic Nanoparticle Arrays using Nanolithography and Pulsed Laser Melting”, **Invited Talk**, San Francisco, CA, February

Frontiers in Applied and Computational Mathematics 2012
J. D. Fowlkes, P. D. Rack, Y. Wu, N. Roberts, J. Diez, A. Gonzalez, and L. Kondic, “The Directed Assembly of Linear Metallic Nanoparticle Chains by Nanolithography and Pulsed Laser Induced Dewetting”, **Invited Talk**, Newark, NJ, May

Directed Self-Assembly of Materials
MRS Workshop
J. D. Fowlkes, P. D. Rack, J. Diez, L. Kondic, Y. Wu and N. Roberts, "The Directed Assembly of Linear Metallic Nanoparticle Chains by Nanolithography and Pulsed Laser Induced Dewetting", **Talk**, Nashville, TN, September

Synthesis and Processing Principal Investigators' Meeting 2011
J. D. Fowlkes, P. D. Rack, M. Fuentes-Cabrera, "Design and Synthesis for Nanomaterials", **Talk**, Washington D.C., September

55th International Conference on Electron, Ion, Photon Beam Technology and Nanofabrication
2011 International Meeting
J. D. Fowlkes, L. Kondic, J. Diez, Y. Wu and P. D. Rack, "The Directed Assembly of Metallic Nanoparticle Chains by Pulsed Laser Induced Dewetting and Nanolithography", **Talk**, Las Vegas, Nevada, USA, June

American Physical Society March Meeting 2011
Y. Wu, J. D. Fowlkes, P. Rack, L. Kondic, and J. Diez, "Self and Directed Assembly of Thin Metallic Films Exposed to Pulsed Laser Irradiation, Talk, Dallas, TX, March

3rd International Workshop on Focused Electron Bead Induced Processing
2010 International Meeting
(Conference co-organizer)
P. D. Rack, M. J. Doktycz, S. T. Retterer and M. L. Simpson, "Fundamental electron–precursor–solid interactions derived from time–dependent electron beam induced deposition simulations and experiments", **Poster**, Albany, New York, USA, July

Microscopy & Microanalysis 2009
J. D. Fowlkes, D. A. Smith, M. J. Doktycz, M. L. Simpson and P. D. Rack, "Electron beam induced deposition: experiments, challenges and nano–based applications", **Invited Talk**, Richmond, July

American Society for Microbiology 109th General Meeting
2009 International Meeting
A. N. Edwards, J. D. Fowlkes, R. F. Standaert, D. A. Pelletier, M. J. Doktycz, J. L. Morrell–Falvey, "A FRAP – based method for Quantification of Binding Affinities *In vivo*", **Poster**, Philadelphia, May

53rd International Conference on Electron, Ion, Photon Beam Technology and Nanofabrication
2009 International Meeting
J. D. Fowlkes, M. Fuentes – Cabrera, J. A. Diez, L. Kondic, A. V. Melechko, R. Kalyanaraman, H. Krishna, Y. Wu and P. D. Rack, "Directed, Liquid Phase Assembly of Patterened, Thin Metallic Films by Pulsed Laser Dewetting", **Poster**, Marco Island, May

Microscopy & Microanalysis 2008
J. D. Fowlkes, D. A. Smith, M. J. Doktycz, M. L. Simpson and P. D. Rack, “Electron beam induced processing: Experimentation, Simulation and Applications”, **Invited Talk**, Albuquerque, August

2nd International Workshop on Focused Electron Bead Induced Processing
2008 International Meeting
J. D. Fowlkes, P. D. Rack, M. J. Doktycz, S. T. Retterer and M. L. Simpson, “Electron stimulated materials processing for nanofabrication and bio – inspired synthesis”, **Poster**, Thun, Switzerland, July 2008

52nd International Conference on Electron, Ion, Photon Beam Technology and Nanofabrication
2008 International Meeting
J. D. Fowlkes and P. D. Rack, “Electron beam induced deposition efficiency”, **Poster**, Portland, OR, June

1st International Workshop on Electron Beam Induced Deposition
2006 International Meeting
P. D. Rack, D. A. Smith, **J. D. Fowlkes**, D. C. Joy, “Understanding electron – beam – induced deposition and etching via a Monte – Carlo based, 3D growth simulation: ‘Envizion’”, **Talk**, Delft, Netherlands, June

52nd International American Vacuum Society
2005 International Meeting
The Focused Beam Processing and Fabrication Session (moderator)
J. D. Fowlkes, B. L. Fletcher, E. D. Hullander, K. L. Klein, T. E. McKnight, M. L. Simpson, and M. J. Doktycz, “A Cell Mimic Structure with Tailored Pore Sizes: Synthesis and Modeling”, **Poster**, Boston, MA, November

49th International Conference on Electron, Ion, Photon Beam Technology and Nanofabrication
2005 International Meeting
J. D. Fowlkes, S. J. Randolph, and P. D. Rack, “Unraveling the complex variable space of electron beam induced deposition (EBID) by a Monte Carlo based, 3D growth simulation”, **Poster**, Orlando, FL, June

Gordon Research Conference
Combinatorial & High Throughput Materials Science 2004
J. D. Fowlkes and P. D. Rack, “Combinatorial Thin Film Synthesis via Multi – Source RF Magnetron Sputtering”, **Poster**, Buellton, CA, January

51st International American Vacuum Society
2004 International Meeting
J. D. Fowlkes, S. J. Randolph, and P. D. Rack, “A Three – Dimensional Computer Simulation of Electron – Beam Induced Deposition (EBID)”, **Talk**, Anaheim, CA, November

50th International American Vacuum Society
2003 International Meeting
J. D. Fowlkes, P. D. Rack, and J. M. Fitz – Gerald, “Gadolinium – Doped Yttrium Oxide Thin Films Deposited by Radio – Frequency Magnetron Sputtering; Film Quality and Cathodoluminescence Properties”, **Talk**, Baltimore, MD, November

Materials Research Society
2003 MRS Spring Meeting
J.D. Fowlkes, P.D. Rack, Y. Deng, S. Allison, and J.M. Fitz-Gerald “Gadolinium – Doped Yttrium Oxide Ultraviolet Emitting Materials”, **Talk**, San Francisco, CA, April

J.M. Fitz-Gerald, R. Bansal, J. Hoekstra, **J.D. Fowlkes**, and P.D. Rack, “Temperature Dependent Cathodoluminescence Characterization of Multi-Layer Ultraviolet Emitting Films Grown by Pulsed Laser Deposition”, **Talk**, San Francisco, CA, April

P.D. Rack, S. Randolph, Y. Deng, Y. Ko, J. Kim, **J.D. Fowlkes**, A. Thesen, and D.C. Joy, “Nanoscale Electron Beam Assisted Etching and Deposition”, **Poster**, San Francisco, CA, April

Materials Research Society
2002 MRS Fall Meeting
J.D. Fowlkes and A.J. Pedraza, "Si Nanoparticle Synthesis and Self - Organization", **Talk**, Boston, MA, December

Gordon Research Conference
Laser Interactions with Materials
J. D. Fowlkes and A. J. Pedraza, “Laser–Induced Nanostructures in Silicon”, **Poster**, Andover, N.H., July

Materials Research Society
2000 MRS Fall Meeting
J. D. Fowlkes, A. J. Pedraza, S. Jesse, C. M. Rouleau, and D. A. Blom, “Formation of Nanostructures in Silicon by Pulsed KrF Laser Irradiation”, **Talk**, Boston, MA, December

American Physical Society
1999 American Physical Society Centennial Meeting
J. D. Fowlkes and A. J. Pedraza, “Self-Organization Silicon Micro-Column Arrays Generated by Pulsed Laser Irradiation”, **Talk**, Atlanta, GA, March

TEACHING EXPERIENCE

- Introduction to Material’s Science and Engineering
- Physical Metallurgy
- Phase Transformations and Diffusion
- Laser Processing

- Thin Film Processes
- X–Ray Diffraction
- Nanoscience and Nanotechnology
- Transport Phenomena in Materials Sciences

OTHER WORK EXPERIENCE

SOUTHWEST SPECIALTY HEAT TREATMENT
Wytheville, VA May – August 1996

- Tool steel hardening heat treatment, flame hardening, and annealing

WILLIAM'S MANUFACTURING INC. Wytheville, VA
May – August 1992 – 1996

- Operation of HAAS machining center milling various tool steel components for the fastener industry and final operations to lathe/milled tool steel machined parts. Tool steel product final inspection, shipping, receiving, and inventory

SKILLS

Material's Science skills : Atomic Force Microscopy, High Resolution Scanning and Transmission Electron Microscopy, Auger Electron Spectroscopy, Grazing Incidence X-ray Diffraction, X-ray Photoelectron Spectroscopy, RF Magnetron Sputtering, Electron–Beam Stimulated Processing, Focused Ion Beam Processing, Cathodoluminescence Spectroscopy, Pulsed Laser Processing, Electron Beam Evaporation, Standard Lithographic Processes including Plasma Enhanced Chemical Vapor Deposition, Reactive Ion Etching, Contact and Step Exposure Lithography, Ink Jetting, Optical Fluorescence Microscopy, Fluorescence Recovery after Photobleaching, Electron Beam Lithography

REFERENCES

Available upon request