Jonathan P. Singer

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EDUCATION

MASSACHUSETTS INSTITUTE OF TECHNOLOGY, Cambridge, MA

- **PhD Materials Science and Engineering 5.0/5.0 GPA, June 2013**
  - Advisor: Edwin L. Thomas
  - Thesis: *Hybrid Direct Write Lithographic Strategies for Complex Hierarchical Structures*
  - Teaching Minor

UNIVERSITY OF PENNSYLVANIA, Philadelphia, PA

- **MS Materials Science and Engineering 3.97/4.0 GPA, August 2008**
  - Advisor: John E. Fischer
  - Thesis: *Determination of the Phase Behavior of the Li-B-N-H System through In Situ X-Ray Analysis*
- **BS Materials Science and Engineering 3.95/4.0 GPA, *summa cum laude*, May 2008**
  - Minors in Math and Physics

HONORS

- 2014 Yale Scientific Teaching Fellow
- 2012 NSF Travel Award for ASME Student Poster Symposium
- 2012 Semifinalist in MIT 100K Accelerate Contest with Team Voltaphon
- 2011 Silver Graduate Student Award at Materials Research Society's Fall Meeting
- 2011 3rd Prize in MIT MADMEC alternative energy contest with Team Voltaphon
- 2011 Lockheed Martin Prize (2nd Place) in the MIT Soldier Design Competition with Team Altenera
- 2011 2nd place prize in the MIT PPST Polymer Poster Contest
- 2011 Sigma Xi inductee
- 2010 Judges Award for Best Poster at COMSOL Boston Conference
- 2009 National Science Foundation Graduate Research Fellowship Program Honorable Mention
- 2008 National Defense Science and Engineering Graduate Fellowship
- 2008 Penn Prize for Excellence in Teaching by Graduate Students
- 2008 R. M. Brick Award, UPenn Department of Materials Science and Engineering
- 2008 Faculty Appreciation Award, UPenn School of Engineering and Applied Science
- 2004-2008 UPenn University Scholar
- 2006 Barry M. Goldwater Scholarship

RELEVANT EXPERIENCE

YALE UNIVERSITY, New Haven, CT

Postdoctoral Associate, Laboratory of Professor C. O. Osuji June 2013-Present

- Developing methods for the nanoimprint of high-resolution, high-aspect ratio solar architectures through bulk metallic glass templates.
- Researching organic-inorganic hybrid photovoltaics through large magnetic field-directed self-assembly of oxide nanorods.
- Drafted grant proposal "Tribological Properties of Nanostructured Metallic Surfaces and Nanocomposites" (In Submission, Taiho Kogyo Tribology Research Foundation).

MASSACHUSETTS INSTITUTE OF TECHNOLOGY, Cambridge, MA
Research Assistant, Laboratory of Professor E. L. Thomas September 2008-June 2013

- Developed hybrid lithographic strategies through a combination of experiments and simulations for applications in optical and mechanical metamaterials.
- Investigated the interaction between periodic microstructures and shock waves.
- Assisted in preparation of three grant proposals: "Blast Wave Manipulation Using Hierarchical Metamaterial Structures" (Supported, DTRA 2012), "PT-Symmetric Optical Materials and Structures," (Supported, AFRO 2013) and "Passive Metamaterials for Extraordinary Absorption at Low Frequencies" (NRO 2013).
- Supervised the research of five undergraduate students.

MASSACHUSETTS INSTITUTE OF TECHNOLOGY, Cambridge, MA
Teaching Assistant, Multiple Courses

- Undergraduate Lecture Course: *Electronic, Optical and Magnetic Properties of Materials* (Spring 2013, P. Anikeeva).
- Undergraduate Laboratory Course: *Materials Laboratory* (Fall 2012, L. Hobbs).

MASSACHUSETTS INSTITUTE OF TECHNOLOGY, Cambridge, MA
DCGS Representative, MIT DMSE September 2009-May 2011

- Represented students on Departmental Committee for Graduate Studies to assess and redesign graduate requirements, including core curriculum, minor requirement and technical electives.

UNIVERSITY OF PENNSYLVANIA, Philadelphia, PA
Research Assistant, Laboratory of Professor J. E. Fischer January 2005-August 2008

- Performed X-ray and hydrogen uptake characterization of the structure and activation of amorphous carbide-derived carbons.
- Developed method for 10% enhancement of activated amorphous carbons' hydrogen storage capability by formation of high density polymer-carbon composites.

UNIVERSITY OF PENNSYLVANIA, Philadelphia, PA
Teaching Assistant, Multiple Courses

- Undergraduate Lecture Courses: *Structure at the Nanoscale* (Fall 2006, D. Luzzi; Fall 2007, C. Murray), *Intro to Nanoscale Materials* (Spring 2008, R. Agarwal).
- Undergraduate Laboratory Course: *Nano-Scale Materials Lab* (Spring 2007, D. Pope).
- Graduate Lecture Course: *Statistical Mechanics* (Spring 2008, M. Khantha).

GENERAL MOTORS CORPORATION, Warren, MI
Research Intern, Laboratory of Dr. F. E. Pinkerton May-August 2007

- Developed phase diagram for metal hydride system with high hydrogen storage through X-ray diffraction and thermogravimetric analysis.

NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY, Gaithersburg MD
Undergraduate Researcher, Laboratory of Dr. T. Yildirim June-August 2006

- Wrote open-source applications for prompt gamma activation analysis, operation of Sieverts high/low pressure gas adsorption system, and analysis of Sieverts data.
- Assisted in the construction of a Sieverts apparatus to enable hydrogen storage measurements.

PEER-REVIEWED PUBLICATIONS

1. Hu, H.; **Singer, J. P.**; Osuji, C. O.; *Morphological Development in Thin Films of a Lamellar PS-b-P4VP Block Copolymer Deposited by Electrospray*, Macromolecules, 47, 16, 5703-5710, 2014.
2. Pelligra, C. I.; Huang S.; **Singer, J. P.**; Mayo, A.; Mu, R. R.; Osuji, C. O.; *High-Fidelity Solvothermal Growth of Arrayed ZnO Nanorods with Controlled Diameter and Spacing Using Block Copolymer Templates*, Small, 10, 21, 4304-4309, 2014.
3. **Singer, J. P.**; Gotrik, K. W.; Lee, J.-H.; Kooi, S. E.; Ross, C. A.; Thomas, E. L.; *Alignment and Reordering of a Block Copolymer by Solvent-Enhanced Thermal Laser Direct Write*, Polymer, 55, 7, 1875-1882, 2014.
4. Lee, J.-H.; Koh, C. Y.; **Singer, J. P.**; Jeon, S.-J.; Maldovan, M.; Stein, O.; Thomas, E. L.; *25th Anniversary Article: Ordered Polymer Structures for the Engineering of Photons and Phonons*, Advanced Materials, 26, 4, 532-569, 2013.
5. **Singer, J. P.**; Lin, P.-T.; Kooi, S. E.; Kimerling, L. A.; Jurgen, M.; Thomas, E. L.; *Direct-Write Dewetting of Polymer Thin Films by a Laser-Induced Thermal Gradient*, Advanced Materials, 25, 42, 6100-6105, 2013.
6. Lee, J.-H.; Veysset, D.; **Singer, J. P.**; Retsch, M.; Saini, G.; Pezeril, T.; Nelson, K. A.; Thomas, E. L.; *Dynamical Responses of Layered Nanostructure Composites at High Strain Rate Deformation*, Nature Communications, 3, 1164, 2012.
7. Lee, J.-H.; **Singer, J. P.**; Thomas, E. L.; *Micro-/Nano-Structural Materials as Mechanical Meta-Materials*, Advanced Materials, 24, 36, 4782-4810, 2012.
8. **Singer, J. P.**; Lee, J.-H.; Kooi, S. E.; Thomas, E. L.; *Rapid Fabrication of 3D Terahertz Split Ring Resonator Arrays by Novel Single-Shot Direct Write Focused Proximity Field Nanopatterning*, Optics Express, 20, 10, 11097-11108, 2012.
9. **Singer, J. P.**; Kooi, S. E.; Thomas, E. L.; *Focused Laser Spike (FLaSk) Annealing of Photoactivated Chemically Amplified Resists for Rapid Hierarchical Patterning*, Nanoscale, 3,7, 2730-2738, 2011.
10. Zhang, G.; **Singer, J. P.**; Kooi, S. E.; Evans, R. E.; Thomas, E. L.; Fraser, C. L.; *Reversible Solid-State Mechanochromic Fluorescence from a Boron Lipid Dye*, Journal of Materials Chemistry, 21, 23, 8295-8299, 2011.
11. **Singer, J. P.**; Meyer, M. S.; Speer Jr., R. M.; Fischer, J. E.; Pinkerton, F. E.; *Determination of the Phase Behavior of $(LiNH_2)_c(LiBH_4)_{1-c}$ Quaternary Hydrides through in Situ X-ray Diffraction*, Journal of Physical Chemistry C, 113, 43, 18927-18934, 2009.
12. Osswald, S.; Portet, C.; Gogotsi, Y.; Laudisio, G.; **Singer, J. P.**; Fischer, J. E.; Sokolov, V.V.; Kukushkina, J. A.; Kravchik, A. E.; *Porosity Control in Nanoporous Carbide-Derived Carbon by Oxidation in Air and Carbon Dioxide*, Journal of Solid State Chemistry, 182, 7, 1733-1741, 2009.
13. Yeon, S. H.; Osswald, S.; Gogotsi, Y.; **Singer, J. P.**; Simmons, J. M.; Fischer, J. E.; Lillo-Rodenas, M. A.; Linares-Solano, A.; *Enhanced Methane Storage of Chemically and Physically Activated Carbide-Derived Carbon*, Journal of Power Sources, 191, 2, 15, 560-567, 2009.
14. Kim, H. S.; **Singer, J. P.**; Gogotsi, Y.; Fischer, J. E.; *Molybdenum Carbide-Derived Carbon for Hydrogen Storage*, Microporous and Mesoporous Materials, 120, 3, 267-271, 2009.
15. **Singer, J. P.**; Mayergoyz, A.; Portet, C.; Schneider, E.; Gogotsi, Y.; Fischer J. E.; *Enhanced Volumetric Hydrogen Storage Capacity of Porous Carbon Powders by Forming Peels or Pellets*, Microporous and Mesoporous Materials, 116, 469-472, 2008.
16. Dash, R. K.; Chmiola, J.; Yushin, G.; Gogotsi, Y.; Laudisio, G.; **Singer, J. P.**; Fischer, J. E.; Kucheyev, S.; *Titanium Carbide Derived Nanoporous Carbon for Energy-Related Applications*, Carbon, 44, 12, 2489-2497, 2006.

17. Laudisio, G.; Dash, R. K.; **Singer, J. P.**; Yushin, G.; Gogotsi, Y.; Fischer, J. E.; *Carbide-Derived Carbons: A Comparative Study of Porosity Based on Small-Angle Scattering and Adsorption Isotherms*, Langmuir, 22, 21, 8945-8950, 2006.

MANUSCRIPTS IN PROGRESS

1. Shao, Z.; **Singer, J. P.**; Liu, Z.; Liu, Y.; Li, H.; Osuji, C. O.; Schroers, J.; *Shear Accelerated Crystallization in a Supercooled Atomic Liquid*, *Manuscript in submission*, arXiv:1407.2078.
2. **Singer, J. P.**; Gopinadhan, M.; Shao, Z.; Taylor, A. D.; Schroers, J.; Osuji, C. O.; *High-Resolution Nanoimprint of Functional Polymers with Bulk Metallic Glass Molds*, *Manuscript in submission.*
3. **Singer, J. P.**; Pelligra, C. I.; Korblum, N.; Gopinadhan, M.; Ketkaew, J.; Schroers, J.; Osuji, C. O.; *Nanotexturing of Amorphous Metals through Sacrificial Templates*, *Manuscript in preparation*.
4. **Singer, J. P.**; Kooi, S. E.; Thomas, E. L.; *Influence of Materials Properties on Laser Spike-Induced Dewetting of Polymer Thin Films*, *Manuscript in preparation*.

ISSUED PATENTS

1. U.S. Patent 8,465,910, HYBRID LITHOGRAPHIC METHOD FOR FABRICATING COMPLEX MULTIDIMENSIONAL STRUCTURES, Issued June 18, 2013 (**J. P. Singer**; J.-H. Lee; S. E. Kooi; E. L. Thomas).

PATENT APPLICATIONS

1. U.S. Patent Application No. 61/819821, OPTICAL INTERCONNECT SYSTEMS FOR CHIP TO CHIP COMMUNICATION, Filed May 6, 2013 (J. Mu; V. Raghunathan; **J. P. Singer**; L. Zhang; P.-T. Lin; J. Michel; L. C. Kimerling).
2. U.S. Patent Application No. 14/256419, DEVELOPER FREE POSITIVE TONE LITHOGRAPHY BY THERMAL DIRECT WRITE, Filed April 18, 2014 (**J. P. Singer**; P.-T. Lin; E. L. Thomas).

INVITED SEMINARS

1. **Singer, J. P**.; *Multiscale Patterning of Metallic Glasses through Sacrificial ZnO Templates*, Yale Institute for Nanoscience and Quantum Engineering Seminar Series, New Haven, CT, Oct. 31, 2014.

SELECTED CONFERENCE PRESENTATIONS AND POSTERS

1. **Singer, J. P**.; Pelligra, C. I.; Huang, S.; Osuji, C. O.; *Solution Processing of Ordered Thin Film Nanowire Composites by Magnetic Field Alignment*, ACS Colloids 2014, Philadelphia, PA, June 24, 2014.
2. **Singer, J. P.**; Lin, P.-T.; Kooi, S. E.; Kimerling, L. A.; Jurgen, M.; Thomas, E. L.; *Direct-Write Dewetting of Polymer Thin Films by a Laser-Induced Thermal Gradient*, APS March Meeting 2014, Denver, CO, Mar. 6, 2014.
3. **Singer, J. P.**; Gotrik, K. W.; Lee, J.-H.; Kooi, S. E.; Ross, C. A.; Thomas, E. L.; *Directed Ordering of a Block Copolymer by an Extreme Laser-Induced Spatial-Temporal Thermal Gradient*, MRS Fall Meeting 2013, Boston, MA, Dec. 5, 2013.
4. **Singer, J. P.**; Veysset, D.; Kooi, S. E.; Nelson, K. A.; Thomas, E. L.; In situ *Observation of the Interaction of Laser Driven Shock Waves with Phononic Microstructure*, MRS Fall Meeting 2012, Boston, MA, Nov. 26, 2012.
5. **Singer, J. P.**; Kooi, S. E.; Thomas, E. L.; *Rapid Patterning of 3D Hierarchical Microstructures by Focused Laser Spike (FLaSk) Annealing*. Poster, ASME Congress 2012, Houston, TX, Nov. 12-15, 2012.