

## Jörg G. Werner, Ph.D.

Assistant Professor  
Department of Mechanical Engineering and  
Division of Materials Science and Engineering  
Boston University

jgwerner@bu.edu  
<http://sites.bu.edu/wernerlab>  
Mail: 110 Cummington Mall, Rm. 101  
Boston, MA 02215  
(617) 353-9596

### Scholarly Profile

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My research group focuses on the spatially controlled synthesis and fabrication of soft and hard functional materials in structures with features sizes from the nano- to the micron-scale. We have experience in the synthesis, characterization, and application of polymeric, solid-state, and composite materials with well-defined extended 3D structures. Currently, our focus is on rationally designed electrodes and 3-D batteries, synthesis and electrodeposition of functional polymeric thin films on porous 3D materials, and nanoconfined synthesis in organo-gels with chemically distinct and continuous nanoscale domains, with application areas in energy storage and carbon capture.

### Academic Positions, Appointments, and Affiliations

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<b>Assistant Professor</b> - Dept. of Mechanical Engineering - Boston University	<b>2020-present</b>
<b>Assistant Professor</b> - Div. of Materials Science and Eng. - Boston University	<b>2020-present</b>
<b>Assistant Professor</b> - Department of Chemistry - Boston University	<b>2024-present</b>
<b>Core Faculty Member</b> – Institute for Global Sustainability	<b>2022-present</b>
<b>Postdoctoral Researcher</b> - School of Applied Sci. and Eng. - Harvard University Advisor: Prof. David Weitz	<b>2016-2019</b>

### Education

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<b>Ph.D. - Dept. of Chemistry and Chem. Biology - Cornell University</b> <i>Thesis Title:</i> “Ordered Three-Dimensional Carbon-Based Multifunctional Nanohybrids for Energy Storage”; <i>Advisor:</i> Prof. Ulrich Wiesner	<b>2011-2016</b>
<b>Diplom (M.S. equivalent) - Chemistry - J. Gutenberg University Mainz</b> <i>Advisors:</i> Prof. Wolfgang Tremel and Prof. Ulrich Wiesner	<b>2006-2011</b>

### Awards and Fellowships

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#### *At BU:*

<b>DARPA Young Faculty Award</b>	<b>2023</b>
<b>Dean’s Catalyst Award:</b> College of Engineering, Boston University	<b>2022</b>
<b>Dean’s Catalyst Award:</b> College of Engineering, Boston University	<b>2020</b>

#### *Before BU:*

<b>Howard Neal Wachter Memorial Prize:</b> Department of Chemistry, Cornell University	<b>2014</b>
<b>Young Investigator Award:</b> Energy Materials Center Cornell (emc <sup>2</sup> )	<b>2012</b>
<b>Research Scholarship:</b> POLYMAT, Graduate School of Excellence MAINZ	<b>2009-2010</b>

**Peer-Reviewed Publications** (36 total, † corresponding author, \* advised students)

1843 total citations, h-index: 20 (Google Scholar, 2024/07/24)

**Publications while at Boston University:**

36. Li, Y.\*, A. Plummer, J. G. Werner†, *Chemically Nanostructured Organogel Monoliths from Crosslinked Block Copolymers for Selective Infusion Templating*, ACS Nano **2024**, 8, 29, 19150–19160.
35. Drouhin, A.J., W.R.T. Tait, W. Moore, F. Yu, Y. Li\*, J. G. Werner, R.B. van Dover, U. Wiesner†, *Block copolymer self-assembly derived mesoporous magnetic materials with three-dimensionally (3D) co-continuous gyroid nanostructure*, Soft Matter **2024**, 20, 2767-2776.
34. Werner†, J.G.; Y. Li\*, and U. Wiesner, *Block Copolymer-Architected Materials in Electrochemical Energy Storage*, Small Science **2023**, 2300074.
33. Ye, X.; Z. Zheng\*; J.G. Werner; J.W. Boley†, *Mechanically Rupturing Liquid Metal Oxide Induces Electrochemical Energy*, Advanced Functional Materials **2023**, 2309177.
32. Quinn, H.; W. Wang\*, J.G. Werner and K.A. Brown†, *Screening for Electrically Conductive Defects in Thin Functional Films using Electrochemiluminescence*, Analytical Methods, 2023, 15, 3592-3600.
31. Wang\*, W.; Z. Zheng\*, A.B. Resing\*, K.A. Brown and J.G. Werner†, *Conformal Electrodeposition of Ultrathin Polymeric Films with Tunable Properties from Dual-Functional Monomers*, Mol. Syst. Des. Eng. **2023**, 8, 624-631.
30. Resing\*, A.B., C. Fukuda\*, J.G. Werner†, *Architected Low-Tortuosity Electrodes with Tunable Porosity from Nonequilibrium Soft-Matter Processing*, Advanced Materials **2023**, 35, 2209694.
29. Elkeles, T., S. Park, J.G. Werner, D.A. Weitz and G. Yossifon†, *Dielectrophoretic Characterization of Dynamic Microcapsules and their Magnetophoretic Manipulation*, ACS Appl. Mater. Interfaces **2022**, 14, 13, 15765–15773.
28. Rendos, A., W. Cao, M. Chern, M. Lauricella, S. Succi, J.G. Werner, A. Dennis, K.A. Brown†, *Electric Field Induced Macroscopic Cellular Phase of Nanoparticles*, Soft Matter **2022**, 18, 1991-1996.
27. Werner, J.G. †, H. Lee, U. Wiesner, D.A. Weitz†, *Ordered Mesoporous Microcapsules from Double Emulsion Confined Block Copolymer Self-Assembly*, ACS Nano **2021**, 15 (2), p. 3490-3499.
26. Wu\*, Z., J.G. Werner†, D.A. Weitz†, *Microfluidic Fabrication of Phase-Inverted Microcapsules with Asymmetric Shell Membranes with Graded Porosity*, ACS Macro Letters **2021**, 10 (1), 116-121.
25. Wheatle, B.K., J.R. Hampton, G.G. Rodríguez-Calero, J.G. Werner, Y. Gu, U. Wiesner, and H.D. Abruña†, *Electrochemical generation of hexacyanoferrate and hexacyanoruthanate electroactive films at nickel electrode surfaces: A promising synthetic approach for new electrode materials in metal ion batteries and supercapacitors*. Journal of Electroanalytical Chemistry, **2020**: p. 114284.
24. Haney, B., J.G. Werner, D.A. Weitz, and S. Ramakrishnan†, *Absorbent–Adsorbates: Large Amphiphilic Janus Microgels as Droplet Stabilizers*. ACS Applied Materials & Interfaces, **2020**. 12(29): p. 33439-33446.
23. Haney, B., J.G. Werner, D.A. Weitz, and S. Ramakrishnan†, *Stimuli responsive Janus microgels with convertible hydrophilicity for controlled emulsion destabilization*. Soft Matter, **2020**. 16 (15): p. 3613-3620.

22. Liu, J., C. Hong, X. Shi, S. Nawar, J.G. Werner, G. Huang, M. Ye, D.A. Weitz, A.A. Solovev, and Y. Mei†, *Hydrogel Microcapsules with Photocatalytic Nanoparticles for Removal of Organic Pollutants*. *Environmental Science: Nano* **2020**, *7*, 656-664.

***Publications prior to Boston University:***

21. Zhu, H., S. Nawar, J.G. Werner, J. Liu, G. Huang, Y. Mei, D.A. Weitz, and A.A. Solovev, *Hydrogel micromotors with catalyst-containing liquid core and shell*. *Journal of Physics: Condensed Matter*, **2019**. 31 (21): p. 214004.
20. Zhang, Q., F. Matsuoka, H.S. Suh, P.A. Beaucage, S.S. Xiong, D.M. Smilgies, K.W. Tan, J.G. Werner, P.F. Nealey, and U.B. Wiesner, *Pathways to Mesoporous Resin/Carbon Thin Films with Alternating Gyroid Morphology*. *ACS Nano*, **2018**. 12 (1): p. 347-358.
19. Werner, J.G., G.G. Rodriguez-Calero, H.D. Abruna, and U. Wiesner, *Block copolymer derived 3-D interpenetrating multifunctional gyroidal nanohybrids for electrical energy storage*. *Energy & Environmental Science*, **2018**. 11 (5): p. 1261-1270.
18. Werner, J.G., S. Nawar, A.A. Solovev, and D.A. Weitz, *Hydrogel Microcapsules with Dynamic pH-Responsive Properties from Methacrylic Anhydride*. *Macromolecules*, **2018**. 51 (15): p. 5798-5805.
17. Werner, J.G., B.T. Deveney, S. Nawar, and D.A. Weitz, *Dynamic microcapsules with rapid and reversible permeability switching*. *Advanced Functional Materials*, **2018**. 28 (39): p. 1803385.
16. Tan, K.W., J.G. Werner, M.D. Goodman, H.S. Kim, B. Jung, H. Sai, P.V. Braun, M.O. Thompson, and U. Wiesner, *Synthesis and Formation Mechanism of All-Organic Block Copolymer-Directed Templating of Laser-Induced Crystalline Silicon Nanostructures*. *ACS Applied Materials & Interfaces*, **2018**. 10 (49): p. 42777-42785.
15. Bolmatov, D., Q. Zhang, D. Soloviov, Y.M. Li, J.G. Werner, A. Suvorov, Y.Q. Cai, U. Wiesner, M. Zhernenkov, and J. Katsaras, *Nanoscale Q-Resolved Phonon Dynamics in Block Copolymers*. *ACS Applied Nano Materials*, **2018**. 1 (9): p. 4918-4926.
14. Levin, B.D.A., M.J. Zachman, J.G. Werner, R. Sahore, K.X. Nguyen, Y.M. Han, B.Q. Xie, L. Ma, L.A. Archer, E.P. Giannelis, U. Wiesner, L.F. Kourkoutis, and D.A. Muller, *Characterization of Sulfur and Nanostructured Sulfur Battery Cathodes in Electron Microscopy Without Sublimation Artifacts*. *Microscopy and Microanalysis*, **2017**. 23 (1): p. 155-162.
13. Amato, D.V., H. Lee, J.G. Werner, D.A. Weitz, and D.L. Patton, *Functional Microcapsules via Thiol Ene Photopolymerization in Droplet-Based Microfluidics*. *ACS Applied Materials & Interfaces*, **2017**. 9 (4): p. 3288-3293.
12. Robbins, S.W., P.A. Beaucage, H. Sai, K.W. Tan, J.G. Werner, J.P. Sethna, F.J. DiSalvo, S.M. Gruner, R.B. Van Dover, and U. Wiesner, *Block copolymer self-assembly-directed synthesis of mesoporous gyroidal superconductors*. *Science Advances*, **2016**. 2 (1): p. e1501119.
11. Werner, J.G., S.S. Johnson, V. Vijay, and U. Wiesner, *Carbon-Sulfur Composites from Cylindrical and Gyroidal Mesoporous Carbons with Tunable Properties in Lithium-Sulfur Batteries*. *Chemistry of Materials*, **2015**. 27 (9): p. 3349-3357.
10. Tan, K.W., H. Sai, S.W. Robbins, J.G. Werner, T.N. Hoheisel, S.A. Hesse, P.A. Beaucage, F.J. DiSalvo, S.M. Gruner, M. Murtagh, and U. Wiesner, *Ordered mesoporous crystalline aluminas from self-assembly of ABC triblock terpolymer-butanol-alumina sols*. *RSC Advances*, **2015**. 5 (61): p. 49287-49294.
9. Tan, K.W., B. Jung, J.G. Werner, E.R. Rhoades, M.O. Thompson, and U. Wiesner, *Transient laser heating induced hierarchical porous structures from block copolymer-directed self-assembly*. *Science*, **2015**. 349 (6243): p. 54-58.

8. Hesse, S.A., J.G. Werner, and U. Wiesner, *One-Pot Synthesis of Hierarchically Macro- and Mesoporous Carbon Materials with Graded Porosity*. ACS Macro Letters, **2015**. 4 (5): p. 477-482.
7. Gu, Y.B., J.G. Werner, R.M. Dorin, S.W. Robbins, and U. Wiesner, *Graded porous inorganic materials derived from self-assembled block copolymer templates*. Nanoscale, **2015**. 7 (13): p. 5826-5834.
6. Werner, J.G., M.R.J. Scherer, U. Steiner, and U. Wiesner, *Gyroidal mesoporous multifunctional nanocomposites via atomic layer deposition*. Nanoscale, **2014**. 6 (15): p. 8736-8742.
5. Werner, J.G., T.N. Hoheisel, and U. Wiesner, *Synthesis and Characterization of Gyroidal Mesoporous Carbons and Carbon Monoliths with Tunable Ultralarge Pore Size*. ACS Nano **2014**. 8 (1): p. 731-743.
4. Levin, B.D., M.J. Zachman, J.G. Werner, U. Wiesner, L.F. Kourkoutis, and D.A. Muller, *Characterizing Sulfur in TEM and STEM, with Applications to Lithium Sulfur Batteries*. Microscopy and Microanalysis **2014**, 20 (S3): p. 446-447.
3. Dorin, R.M., W.A. Phillip, H. Sai, J.G. Werner, M. Elimelech, and U. Wiesner, *Designing block copolymer architectures for targeted membrane performance*. Polymer, **2014**. 55 (1): p. 347-353.
2. Warren, S.C., M.R. Perkins, A.M. Adams, M. Kamperman, A.A. Burns, H. Arora, E. Herz, T. Suteewong, H. Sai, Z.H. Li, J.G. Werner, J.H. Song, U. Werner-Zwanziger, J.W. Zwanziger, M. Gratzel, F.J. DiSalvo, and U. Wiesner, *A silica sol-gel design strategy for nanostructured metallic materials*. Nature Materials, **2012**. 11 (5): p. 460-467.
1. Phillip, W.A., R.M. Dorin, J.G. Werner, E.M.V. Hoek, U. Wiesner, and M. Elimelech, *Tuning Structure and Properties of Graded Triblock Terpolymer-Based Mesoporous and Hybrid Films*. Nano Letters, **2011**. 11 (7): p. 2892-2900.

## Invited Non-Peer-Reviewed Articles

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1. Werner, J.G., *Bridging the gap in mesoscopic length scales*, Nature Materials **2024**, 23, 33-34.

## Patents

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### Granted:

1. U. B. Wiesner, J. G. Werner, G. G. Rodriguez-Calero, H. D. Abruna, "Solid-State Three-Dimensional Battery Assembly", US Patent No.: 10,103,408
2. U. B. Wiesner, J. G. Werner, "Gyroidal Mesoporous Carbon Materials and Methods Thereof" US Patent No.: 9,714,173; US Patent No.: 12,012,492.
3. U. B. Wiesner, R. M. Dorin, J. G. Werner, W. A. Phillip; "Multiblock Copolymer Films, Methods of Making Same, and Uses Thereof" US Patent No.: 9,527,041

### Pending patent applications submitted while at Boston University:

1. J. G. Werner, W. Wang, Z. Zheng, *Controlled and Tunable Fabrication of Novel Polymer Thin Films*, Application number: US63/581,075; Application date: 10/26/2023
2. D. A. Weitz, J. G. Werner, J. V. Bouchon, J. Heyman, B. Deverney, *Copolymers for stabilizing emulsions and/or forming interfacial films, and methods thereof*, Application number: US17/613,023, PCT/US2020/034187; Application date: 05/22/2020

**Pending patent applications submitted prior to joining Boston University:**

3. D. A. Weitz, J. G. Werner, S. Nawar, B. Deverney, *Poly(acid) microcapsules and related methods*, Application number: US16/640,598, PCT/US2018/047053; Application date: 08/20/2018

**Invited Conference and Seminar Talks**

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**While at Boston University:**

1. ACS Fall meeting in Denver CO, August **2024**: *Conformal electrodeposition of polymer networks*.
2. New England Society of Microscopy (NESM) symposium in Woods Hole MA, April 5th **2024**: *Bottom-Up Fabrication of Functional Nanostructured Materials with Polymer Assembly*.
3. ACS Fall meeting in San Francisco CA, August **2023**: *Electrodeposition of ultrathin functional polymer films – high throughput materials discovery and process optimization*.
4. Physical Chemistry Seminar at Boston University, Boston MA, October **2022**: *Architecting Multifunctional Materials on All Scales with Soft-Matter Chemistry and Physics*.
5. New England Complex Fluids Workshop at Harvard University, Cambridge MA, December **2021**: *Miniaturizing Battery Architectures without Losing Energy - Can Soft Matter Help?*
6. Squishy Physics Seminar at Harvard University, Cambridge MA, October **2021**: *Phase Inversion of Polymers and Composites*.
7. Soft Matter Far From Equilibrium - CHESS 2030 Workshop (virtual), June **2021**: *Mesoporous Membranes from Block Copolymer Self-Assembly in Liquid Confinement*.
8. 1<sup>st</sup> Virtual European Polymer Conference, September **2020**: *Functional Polymeric Microcapsules from Double Emulsion Drop Templates*.

**Prior to Boston University:**

9. Spring seminar series at Boston University, Boston MA, February **2019**: *From Block Copolymer Self-Assembly to 3-D Nano-integrated Energy Storage Devices*.
10. Faculty Seminar at the University of Connecticut, Storrs CT, January **2019**: *From Block Copolymer Self-Assembly to 3-D Nano-integrated Energy Storage Devices*.
11. Society of Plastics seminar at the University of Connecticut, Storrs CT, September **2018**: *Dynamically Responsive Microcapsules from Microfluidic Complex Emulsion Drop Templating*.
12. Soft Materials, Structures and Devices (SMSD) seminar at Massachusetts Institute of Technology, Cambridge MA, March **2018**: *From Block Copolymer Self-Assembly to 3-D Nano-integrated Energy Storage Devices*.
13. Special Seminar at UMass Amherst, Amherst MA, March **2017**: *From Block Copolymer Self-Assembly to 3D Ordered Functional Nanohybrids*.
14. Guest Lecture at UMass Amherst (CHEM-ENG 590E, course by Sarah Perry), Mar. **2017**: *Droplet Microfluidics*.
15. Squishy Physics Seminar at Harvard University, Cambridge MA, Feb. **2016**: *From Block Copolymer Self-Assembly to 3D Ordered Functional Nanohybrids*.
16. Chemistry Grad and Postdoc Seminar at Cornell University, Ithaca NY, Mar. **2015**: *Gyroidal Mesoporous Carbon Materials: Tunable Synthesis, Modifications, and Application*.

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## Press Coverage

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1. **College of Engineering at Boston University (12/2023):** DARPA YFA award on carbon dioxide capture highlighted: <https://www.bu.edu/eng/2023/11/27/clearing-the-air/>
2. **The Brink (01/2024):** Research featured in article *The Race to a Battery-Powered Future*, <https://www.bu.edu/articles/2024/the-race-to-a-battery-powered-future/>

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## Teaching at Boston University (S: Spring; F: Fall)

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1. **Heat Transfer** (ME 419), Department of Mechanical Engineering, Boston University, Semesters S20, F20, S21, S22, S23, S24, S25.
2. **Electrochemistry for Battery and Fuel Cells** (MS/ME 545), Department of Mechanical Engineering and Division of Materials Science and Engineering, Boston University, F23, S25.

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## Internal Service at Boston University

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- Course Coordinator for ME 419: Heat Transfer (2023-present)
- Member of *Graduate Committee*, Division of Materials Science and Engineering (2021-present)
- Member of *MS Committee*, Department of Mechanical Engineering (2023-present)
- Chair of *MSE Colloquium Committee* (2021-present)
- Member of BU's *Laboratory Safety Committee* (2022-present)
- Subgroup member of *ME Department's Strategic Plan* work group in "collaborative culture" (2023-2024)
- Member of *Review Committee for the Campus Climate Lab* administered by IGS (2022-2023, 2024-present)
- Member of *ME Faculty Search Committee* in "Emerging Areas" (2021-2022)

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## External Service

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1. **Member** of the *ACS PMSE Awards and Recognitions Committee* (2024-present).
2. **Lead-organizer** of a *New England Complex Fluids* workshop with J. Bird, a local day-long soft-matter and fluids research community symposium to be held at BU (6/23/2023)
3. **Member** of the *Judges Advisory Committee* for the Massachusetts Science and Engineering Fair (MSEF) (01/2023-7/2023).
4. **Member** of the *International Advisory Board of Small Science*, a Wiley journal (12/2021 - present).
5. **Co-organizer** of the virtual workshop series "Where is Energy Storage Headed?", a 4-part online webinar series with talks and panel discussion on current challenges and future directions of electrochemical energy storage (2022).
6. **Reviewer** for *Nature Materials*, *Nature Communications*, *Advanced Functional Materials*, *Macromolecules*, *ACS Applied Materials and Interfaces*, *Journal of Materials Chemistry A*, *Journal of Polymer Science*, *Macromolecular Rapid Communications*, *ChemElectroChem*, *MRS Advances*, *Colloid and Polymer Science*, *Applied Nanoscience*, *Langmuir*, *Small*, *Small Methods*, *Nano Express*, *Multifunctional Materials*, *ACS Applied Polymer Materials*.

### **Prior to Boston University:**

7. Organizer of the weekly seminar series "Squishy Physics" in the School of Engineering and Applied Sciences at Harvard University (2016-2019).