

Yuan Yang

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Education

Sep 2007 – Jun 2012 **Ph.D., Department of Materials Science and Engineering, Stanford University**
Sep 2003 – Jul 2007 **B.S., Department of Physics, Peking University, China**

Professional Experience

Jul 2015 –present **Assistant Professor, Materials Science and Engineering, Department of Applied Physics and Applied Mathematics, Columbia University**
Jul 2012 – Jun 2015 **Postdoctoral Associate, Department of Mechanical Engineering, MIT**

Awards & Honors

Aug 2017 Scialog Fellow on Advanced Energy Storage
May 2017 Research Initiatives for Science and Engineering (RISE) Award of Columbia University
Apr 2015 MRS Postdoctoral Award for 2015 Spring Meeting
Dec 2014 World Changing Ideas Selected by *Scientific American*
Nov 2014 Best Poster Award, ASME International Mechanical Engineering Congress & Exposition
Jun 2010 Dan Cubicciotti Award of Electrochemical Society (honor mention)
Jun 2010 O. Cutler Shepard Award at Stanford University

Journal Publications

*: corresponding author §: equal contribution

Total citation > 15,000 times H index: 35

61. Q. Cheng, A. Li, N. Li, S. Li, Z. Amirali Z. T. Li, W. Huang, A. Li, T. Jin, Q. Song, W. Xu, N. Ni, H. Zhai, D. Martin, Z. Karim Z, C. Xiu, D. Su, K. Yan*, **Y. Yang***; Boron Nitride-Based Nanocomposite Coating for Stabilizing Solid Electrolyte/Anode Interface in Lithium Metal Batteries. *Joule*, online (2019).

60. X. Wang, H. Zhai, B. Qie, Q. Cheng, A. Li, J. Borovilas, B. Xu, C. Shi, T. Jin, X. Liao, Y. Li, X. He, S. Du, Y. Fu, Y. M. Dontigny, K. Zaghib, **Y. Yang***, Rechargeable solid-state lithium metal batteries with vertically aligned ceramic nanoparticle/polymer composite electrolyte. *Nano Energy*, 60, 205 (2019).
59. A. P. Aydt, B. Qie, A. Pinkard, L. Yang, Q. Cheng, S. J. Billinge, **Y. Yang***, X. Roy*, Microporous Battery Electrodes from Molecular Cluster Precursors. *ACS Applied Materials & Interfaces* 11, 11292 (2019).
58. Q. Cheng, W. Xu, S. Qin, S. Das, T. Jin, A. Li, A. C. Li, B. Qie, P. Yao, H. Zhai, C. Shi, X. Yong, **Y. Yang***, Full Dissolution of Li_2S_8 to Li_2S in Safe Eutectic Solvent for Rechargeable Lithium-Sulfur Batteries. *Angewandte Chemie International Edition*. 58, 5557 (2019)
57. G. Qian, X. Liao, Y. Zhu, F. Pan*, X. Chen*, **Y. Yang***; Designing Flexible Lithium-Ion Batteries by Structural Engineering. *ACS Energy Letters* 4, 3 (2019).
56. B. Xu, H. Zhai, X. Liao, B. Qie, J. Mandal, T. Gong, L. Tan, X. Yang, K. Sun, Q. Cheng, M. Chen, Y. Miao, M. Wei, B. Zhu, Y. Fu, A. Li, X. Chen, W. Min, C. Nan*, C, Y. Lin*, **Y. Yang***; Porous Insulating Matrix for Lithium Metal Anode with Long Cycling Stability and High Power, *Energy Storage Materials* 17, 31 (2019).
55. C. Shi, T. Wang, X. Liao, B. Qie, P. Yang, M. Chen, X. Wang, A. Srinivasan, Q. Cheng, A. Li, X. Chen, **Y. Yang***, ; *Accordion-like Stretchable Li-ion Batteries with High Energy Density*, *Energy Storage Materials* 17, 136 (2019).
54. X. Liao, C. Shi, T. Wang, B. Qie, Y. Chen, P. Yang, Q. Cheng, H. Zhai, M. Chen, X. Wang, X. Chen*, **Y. Yang***, High-Energy-Density Foldable Battery Enabled by Zigzag-like Design, *Advanced Energy Materials*, 1802998 (2018).
53. J. Mandal, Y. Fu, A. Overvig, M. Jia, K. Sun, N. Shi, H. Zhou, X. Xiao, N. Yu*, **Y. Yang***, Hierarchically Porous Polymer Coatings for Highly Efficient Passive Daytime Radiative Cooling. *Science*, 362, 315 (2018).
52. Q. Cheng, L. Wei, Z. Liu, N. Ni, Z. Sang, B. Zhu, W. Xu, M. Chen, Y. Miao, L. Chen, W. Min, **Y. Yang***, Operando and Three-Dimensional Visualization of Anion Depletion and Lithium Growth by Stimulated Raman Scattering Microscopy. *Nature Communications*, 9, 2942 (2018).
51. S. R. Peurifoy, J. C. Russell, T. J. Sisto, **Y. Yang***, X. Roy*, and C. Nuckolls*, Designing Three-Dimensional Architectures for High-Performance Electron Accepting Pseudocapacitors. *Journal of the American Chemical Society*, 140(35), 10960 (2018).
50. P. Yao, B. Zhu, H. Zhai, X. Liao, Y. Zhu, W. Xu, Q. Cheng, C. Jayyosi, Z. Li, J. Zhu, K. Myers, X. Chen, **Y. Yang***, PVDF/Palygorskite Nanowire Composite Electrolyte for 4 V Rechargeable Lithium Batteries with High Energy Density. *Nano Letters*, 18(10), 6113 (2018).
49. J. Mandal, S. Du, M. Dontigny, K. Zaghib, N. Yu*, **Y. Yang***, $\text{Li}_4\text{Ti}_5\text{O}_{12}$: A Visible-to-Infrared Broadband Electrochromic Material for Optical and Thermal Management. *Advanced Functional Materials*, 1802180 (2018).
48. Q. Wang, M. Shang, Y. Zhang, **Y. Yang**, Y. Wang, Rate-Limiting Step in Batteries with Metal Oxides as the Energy Materials. *ACS Applied Materials & Interfaces*, 10, 7162 (2018).
47. G. Qian, B. Zhu, X. Liao, H. Zhai, A. Srinivasan, N. Fritz, Q. Cheng, M. Ning, B. Qie,

- B, Y. Li, S. Yuan, J. Zhu, X. Chen, **Y. Yang***, Bio-inspired, spine-like flexible rechargeable lithium-ion batteries with high energy density. *Advanced Materials*, 30, 1704947 (2018).
46. Y. Qiao, Z. Zhou, Z. Chen, S. Du, Q. Cheng, H. Zhai, N. Fritz, Q. Du, **Y. Yang***, Visualizing Ion Diffusion in Battery Systems by Fluorescence Microscopy: A Case Study on the Dissolution of LiMn_2O_4 . *Nano Energy*, 45, 68-74 (2018).
45. M. Milton, Q. Cheng, **Y. Yang***, C. Nuckolls*, R. Hernández Sánchez*, and T. Sisto*, Molecular Materials for Non-Aqueous Flow Batteries with High Coulombic Efficiency and Stable Cycling. *Nano Letters*, 17, 7859 (2017).
44. C. Gao, S. Lee*, **Y. Yang***, Thermally Regenerative Electrochemical Cycle for Low-grade Heat Harvesting. *ACS Energy Letters*, 2, 2326 (2017)
43. J. Mandal, D. Wang, A. Overvig, N. Shi, D. Paley, A. Zangiabadi, Q. Cheng, K. Barmak, N. Yu*, and **Y. Yang***, Scalable, Low-temperature ‘Dip-and-dry’ Technique to Fabricate Plasmonic Selective Absorber for High-efficiency Solar-thermal Energy Conversion. *Advanced Materials*, 29, 1702156 (2017)
42. H. Zhai, P. Xu, M. Ning, Q. Cheng, J. Mandal, and **Y. Yang***, A Flexible Solid Composite Electrolyte with Vertically Aligned and Connected Ion-Conducting Nanoparticles for Lithium Batteries. *Nano Letters*, 17 (5), 3182–3187 (2017).
41. Z. Y. Cao, P. Y. Xu, H. W. Zhai, S. C. Du, J. Mandal, and **Y. Yang***, An Ambient-air Stable Lithiated Anode for Rechargeable Li-ion Batteries with High Energy Density, *Nano Letters*, 16, 7235–7240 (2016).
40. J. Liang, K. Xi, G. Tan, S. Chen, T. Zhao, P. Coxon, H. Kim, S. Ding, **Y. Yang**, R. Vasant Kumar, and J. Lu, Sea urchin-like $\text{NiCoO}_2@\text{C}$ nanocomposites for Li-ion batteries and supercapacitors. *Nano Energy*, 27, 457–465 (2016).
39. **Y. Yang***, X. P. Huang, Z. Y. Cao, and G. Chen*, Thermally conductive separator with hierarchical nano/microstructures for improving thermal management of batteries. *Nano Energy*, 22, 301–309 (2016).

Prior to joining Columbia

38. **Y. Yang**, G. Y. Zheng, and Y. Cui, Nanostructured Sulfur Cathodes. *Chemical Society Reviews* 42, 3018-3032 (2013).
37. S. W. Lee[§], **Y. Yang**[§], H. W. Lee, H. Ghasemi, D. Kraemer, G. Chen, and Y. Cui, An Electrochemical System for Highly Efficient Harvesting of Low-grade Heat Energy. *Nature Communications*, 5, 3942 (2014).
36. **Y. Yang**[§], S. W. Lee[§], G. Ghasemi, J. Loomis, X. B. Li, D. Kraemer, G. Y. Zheng, Y. Cui, and G. Chen, Charging-free Electrochemical System for Harvesting Low-grade Thermal Energy. *PNAS*, 111, 17011–17016 (2014).
35. **Y. Yang**, S. Jeong, L. B. Hu, H. Wu, S. W. Lee, and Y. Cui, Transparent Lithium-ion Batteries. *PNAS* 108, 13013-13018 (2011).
34. L. B. Hu[§], J. W. Choi[§], **Y. Yang**[§], S. Jeong, F. La Mantia, L. F. Cui, and Y. Cui, Highly Conductive Paper for Energy-storage Devices. *PNAS* 106, 21490-21494 (2009).
33. **Y. Yang**, J. Loomis, G. Ghasemi, S. W. Lee, J. Wang, Y. Cui, and G. Chen, A Membrane-free Battery for Harvesting Low-grade Thermal Energy. *Nano Letters* 14,

- 6578–6583 (2014).
32. **Y. Yang**[§], G. Y. Zheng[§], and Y. Cui, A Membrane-free Lithium/polysulfides Semi-liquid Battery for Large-Scale Energy Storage. *Energy & Environmental Sciences*, 6, 1552-1558 (2013).
 31. **Y. Yang**, G. Y. Zheng, S. Misra, J. Nelson, M. F. Toney, and Y. Cui, High Capacity Micrometer-sized Li₂S Particles as Cathode Materials for Advanced Rechargeable Lithium Ion Batteries. *JACS* 134, 15387-94 (2012).
 30. **Y. Yang**[§], M. T. McDowell[§], A. Jackson[§], J. J. Cha, S. S. Hong, and Y. Cui, New Nanostructured Li₂S/Silicon Rechargeable Battery with High Specific Energy. *Nano Letters* 10, 1486-1491 (2010).
 29. **Y. Yang**, C. Xie, R. Ruffo, H. L. Peng, D. K. Kim, and Y. Cui, Single Nanorod Devices for Battery Diagnostics: A Case Study on LiMn₂O₄. *Nano Letters* 9, 4109-4114 (2009).
 28. **Y. Yang**[§], G. H. Yu[§], J. J. Cha, H. Wu, M. Vosgueritchian, Y. Yao, Z. N. Bao, and Y. Cui, Improving the Performance of Li-S Battery by Conductive Polymer Coating. *ACS Nano* 5, 9187–9193 (2011).
 27. **Y. Yang**, Q. Zhao, X. Z. Zhang, Z. G. Liu, C. X. Zou, B. Shen, and D. P. Yu, Mn-doped AlN Nanowires with Room Temperature Ferromagnetic Ordering. *Applied Physics Letters* 90, 092118 (2007).
 26. H. L. Wang[§], **Y. Yang**[§], Y. Y. Liang, G. Y. Zheng, Y. G. Li, Y. Cui, and H. J. Dai, Rechargeable Li-O₂ Batteries with Covalently Coupled MnCo₂O₄-Graphene Hybrid as Oxygen Cathode Catalyst. *Energy & Environmental Sciences* 5, 7931-7935 (2012).
 25. J. Nelson[§], S. Misra[§], **Y. Yang**[§], A. Jackson, Y. J. Liu, H. L. Wang, H. J. Dai, J. C. Andrews, Y. Cui, and M. F. Toney, In operando X-ray Diffraction and Transmission X-ray Microscopy of Lithium Sulfur Batteries. *JACS* 134, 6337–6343 (2012).
 24. G. Y. Zheng[§], **Y. Yang**[§], J. J. Cha, S. S. S, and Y. Cui, Hollow Carbon Nanofiber-Encapsulated Sulfur Cathodes for High Specific Capacity Lithium Batteries. *Nano Letters* 11, 4462-4467 (2011).
 23. H. L. Wang[§], **Y. Yang**[§], Y. Liang, J. T. Robinson, Y. Li, A. Jackson, Y. Cui, and H. Dai, Graphene-Wrapped Sulfur Particles as a Rechargeable Lithium/sulfur Battery Cathode Material with High Capacity and Cycling Stability. *Nano Letters* 11, 2644-2647 (2011).
 22. H. L. Wang[§], **Y. Yang**[§], Y. Y. Liang, L. F. Cui, H. S. Casalongue, Y. G. Li, G. S. Hong, H. J. Dai, and Y. Cui, LiMn_{1-x}Fe_xPO₄ Nanorods Grown on Graphene Sheets for Ultrahigh-Rate-Performance Lithium Ion Batteries. *Angewandte Chemie - International Edition* 50, 7364-7368 (2011).
 21. J. Wang, S. P. Feng, **Y. Yang**, N. Hau, M. Munro, E. F. Yang, and G. Chen, “Thermal Charging” Phenomenon in Electrical Double Layer Capacitors, *Nano Letters*, DOI: 10.1021/acs.nanolett.5b01761 (2015).
 20. C. Wang, X. S. Wang, **Y. Yang**, A. Kushima, J. T. Chen, Y. H. Huang, and J. Li, Slurryless Li₂S/Reduced Graphene Oxide Cathode Paper for High-Performance Lithium Sulfur Battery, *Nano Letters*, 15, 1796-1802 (2015).
 19. W. Y. Li, G. Y. Zheng, **Y. Yang**, Z. W. Seh, N. Liu, and Y. Cui, High-performance

- Hollow Sulfur Nanostructured Battery Cathode through a Scalable, Room Temperature, One-step, Bottom-up Approach. *PNAS* 110, 7148-7153 (2013).
18. Y. Lin, **Y. Yang**, H. W. Ma, Y. Cui, and W. L. Mao, Compressional Behavior of Bulk and Nanorod LiMn_2O_4 under Nonhydrostatic Stress. *Journal of Physical Chemistry C* 115, 9844-9849 (2011).
 17. H. L. Wang, L. F. Cui, **Y. Yang**, H. S. Casalongue, J. T. Robinson, Y. Y. Liang, and H. J. Dai, et al. Mn_3O_4 -Graphene Hybrid as a High-Capacity Anode Material for Lithium Ion Batteries. *JACS* 132, 13978-13980 (2010).
 16. L. F. Cui, **Y. Yang**, C. M. Hsu, and Y. Cui, Carbon-Silicon Core-Shell Nanowires as High Capacity Electrode for Lithium Ion Batteries. *Nano Letters* 9, 3370-3374 (2009).
 15. J. Zheng, **Y. Yang**, B. Yu, X. B. Song, and X. G. Li, [0001] Oriented Aluminum Nitride One-dimensional Nanostructures: Synthesis, Structure Evolution, and Electrical Properties. *ACS Nano* 2, 134-142 (2008).
 14. G. Y. Zheng, Q. F. Zhang, J. J. Cha, **Y. Yang**, W. Y. Li, Z. W. Seh, and Y. Cui, Amphiphilic Surface Modification of Hollow Carbon Nanofibers for Improved Cycle Life of Lithium Sulfur Batteries. *Nano Letters*, 13, 1265-1270 (2013).
 13. J. G. Zhou, J. Wang, Y. F. Hu, T. Regier, H. L. Wang, **Y. Yang**, Y. Cui, and H. J. Dai, Imaging State of Charge and Its Correlation to Interaction Variation in an $\text{LiMn}_{0.75}\text{Fe}_{0.25}\text{PO}_4$ Nanorods-graphene Hybrid. *Chemical Communications*, 49, 1765-1767 (2013).
 12. Z. W. Seh, W. Y. Li, J. J. Cha, G. Y. Zheng, **Y. Yang**, M. T. McDowell, P. C. Hsu, and Y. Cui, Sulphur-TiO₂ Yolk-shell Nanoarchitecture with Internal Void Space for Long-cycle Lithium-sulphur Batteries. *Nature Communications*, 4, 1331 (2013).
 11. P. H. Hsu, H. Wu, T. J. Carney, M. T. McDowell, **Y. Yang**, E. C. Garnett, M. Li, B. L. Hu, and Y. Cui, Passivation Coating on Electrospun Copper Nanofibers for Stable Transparent Electrodes. *ACS Nano* 6, 5150-5156 (2012).
 10. H. Wu, G. Chan, J. W. Choi, I. Ryu, Y. Yao, M. T. McDowell, S. W. Lee, A. Jackson, **Y. Yang**, L. B. Hu, and Y. Cui, Stable Cycling of Double-walled Silicon Nanotube Battery Anodes through Solid-electrolyte Interphase Control. *Nature Nanotechnology* 7, 310-315 (2012).
 9. H. Wu, G. Y. Zheng, N. Liu, T. J. Carney, **Y. Yang**, and Y. Cui, Engineering Empty Space between Si Nanoparticles for Lithium-Ion Battery Anodes. *Nano Letters* 12, 904-909 (2012).
 8. L. B. Hu, W. Chen, X. Xie, N. Liu, **Y. Yang**, H. Wu, Y. Yao, M. Pasta, H. N. Alshareef, and Y. Cui, Symmetrical MnO_2 -Carbon Nanotube-Textile Nanostructures for Wearable Pseudocapacitors with High Mass Loading. *ACS Nano* 5, 8904-8913 (2011).
 7. G. H. Yu, L. B. Hu, N. Liu, H. L. Wang, M. Vosgueritchian, **Y. Yang**, Y. Cui, and Z. N. Bao, Enhancing the Supercapacitor Performance of Graphene/ MnO_2 Nanostructured Electrodes by Conductive Wrapping. *Nano Letters* 11, 4438-4442 (2011).
 6. X. Xie, M. Pasta, L. B. Hu, **Y. Yang**, J. McDonough, J. Cha, C. S. Criddle, and Y. Cui, Nano-structured Textiles as High-performance Aqueous Cathodes for Microbial Fuel Cells. *Energy & Environmental Science* 4, 1293-1297 (2011).

5. L. B. Hu, H. Wu, F. La Mantia, **Y. Yang**, and Y. Cui, Thin, Flexible Secondary Li-Ion Paper Batteries. *ACS Nano* 4, 5843-5848 (2010).
4. H. Wu, L. B. Hu, M. W. Rowell, D. S. Kong, J. J. Cha, J. R. McDonough, J. Zhu, **Y. Yang**, M. D. McGehee, and Y. Cui, Electrospun Metal Nanofiber Webs as High-Performance Transparent Electrode. *Nano Letters* 10, 4242-4248 (2010).
3. J. R. McDonough, J. W. Choi, **Y. Yang**, F. La Mantia, Y. Cui, and Y. G. Zhang, Carbon Nanofiber Supercapacitors with Large Areal Capacitances. *Applied Physics Letters* 95, 243109 (2009).
2. D. T. Schoen, S. Meister, H. L. Peng, C. Chan, **Y. Yang**, and Y. Cui, Phase Transformations in One-dimensional Materials: Applications in Electronics and Energy sciences. *Journal of Materials Chemistry* 19, 5879-5890 (2009).
1. D. K. Kim, P. Muralidharan, H. W. Lee, R. Ruffo, Y. Yang, C. K. Chan, H. Peng, R. A. Huggins, and Y. Cui, Spinel LiMn_2O_4 Nanorods as Lithium Ion Battery Cathodes. *Nano Letters* 8, 3948-3952 (2008).

Patents Applications

8. Y. Yang, and J. Mandal, "Scalable Method of Fabricating Structured Polymer For Passive Daytime Radiative Cooling and Other Applications", pending
7. Y. Yang, G. Qian, X. Chen, X. Liao, C. Shi and T. Wang, "Flexible batteries And Related Designs", pending
6. C. Nuckolls, Y. Yang, T. Sisto, R. H. Sanchez, M. Milton, Margarita, Q. Cheng, Redox Flow Batteries and Compounds for Battery Application, WO/2019/036633 (2019)
5. **Y. Yang**, and Z. Y. Cao, "Alkali Metal Battery Negative Electrodes And Related Methods", US 20190044183 (2019).
4. **Y. Yang**, L. B. Hu, Y. Cui, and S. Jeong, "Transparent electrochemical energy storage devices", US 13/551,749 (2013).
3. **Y. Yang**, M. McDowell, A. Jackson, and Y. Cui, "Device and electrode having nanoporous graphite with lithiated sulfur for advanced rechargeable batteries", US 12/914,876 (2013).
2. W. Y. Li, Y. Cui, Z. W. Seh, G. Y. Zheng, and **Y. Yang**, "Encapsulated sulfur cathodes for rechargeable lithium batteries" US 13/612,493 (2013).
1. L. B. Hu, J. W. Choi, **Y. Yang**, and Y. Cui, "Conductive fibrous materials", PCT/US2010/054776 (2011).

Invited Presentations

11. Material Characterizations and Designs for Advanced Energy Storage, MRS fall meeting, Nov 28, 2018.
10. In-operando mesoscale 3D visualization of ion transport in battery electrolyte, ACS 256th National Meeting, August 22, 2018
9. Designing composite solid electrolyte for lithium batteries with high energy density, ACS 256th National Meeting, August, 20, 2018
8. In-operando 3D Visualization of Ion Depletion and Lithium Growth By Stimulated Raman Scattering Microscopy, Nature Conference, Shenzhen, China, Jan 14, 2018

7. Rational Structural Design for Lithium-based Rechargeable Batteries with High Energy Density, ACS 254th National Meeting, Washington DC, Aug 22, 2017
6. Electrochemical Materials and Devices for Energy Storage and Conversion, Department of Mechanical Engineering, Binghamton University, Mar 5, 2016
5. Electrochemical Materials and Devices for Energy Storage and Conversion, Department of Materials Science and Engineering, Columbia University, Feb 6, 2015
4. Rechargeable Batteries and Beyond, College of Engineering, Nanjing University, China, Sep 9, 2013
3. Rechargeable Batteries and Beyond, Department of Chemistry, Peking University, China, Aug 27, 2013
2. Advanced Batteries: Materials Development and Device Fabrication. Oral Presentation in Mechanical Engineering, MIT, Mar 20, 2013
1. Transparent Batteries for Future Transparent Electronics. Oral Presentation at Printed Electronics & Photovoltaics USA 2011 – Santa Clara, CA, Dec 1, 2011

Professional Activities

Conference Organizer:

2. Symposium ES2: High Capacity Electrode Materials for Next-generation Energy Storage, 2017 MRS Spring Meeting, Phoenix, AZ, USA
1. Symposium B-5: Heat Transfer: from Meso-scale to Macro-scale, Oct 3-4, 2016, College Park, MD, USA

Journal Reviewer: Nature Communications; Advanced Materials; Nano Letters; Energy & Environmental Science; Chemical Communications; Journal of Materials Chemistry; Nano research; Nano energy; Langmuir; RSC Advance; Physical Chemistry Chemical Physics; RSC Advances

Memberships: Materials Research Society; American Society of Mechanical Engineers