

## Po-Chun Hsu

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### EDUCATION

Stanford University	Ph.D. in Materials Science and Engineering <i>Advisor: Prof. Yi Cui</i> <i>Thesis: "Light-managing nanomaterials for energy efficiency"</i>	2010-2016
National Tsing Hua University	B.S. in Materials Science and Engineering <i>Advisor: Prof. Lih-Juann Chen</i> <i>Project: "Branched ZnO nanowire synthesis"</i>	2003-2007

### RESEARCH EXPERIENCE

Stanford University	Postdoctoral Researcher <i>Advisor: Prof. Arun Majumdar</i> <i>Project: "Wearable solid-state refrigerators"</i>	2016-Present
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### AWARDS & HONORS

MRS Graduate Student Silver Award	2015
International Fulbright Science and Technology Award	2010-2013
Studying Abroad Scholarship, by ROC Ministry of Education	2010
Mr. Pei-Yi Chiang Memorial Scholarship	2007
Outstanding College Youth, by China Youth Corps	2006
Mr. Chi-Jen Chen Memorial Scholarship	2005
Tsinghua University Academic Exchange Scholarship	2005
Mr. Feng-Chang Lu Memorial Scholarship	2005
The Academic Achievement Award	2004
Student Tien-Hsing Ho Memorial Scholarship	2004
Taiwan Semiconductor Manufacturing Company (TSMC) Scholarship	2004
The First Place in Joint University Entrance Examination	2003

### SELECTED KEY PUBLICATIONS (\* denotes equal contribution)

(Total published papers: 46 H-index: 31 Total citations: 5744)

1. **P.-C. Hsu**, A. Y. Song, P. B. Catrysse, C. Liu, Y. Peng, J. Xie, S. Fan, Y. Cui. "Radiative human body cooling by nanoporous polyethylene textile" *Science*, 2016, 353 (6303), 1019-1023  
*Highlighted in Science, Scientific American, C&E News, ABC News*
2. **P.-C. Hsu**, C. Liu, A.Y. Song, Z. Zhang, Y. Peng, J. Xie, K. Liu, C.-L. Wu, P.B. Catrysse, L. Cai, S. Zhai, A. Majumdar, S. Fan, Y. Cui. "Dual-mode textile for human body radiative heating and cooling" *Science Advances*, 3, e1700895
3. **P.-C. Hsu**, X. Liu, C. Liu, X. Xie, H.R. Lee, A.J. Welch, T. Zhao, Y. Cui. "Personal thermal management by metallic nanowire-coated textile" *Nano Letters*, 2015, 15 (1), 365-371  
*Highlighted in Nature Nanotechnology, ACS News, The Wall Street Journal, Popular Science*
4. B. Deng\*, **P.-C. Hsu**\*, G. Chen, B.N. C, L. Liao, Z. Ayitimuda, J. Wu, Y. Guo, L. Lin, Y. Zhou, M. Aisijiang, Q. Xie, Y. Cui, Z. Liu, H. Peng. "Roll-to-roll encapsulation of metal nanowires in graphene and plastic substrate for high-performance flexible transparent electrodes" *Nano Letters*, 2015, 15 (6), 4206-4213
5. C. Liu\*, **P.-C. Hsu**\*, H.W. Lee, M. Ye, G. Zheng, N. Liu, W. Li, Y. Cui. "Transparent air filter for high-efficiency PM<sub>2.5</sub> capture" *Nature Communications*, 2015, 6:6205  
*Highlighted in Stanford News, The Wall Street Journal*
6. **P.-C. Hsu**, D. Kong, S. Wang, H. Wang, A.J. Welch, H. Wu, Y. Cui. "Electrolessly deposited electrospun metal nanowire transparent electrodes" *J. Am. Chem. Soc.*, 2014, 136 (30), 10593-10596

7. **P.-C. Hsu\***, S. Wang\*, H. Wu, V.K. Narasimhan, H.Y. Lee, Y. Cui. "Performance enhancement of metal nanowire transparent conducting electrodes by mesoscale metal wires" *Nature Communications*, 2013, 4:2522
8. **P.-C. Hsu**, H. Wu, T.J. Carney, M.T. McDowell, Y. Yang, E.C. Garnett, M. Li, L. Hu, Y. Cui. "Passivation coating on electrospun copper nanofibers for stable transparent electrodes" *ACS Nano*, 2012, 6 (6), 5150-5156

#### ADDITIONAL PUBLICATIONS (\* denotes equal contribution)

9. R. Zhang, C. Liu, G. Zhou, J. Sun, N. Liu, **P.-C. Hsu**, H. Wang, Y. Qiu, J. Zhao, T. Wu, W. Zhao, Y. Cui. "Morphology and property investigation of primary particulate matter particles from different sources" *Nano Research*, 2018, 11(6), 3182–3192
10. Y. Peng\*, J. Chen\*, A.Y. Song\*, P.B. Catrysse\*, **P.-C. Hsu**, L. Cai, B. Liu, Y. Zhu, G. Zhou, D.S. Wu, H.R. Lee, S. Fan, Y. Cui. "Nanoporous polyethylene microfibrils for large-scale radiative cooling fabric" *Nature Sustainability*, 2018, 1, 105-122
11. R. Zhang, B. Liu, A. Yang, Y. Zhu, C. Liu, G. Zhou, J. Sun, **P.-C. Hsu**, W. Zhao, D. Lin, Y. Liu, A. Pei, J. Xie, W. Chen, J. Xu, Y. Jin, T. Wu, X. Huang, Y. Cui. "In-situ investigation on the nanoscale capture and evolution of aerosols on nanofibers" *Nano Letters*, 2018, 18 (2), 1130–1138
12. L. Cai, A.Y. Song, P. Wu, **P.-C. Hsu**, Y. Peng, J. Chen, C. Liu, P.B. Catrysse, Y. Liu, A. Yang, C. Zhou, C. Zhou, S. Fan, Y. Cui. "Warming up human body by nanoporous metallized polyethylene textile" *Nature Communications*, 2017, 8:496
13. J. Xie, J. Zhao, Y. Liu, H. Wang, C. Liu, T. Wu, **P.-C. Hsu**, D. Lin, Y. Jin, Y. Cui. "Engineering the surface of LiCoO<sub>2</sub> electrodes using atomic layer deposition for stable high-voltage lithium ion batteries" *Nano Research*, 2017, 10(11), 3754–3764
14. J. Zhao, G. Zhou, K. Yan, J. Xie, Y. Li, L. Liao, Y. Jin, K. Liu, **P.-C. Hsu**, J. Wang, H.-M. Cheng, Y. Cui, "Air-stable and freestanding lithium alloy/graphene foil as an alternative to lithium metal anodes", *Nature Nanotechnology*, 2017, 12, 993-999
15. A. Yang, L. Cai, R. Zhang, J. Wang, **P.-C. Hsu**, H. Wang, G. Zhou, J. Xu, Y. Cui. "Thermal management in nanofiber-based face mask" *Nano Letters*, 2017, 17 (6), 3506-3510
16. K. Liu, A. Pei, H.R. Lee, B. Kong, N. Liu, D. Lin, Y. Liu, C. Liu, **P.-C. Hsu**, Z. Bao, Y. Cui. "Lithium Metal Anodes with an Adaptive Solid-Liquid Interfacial Protective Layer" *J. Am. Chem. Soc.*, 2017, 139 (13), 4815-4820
17. C. Liu, **P.-C. Hsu**, J. Xie, J. Zhao, T. Wu, H. Wang, W. Liu, J. Zhang, S. Chu, Y. Cui. "A half-wave rectified alternating current electrochemical method for uranium extraction from seawater" *Nature Energy*, 2017, 2:17007
18. C. Liu, D. Kong, **P.-C. Hsu**, H. Yuan, H.-W. Lee, Y. Liu, H. Wang, S. Wang, K. Yan, D. Lin, A.B. Boehm, Y. Cui. "Rapid water disinfection using vertically aligned MoS<sub>2</sub> nanofilms and visible light" *Nature Nanotechnology*, 2016, 11, 1098-1104  
*Highlighted in Nature*
19. Y. Qiu, W. Liu, W. Chen, W. Chen, G. Zhou, **P.-C. Hsu**, R. Zhang, Z. Liang, S. Fan, Y. Zhang, Y. Cui. "Efficient solar-driven water splitting by nanocone BiVO<sub>4</sub>-perovskite tandem cells" *Science Advances*, 2016, 2, e1501764
20. R. Zhang, C. Liu, **P.-C. Hsu**, C. Zhang, N. Liu, J. Zhang, H. R. Lee, Y. Lu, Y. Qiu, S. Chu, Y. Cui. "Nanofiber air filters with high temperature stability for efficient PM<sub>2.5</sub> removal from the pollution sources" *Nano Letters*, 2016, 16 (6), 3642-3649
21. J. Xu\*, C. Liu\*, **P.-C. Hsu**, K. Liu, Y. Liu, Y. Cui. "Roll-to-roll transfer of electrospun nanofiber film for high-efficiency transparent air filter" *Nano Letters*, 2016, 16 (2), 1270-1275
22. Z. Chen, **P.-C. Hsu**, J. Lopez, Y. Li, J. To, N. Liu, C. Wang, S. Andrews, Y. Cui, Z. Bao. "Fast and reversible thermoresponsive polymer switching for safer batteries" *Nature Energy*, 2016, 1:15006
23. K. Yan, Z. Lu, H.-W. Lee, F. Xiong, **P.-C. Hsu**, Y. Li, J. Zhao, S. Chu, Y. Cui. "Selective deposition and stable encapsulation of lithium through heterogeneous seeded growth" *Nature Energy*, 2016, 1:16010
24. D. Lin, W. Liu, Y. Liu, H.R. Lee, **P.-C. Hsu**, K. Liu, Y. Cui. "High ionic conductivity of composite solid polymer electrolyte via in situ synthesis of monodispersed SiO<sub>2</sub> nanospheres in poly(ethylene oxide)" *Nano Letters*, 2016, 16 (1), 459-465

25. N. Liu, K. Kim, H.Y. Jeong, **P.-C. Hsu**, Y. Cui, Z. Bao. "Effect of chemical structure on polymer-templated growth of graphitic nanoribbons" *ACS Nano*, 2015, 9 (9), 9043-9049
26. H. Wang, H.-W. Lee, Y. Deng, Z. Lu, **P.-C. Hsu**, Y. Liu, D. Lin, Y. Cui. "Bifunctional non-noble metal oxide nanoparticle electrocatalysts through lithium-induced conversion for overall water splitting" *Nature Communications*, 2015, 6:7621
27. Z. Liang, G. Zheng, C. Liu, N. Liu, W. Li, K. Yan, H. Yao, **P.-C. Hsu**, S. Chu, Y. Cui. "Polymer nanofiber-guided uniform lithium deposition for battery electrodes" *Nano Letters*, 2015, 15 (5), 2910-2916
28. W. Liu, N. Liu, J. Sun, **P.-C. Hsu**, Y. Li, H.W. Lee, Y. Cui. "Ionic conductivity enhancement of polymer electrolytes with ceramic nanowire fillers" *Nano Letters*, 2015, 15 (4), 2740-2745
29. D. Lin, Z. Lu, **P.-C. Hsu**, H.R. Lee, N. Liu, J. Zhao, H. Wang, C. Liu, Y. Cui. "A high tap density secondary silicon particle anode fabricated by scalable mechanical pressing for lithium-ion batteries", *Energy Environ. Sci.*, 2015, 8, 2371
30. Y. Liu, H. Wang, D. Lin, C. Liu, **P.-C. Hsu**, W. Liu, W. Chen, Y. Cui. "Electrochemical tuning of olivine-type lithium transition-metal phosphates as efficient water oxidation catalysts" *Energy Environ. Sci.*, 2015, 8, 1719-1724
31. X. Xie, M. Ye, C. Liu, **P.-C. Hsu**, C.S. Criddle, Y. Cui. "Use of low cost and easily regenerated Prussian Blue cathodes for efficient electrical energy recovery in a microbial battery" *Energy Environ. Sci.*, 2015, 8, 546-551
32. N. Liu, K. Kim, **P.-C. Hsu**, A.N. Sokolov, F.L. Yap, H. Yuan, Y. Xie, H. Yan, Y. Cui, H.Y. Hwang, Z. Bao. "Large-scale production of graphene nanoribbons from electrospun polymers" *J. Am. Chem. Soc.*, 2014, 136 (49), 17284-17291
33. H. Wang, Q. Zhang, H. Yao, Z. Liang, H.W. Lee, **P.-C. Hsu**, G. Zheng, Y. Cui. "High electrochemical selectivity of edge versus terrace sites in two-dimensional layered MoS<sub>2</sub> materials" *Nano Letters*, 2014, 14 (12), 7138-7144
34. A. Wangperawong, **P.-C. Hsu**, Y. Yee, S.M. Herron, B.M. Clemens, Y. Cui, S.F. Bent. "Bifacial solar cell with SnS absorber by vapor transport deposition" *Appl. Phys. Lett.*, 2014, 105, 173904
35. Z.W. Seh, J.H. Yu, W. Li, **P.-C. Hsu**, H. Wang, Y. Sun, H. Yao, Q. Zhang, Y. Cui. "Two-dimensional layered transition metal disulphides for effective encapsulation of high-capacity lithium sulphide cathodes" *Nature Communications*, 2014, 5:5017
36. Z. Lu, H. Wang, D. Kong, K. Yan, **P.-C. Hsu**, G. Zheng, H. Yao, Z. Liang, X. Sun, Y. Cui. "Electrochemical tuning of layered lithium transition metal oxides for improvement of oxygen evolution reaction" *Nature Communications*, 2014, 5:4345
37. H. Yao\*, G. Zheng\*, **P.-C. Hsu**, D. Kong, J.J. Cha, W. Li, Z.W. Seh, M.T. McDowell, K. Yan, Z. Liang, V.K. Narasimhan, Y. Cui. "Improving lithium-sulphur batteries through spatial control of sulphur species deposition on a hybrid electrode surface" *Nature Communications*, 2014, 5:3943
38. Z.W. Seh, H. Wang, **P.-C. Hsu**, Q. Zhang, W. Li, G. Zheng, H. Yao, Y. Cui. "Facile synthesis of Li<sub>2</sub>S-polypyrrole composite structures for high-performance Li<sub>2</sub>S cathodes" *Energy Environ. Sci.*, 2014, 7, 672-676
39. H. Wang, Z. Lu, S. Xu, D. Kong, J.J. Cha, G. Zheng, **P.-C. Hsu**, K. Yan, D. Bradshaw, F.B. Prinz, Y. Cui. "Electrochemical tuning of vertically aligned MoS<sub>2</sub> nanofilms and its application in improving hydrogen evolution reaction" *PNAS*, 2013, 110 (49), 19701-19706
40. X. Xie, M. Ye, **P.-C. Hsu**, N. Liu, C.S. Criddle, Y. Cui. "Microbial battery for efficient energy recovery" *PNAS*, 2013, 110 (40), 15925-15930
41. H. Wu, D. Kong, Z. Ruan, **P.-C. Hsu**, S. Wang, Z. Yu, T.J. Carney, L. Hu, S. Fan, Y. Cui. "A transparent electrode based on a metal nanotrough network" *Nature Nanotechnology*, 2013, 8 (6), 421-425
42. Z.W. Seh, W. Li, J.J. Cha, G. Zheng, Y. Yang, M.T. McDowell, **P.-C. Hsu**, Y. Cui. "Sulphur-TiO<sub>2</sub> yolk-shell nanoarchitecture with internal void space for long-cycle lithium-sulphur batteries" *Nature Communications*, 2013, 4:1331
43. T.-W. Huang, C.-M. Lin, H.-S. Sheu, T.-L. Hung, K.-W. Yeh, **P.-C. Hsu**, Y.-L. Huang, F.-C. Hsu, M.-K. Wu, "Raman and X-ray diffraction studies of superconducting FeSe under pressure", *Physica C: Superconductivity*, 2010, 470, S502-S503
44. C.-C. Chang, J.-Y. Luo, T.-K. Chen, K.-W. Yeh, T.-W. Huang, C.-H. Hsu, W.-H. Chao, C.-T. Ke, **P.-C. Hsu**, M.-J. Wang, M.-K. Wu. "Pulsed laser deposition of (MoO<sub>3</sub>)<sub>1-x</sub>(V<sub>2</sub>O<sub>5</sub>)<sub>x</sub> thin films: preparation, characterization

- and gasochromic studies” *Thin Solid Films*, 2010, 519 (5), 1552-1557
45. T.-K. Chen, J.-Y. Luo, C.-T. Ke, H.-H. Chang, T.-W. Huang, K.-W. Yeh, C.-C. Chang, **P.-C. Hsu**, C.-T. Wu, M.-J. Wang, M.-K. Wu. “Low-temperature fabrication of superconducting FeSe thin films by pulsed laser deposition” *Thin Solid Films*, 2010, 519 (5), 1540-1545
  46. Y.-C. Chang, W.-C. Yang, C.-M. Chang, **P.-C. Hsu**, and L.-J. Chen, “Controlled Growth of ZnO Nanopagoda Arrays with Varied Lamination and Apex Angles”, *Cryst. Growth Des.*, 2009, 9 (7), 3161-3167

## PATENTS

1. **(Licensed)** P.-C. Hsu, A.Y. Song, P.B. Catrysse, Y. Peng, S. Fan, Y. Cui. “Infrared-transparent porous polymer textile for human body cooling and heating” WO 2017143222 A1
2. **(Licensed)** P.-C. Hsu, A.Y. Song, P.B. Catrysse, Y. Peng, J. Chen, S. Fan, Y. Cui. “Infrared-transparent, polymer fiber-based woven textiles for human body cooling” WO 2018058062 A1
3. **(Licensed)** C. Liu, P.-C. Hsu, R. Zhang, S. Chu, Y. Cui. “Transparent air filter for high-efficiency PM<sub>2.5</sub> capture” WO 2016094906 A1
4. P.-C. Hsu, A.Y. Song, W. Li, L. Cai, S. Fan, Y. Cui. “Spectrally selective textile for passive radiative outdoor personal cooling” US Provisional Patent Application 62/626,532
5. P.-C. Hsu, S. Wang, H. Wu, Y. Cui. “Transparent conducting electrodes comprising mesoscale metal wires” US 20150056435 A1

## CONFERENCES

1. **(Invited)** “Light-Managing Textiles for Energy Efficiency and Thermal Comfort” *e-Wear Symposium*, Stanford, CA, USA
2. “Radiative Human Body Cooling by Nanoporous Polyethylene Textile” *Materials Research Society Spring Meeting 2017*, Phoenix, AZ, USA
3. “Personal Thermal Management by Metallic Nanowire-Coated Textile” *Materials Research Society Spring Meeting 2017*, Phoenix, AZ, USA
4. **(Invited)** “Light-Managing Nanomaterials for Energy Efficiency” *Stanford-Chalmers Workshop on Advancing Materials Innovatively 2016*, Stanford, USA
5. **(Invited)** “Metal Nanowire Transparent Electrodes” *International Conference on Materials for Advanced Technologies 2015*, Singapore
6. “Electrolessly Deposited Metal Electrospun Nanowire Transparent Electrodes” *Materials Research Society Spring Meeting 2015*, San Francisco, CA, USA
7. “Performance Enhancement of Metal Nanowire Transparent Conducting Electrodes by Mesoscale Metal Wires” *Materials Research Society Spring Meeting 2014*, San Francisco, CA, USA
8. **(Invited)** “High Performance Metal Nanowire Transparent Electrodes” *Stanford Photonics Research Center Symposium 2014*, Stanford, CA, USA
9. “Metal Nanowire Transparent Electrode” *Fulbright Science and Technology Capstone 2013*, Washington, DC, USA
10. “High performance multiscale metal nanowire transparent electrode” *European Photovoltaic Solar Energy Conference 2013*, Paris, France
11. “Electrolessly deposited electrospun metal nanofiber transparent electrodes” *Materials Research Society Fall Meeting 2013*, Boston, MA, USA
12. “Metal Nanowire and Mesowire Network Transparent Electrodes” *Bay Area Photovoltaic Consortium 2013*, Berkeley, CA, USA