

# Po-Chun Hsu

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Department of Mechanical Engineering and Materials Science  
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## EDUCATION

Stanford University	Ph.D. in Materials Science and Engineering <i>Advisor: Prof. Yi Cui</i>	2010-2016
National Tsing Hua University	B.S. in Materials Science and Engineering <i>Advisor: Prof. Lih-Juann Chen</i>	2003-2007

## EXPERIENCE

Duke University	Assistant Professor Mechanical Engineering and Materials Science	2019-present
Stanford University	Postdoctoral Researcher <i>Advisor: Prof. Arun Majumdar</i>	2016-2018
Academia Sinica	Research Assistant <i>Advisor: Prof. Maw-Kuen Wu</i>	2008-2010

## PROFESSIONAL SERVICES

Nano Letters	Early Career Board	2020-present
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## PUBLICATIONS (\*corresponding authors, †equal contribution)

(Total published: 58      H-index: 42      Total citations: 14898      Google Scholar: [goo.gl/icmTfi](https://scholar.google.com/citations?user=go0Tfi))

- 61 Y. Rao†, J. Dai†, C. Sui†, Y.-T. Lai†, Z. Li, H. Fang, X. Li, W. Li, P.-C. Hsu\* “Ultra-Wideband Transparent Conductive Electrode for Electrochromic Synergistic Solar and Radiative Heat Management” *Submitted*
- 60 X. Li†, B. Ma†, J. Dai†, C. Sui, D. Pande, D. R. Smith, L. C. Brinson\*, P.-C. Hsu\* “Metalized polyamide heterostructure as a moisture-responsive actuator for multimodal adaptive personal heat management” *Submitted*
- 59 C. Sui†, Y.-Y. Li†, X. Li, G. Higueros, K. Wang, W. Xie, P.-C. Hsu\* “Bio-inspired vascularized electrodes for high-performance fast-charging batteries designed by deep learning” *Submitted*
- 58 X. Li\*, T. Cooper, W. Xie, P.-C. Hsu\* “Design and utilization of infrared light for interfacial solar water purification” *ACS Energy Letters* (2021) DOI: 10.1021/acseenergylett.1c00869
- 57 H. Fang, W. Xie, X. Li, K. Fan, Y.-T. Lai, B. Sun, S. Bai, W. J. Padilla, P.-C. Hsu\* “A triple-mode midinfrared modulator for radiative heat management of objects with various emissivity” *Nano Letters* (2021) DOI: 10.1021/acs.nanolett.1c01147
- 56 P.-C. Hsu\*, X. Li “Photon-engineered radiative cooling textiles” *Science* (2020) DOI: 10.1126/science.abe4476  
*Highlighted in Science Podcast & Science Facebook Live*

- 55 X. Li, B. Sun, C. Sui, A. Nandi, H. Fang, Y. Peng, G. Tan\*, P.-C. Hsu\* “Integration of daytime radiative cooling and solar heating for year-round energy saving in buildings” *Nature Communications* (2020) DOI: 10.1038/s41467-020-19790-x  
*Highlighted in Materials Today*
- 54 X. Li, W. Xie, C. Sui, P.-C. Hsu\* “Multispectral Thermal Management Designs for Net-Zero Energy Buildings” *ACS Materials Letters* (2020) DOI: 10.1021/acsmaterialslett.0c00322
- 53 [Before Duke] 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) DOI: 10.1126/science.aaf5471  
*Highlighted in Scientific American, C&E News, ABC News*
- 52 [Before Duke] 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* (2017) DOI: 10.1126/sciadv.1700895  
*Highlighted in Science*
- 51 Y.-T. Lai, Y.-S. Huang, C.-H. Chen, Y.-C. Lin, H.-T. Jeng, M.-C. Chang, L.-J. Chen, C.-Y. Lee, P.-C. Hsu\*, N.-H. Tai\*. “Green Treatment of Phosphate from Wastewater Using a Porous Bio-Templated Graphene Oxide/MgMn-Layered Double Hydroxide Composite” *Isience* (2020) DOI: 10.1016/j.isci.2020.101065
- 50 H. Fang, H. Guo, Y. Hu, Y. Ren, P.-C. Hsu, S.-L. Bai\*. “In-situ grown hollow Fe<sub>3</sub>O<sub>4</sub> onto graphene foam nanocomposites with high EMI shielding effectiveness and thermal conductivity” *Composites Science and Technology* (2020) DOI: 10.1016/j.compscitech.2019.107975
- 49 C. Liu, Y. Li, D. Lin, P.-C. Hsu, B. Liu, G. Yan, T. Wu, Y. Cui, S. Chu “Lithium Extraction from Seawater through Pulsed Electrochemical Intercalation” *Joule* (2020) DOI: 10.1016/j.joule.2020.05.017
- 48 J. Xu, C. Liu, P.-C. Hsu, J. Zhao, T. Wu, J. Tang, K. Liu, Y. Cui. “Remediation of heavy metal contaminated soil by asymmetrical alternating current electrochemistry” *Nature Communications*, 2019, 10:2440
- 47 C. Liu, T. Wu, P.-C. Hsu, J. Xie, J. Zhao, K. Liu, J. Sun, J. Xu, J. Tang, Z. Ye, D. Lin, Y. Cui. “Direct/Alternating Current Electrochemical Method for Removing and Recovering Heavy Metal from Water Using Graphene Oxide Electrode” *ACS nano*, 2019, 13(6), 6431-6437

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- 46 L. Cai, A.Y. Song, W. Li, P.-C. Hsu, D. Lin, P.B. Catrysse, Y. Liu, Y. Peng, J. Chen, H. Wang, J. Xu, A. Yang, S. Fan, Y. Cui. “Spectrally selective nanocomposite textile for outdoor personal cooling” *Advanced Materials*, 2018, 30(35), 1802152
- 45 K. Liu†, C. Liu†, P.-C. Hsu, J. Xu, B. Kong, T. Wu, R. Zhang, G. Zhou, W. Huang, J. Sun, Y. Cui. “Core–Shell Nanofibrous Materials with High Particulate Matter Removal Efficiencies and Thermally Triggered Flame Retardant Properties” *ACS Central Science*, 2018, 4(7), 894-898
- 44 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
- 43 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

- 42 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
- 41 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
- 40 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
- 39 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
- 38 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
- 37 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
- 36 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
- 35 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*
- 34 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
- 33 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
- 32 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
- 31 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
- 30 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
- 29 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
- 28 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) DOI: 10.1021/acs.nanolett.5b01531

- 27 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) DOI: 10.1021/nl5036572  
*Highlighted in Nature Nanotechnology, Science, The Wall Street Journal, Popular Science*
- 26 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) DOI: 10.1038/ncomms7205  
*Highlighted in Stanford News, The Wall Street Journal*
- 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
- 24 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
- 23 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
- 22 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
- 21 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
- 20 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
- 19 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
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- 17 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
- 16 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
- 15 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
- 14 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
- 13 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
- 12 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

- 11 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
- 10 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) DOI: 10.1038/ncomms3522
- 9 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
- 8 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
- 7 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
- 6 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
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- 2 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
- 1 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

## AWARDS & HONORS

Ralph E. Powe Junior Faculty Enhancement Awards	2021
MIT Technology Review, Innovators Under 35 (TR35) (China)	2020
Sony Faculty Innovation Award	2019
Clarivate Analytics Highly Cited Researchers	2019-2020
Top Ten World-Changing Ideas by Scientific American	2016
MRS Graduate Student Silver Award	2015
International Fulbright Science and Technology Award	2010
Studying Abroad Scholarship, by ROC Ministry of Education	2010
Outstanding College Youth, by China Youth Corps	2006
Tsinghua University Academic Exchange Scholarship	2005
The Academic Achievement Award	2004
Taiwan Semiconductor Manufacturing Company (TSMC) Scholarship	2004

## PATENTS

1. P.-C. Hsu, X. Li “A dual-mode device for energy saving of building” WO 2021/113332
2. P.-C. Hsu, H. Fang. “Radiative thermal managing device” US Provisional Patent Application 63/120,941

### *Before Duke*

3. **(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
4. **(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
5. **(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
6. 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
7. P.-C. Hsu, S. Wang, H. Wu, Y. Cui. “Transparent conducting electrodes comprising mesoscale metal wires” US 20150056435 A1

## TALKS & CONFERENCES

### *2021*

1. SPIE Optics + Photonics
2. CLEO 2021
3. **(Invited)** UCLA MSE, Department seminar
4. MRS Spring 2021
5. **(Invited)** NC State University, Textile Engineering, Department seminar
6. **(Invited)** UNC Chapel Hill, Applied Physical Sciences, Department seminar

### *2020*

7. **(Invited)** Project Tyra (Taiwanese Young Research Association)
8. **(Invited)** Triangle Hard Matter Workshop
9. **(Invited)** AAAS Science Facebook Live, 2020, “Cooling in a Warming World”
10. **(Invited)** MRS Fall 2020
11. IMECE 2020
12. **(Invited)** Techtexil North America 2020

### *Before Duke*

13. **(Invited)** “Light-Managing Textiles for Energy Efficiency and Thermal Comfort” *e-Wear Symposium*, Stanford, CA, USA
14. “Radiative Human Body Cooling by Nanoporous Polyethylene Textile” *Materials Research Society Spring Meeting 2017*, Phoenix, AZ, USA
15. “Personal Thermal Management by Metallic Nanowire-Coated Textile” *Materials Research Society Spring Meeting 2017*, Phoenix, AZ, USA
16. **(Invited)** “Light-Managing Nanomaterials for Energy Efficiency” *Stanford-Chalmers Workshop on Advancing Materials Innovatively 2016*, Stanford, USA
17. **(Invited)** “Metal Nanowire Transparent Electrodes” *International Conference on Materials for Advanced Technologies 2015*, Singapore
18. “Electrolessly Deposited Metal Electrospun Nanowire Transparent Electrodes” *Materials Research Society Spring Meeting 2015*, San Francisco, CA, USA
19. “Performance Enhancement of Metal Nanowire Transparent Conducting Electrodes by Mesoscale Metal Wires” *Materials Research Society Spring Meeting 2014*, San Francisco, CA, USA
20. **(Invited)** “High Performance Metal Nanowire Transparent Electrodes” *Stanford Photonics Research Center Symposium 2014*, Stanford, CA, USA
21. “Metal Nanowire Transparent Electrode” *Fulbright Science and Technology Capstone 2013*,

Washington, DC, USA

22. “High performance multiscale metal nanowire transparent electrode” *European Photovoltaic Solar Energy Conference 2013*, Paris, France
23. “Electrolessly deposited electrospun metal nanofiber transparent electrodes” *Materials Research Society Fall Meeting 2013*, Boston, MA, USA
24. “Metal Nanowire and Mesowire Network Transparent Electrodes” *Bay Area Photovoltaic Consortium 2013*, Berkeley, CA, USA