

## YAN YAO

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### (A) RESEARCH INTERESTS

My research group at the University of Houston is dedicated to designing novel functional materials to meet the growing demand for safe, low-cost, and high-energy battery technologies. I am primarily an experimentalist in collaboration with computational scientists to better understand the structure/composition of electrode and electrolyte-electrode interface. Following research directions are actively pursued in my group: (i) magnesium battery electrodes and electrolytes, (ii) long cycle life aqueous rechargeable batteries, and (iii) solid-state-electrolyte and all-solid-state batteries.

### (B) EDUCATION AND PROFESSIONAL TRAINING

- Postdoctoral Scholar, Stanford University, Stanford, USA, 2010-2012 (Advisor: Yi Cui)
- Ph.D. in Materials Science and Engineering, University of California, Los Angeles, USA, 2008 (Advisor: Yang Yang)
- M.S. in Materials Science, Fudan University, China, 2003
- B.S. in Materials Science, Fudan University, China, 2000

### (C) EMPLOYMENT HISTORY

- Associate Professor with tenure, Department of Electrical and Computer Engineering (effective 2017/9/1), University of Houston, Houston, TX, USA
- Assistant Professor of Electrical and Computer Engineering (2012-2017), University of Houston, Houston, TX, USA
- Joint Appointment in Texas Center for Superconductivity at the University of Houston (2012-Present), Houston, TX, USA
- Joint Appointment in Chemical and Biomolecular Engineering, University of Houston (2016-Present), Houston, TX, USA
- Postdoctoral Scholar (2010-2012), Stanford University, Stanford, CA, USA
- Senior Research Scientist (2008-2010), Polyera Corporation, Skokie, IL, USA
- Research & Teaching Assistant (2003-2008), University of California, Los Angeles, Los Angeles, CA, USA
- Research & Teaching Assistant (2000-2003), Fudan University, Shanghai, China

## **(D1) AWARDS AND ACADEMIC RECOGNITIONS**

- Scialog Fellow, Research Corporation for Science Advancement, USA, 2017
- Junior Faculty Research Excellence Award, Cullen College of Engineering, University of Houston, 2016
- Teaching Excellence Award, Cullen College of Engineering, University of Houston, 2016
- US ARPA-E 2015 OPEN, Co-Principal Investigator, Washington DC, USA, 2015
- US ARPA-E RANGE Award, Principal Investigator, Washington DC, USA, 2013
- US Navy Office of Naval Research Young Investigator Award, Arlington, USA, 2013
- Ralph E. Powe Junior Faculty Enhancement Award, Oak Ridge Ass. Univ., USA, 2013
- Robert A. Welch Endowed Professorship, TcSUH, 2012
- Excellence in Graduate Polymer Science Research, American Chemical Society, USA, 2008
- Chinese Government Award for Outstanding Students Abroad, China, 2007
- ICI Student Award Finalist in Applied Polymer Science, American Chemical Society, USA, 2007
- Dissertation Year Fellowship, UCLA, USA, 2007
- General Electric Scholarship, Fudan University, China, 2001
- Chun-Tsung Scholar, Chun-Tsung Endowment, 2000
- Outstanding Undergraduate Student Award, Shanghai Education Council, China, 2000

## **(D2) STUDENT AWARDS**

- Karun Kumar Rao (NASA Space Technology Research Fellowship) 2017
- Saman Gheyhani (First Prize in TcSUH 53rd Student Symposium) 2016
- Yifei Li (Best Dissertation Award of Materials Science and Engineering) 2016
- Fang Hao (Third Prize in TcSUH 52nd Student Symposium) 2016
- Raymond McCoy (Best Poster Award in REEMS REU Program) 2016
- Hui Dong (TcSUH Travel Award and Future Faculty Program) 2016
- Hui Dong (Third Prize in TcSUH 51st Student Symposium) 2016
- Yanliang Liang (Nano Research Poster Award) 2015
- Yifei Li (Urvish Medh award of the best overall presentation) 2014
- Yifei Li (Third Prize in TcSUH 47th Student Symposium) 2014

## **(E) RESEARCH FUNDING**

I have obtained **over \$3 million external federal funding** since I joined the University of Houston in 2012.

- **Advanced Research Project Agency – Energy, 2016-2019, co-PI: \$889,000**  
“Low-Cost, Safe, and Efficient All Solid State Sodium Batteries for Grid-scale Energy Storage and Other Applications”

Total project: \$3.2 million, PI: Steve Martin, Iowa State University.

- **National Science Foundation, 2014-2017, Single PI: \$353,297**  
“SusChEM: Design and Manufacture of Electrodes for High Energy Density Rechargeable Sodium Batteries”
  - **Office of Naval Research, 2013-2017, Single PI: \$660,000**  
“Developing Multivalent Ion Intercalation Batteries as High Energy and Safe Marine Distributed Power Sources”  
**ONR Young Investigator Award**, 16 awards out of 310 applications
  - **Advanced Research Project Agency – Energy, 2013-2015, PI: \$760,000**  
“Aqueous Lithium-Ion Batteries with High-Energy Novel Organic Anodes for Safe and Robust Energy Storage”  
Robust Affordable Next Generation Energy Storage Systems (RANGE) Program
  - **Advanced Research Project Agency – Energy, 2015, Single PI: \$200,000**  
“Aqueous Lithium-Ion Batteries with High-Energy Novel Organic Anodes for Safe and Robust Energy Storage”  
Robust Affordable Next Generation Energy Storage Systems (RANGE) Program Plus-up
  - **Office of Naval Research, 2015-2017, co-PI: \$121,500**  
“Physical Property Measurement System for Research on Advanced Materials for Energy and Electronic Applications”  
Total project: \$810,000, PI: Venkat Selvamanickam, UH
  - **Ralph E. Powe Junior Faculty Award, 2014, Single PI: \$5,000**  
“Understanding the High Efficiency Origin of Two-Dimensional Conjugated Polymer Based Solar Cells”
- Total internal funding of \$203,000:**
- TcSUH Core Funding Award (2016-2017) Single PI: **\$45,000**  
“Superionic All Solid State Na-ion Conductor”.
  - TcSUH Core Funding Award (2015-2016) Single PI: **\$25,000**  
“Achieving High Efficiency Perovskite Solar Cells through Understanding Intermediate Phase”.
  - TcSUH Core Funding Award (2013-2015) Single PI: **\$40,000**  
“Novel High-Energy Polymer Anodes for Safe and Robust Aqueous Lithium-Ion Batteries”.
  - TcSUH (2012-2015) Single PI: **\$90,000**  
“Robert A. Welch Foundation Professorship”
  - UH Small Grant (2013) Single PI: **\$3,000**

“Inverse-Opal Nanostructured Cathodes for High Energy Density Lithium-Air Batteries”

**(F) SYNERGISTIC ACTIVITIES**

- Editorial Board of *Scientific Reports*, a journal from Nature Publishing Group (2014-present).
- Treasure, Institute of Electrical and Electronics Engineers Magnetic Society and Nanotechnology Council Houston Chapter (2015- present).
- Faculty advisor of ECS Chapter at the University of Houston founded in Jun. 2016
- Proposal reviewer for National Science Foundation CBET (Energy for Sustainability, 2016.3), DMR (Ceramic, 2013.11), ECCS (EMPD, 2012.12 and 2013.1), ACS Petroleum Research Fund (2014.9, 2015.4, 2016.2), NASA EPSCoR proposal (2015.8), European Research Council proposal (2015.7), and AAAS Center proposal (2014.12).
- Journal reviewer for 20+ journals including ACS Nano, Advanced Energy Materials, Advanced Functional Materials, Advance Materials, Angewandte Chemie, Chemistry of Materials, Chemical Science, Energy and Environmental Science, Journal of Electrochemical Society, Nano Energy, Nano Letters, Nano Research, Nature Communications, Scientific Reports, Small, and Journal of Solid State Chemistry.
- Co-organizer of 2<sup>nd</sup> Organic battery days, Tianjin, China, June 2018.
- Co-organizer of Nature Conference on materials electrochemistry: fundamentals and applications, Shenzhen, China, Jan. 2018.
- Symposium Co-chair of European Materials Research Society (E-MRS) at Strasbourg, France, May 2017. Symposium: Frontiers in Electrochemical Energy Storage.
- Symposium Co-chair of 20<sup>th</sup> Topical Meeting of the International Society of Electrochemistry, Buenos Aires, Argentina, March 19-22 2017. Symposium: Advanced in lithium and hydrogen electrochemical systems for energy conversion and storage.
- Symposium Co-chair of International Materials Research Congress (IMRC) at Cancun, Mexico, 2016. Symposium B4: Materials and technologies for stationary electrochemical energy storage.
- Symposium Co-chair of 229th ECS meeting at San Diego, CA, 2016. Electrochemistry and batteries for safe and low-cost energy storage.
- Symposium Co-chair of 144th Minerals, Metals and Materials Society (TMS) Annual Meeting at Orlando, FL, 2015. Nanostructured materials for rechargeable batteries and for supercapacitors III.
- Symposium Chair of Fall MRS Meeting at Boston, MA, 2015. Materials and architectures for safe and low-cost electrochemical energy storage technologies.
- Symposium Co-chair of 248th ACS Meeting at San Francisco, CA, 2014. Batteries and fuel cell technologies: challenges and solutions.
- Member, ECE Faculty Search Committee, 2015 Fall
- Member, ECE Graduate Admission Committee, 2013-Present

- Developed a new course *Advanced Batteries* for graduate students, and redesigned *Introduction to Nanotechnology* with a lab session.
- Judge, Science and Engineering Fair of Houston for the Senior Engineering Students, 2016.
- Judge, I-SWEEP Energy Competition, 2014
- Judge, Science and Engineering Fair of Houston for the 9th Grade Engineering Students, 2013
- Hosted 10 undergraduate and 4 high school students summer research, 2013-2016.
- Hosted the laboratory tours for Lemelson-MIT InvenTeams program. Approximately 100 students and 20 teachers participated the tour on April 28, 2016.
- Hosted the laboratory tour for HCC REEMS scholars on April 29, 2016.
- Hosted the laboratory tour of Materials Day at UH on Feb. 26, 2016.

### (G) PUBLICATIONS

- Journal Publications: Total citations: **14,632**; H-index: **33**.
- Conference Proceedings: 4
- U.S. Patent/Patent Applications: 11
- Book chapter: 1

### (G1) SELECTED PUBLICATIONS

- Yanliang Liang, Yan Jing, Saman Gheytani, Kuan-Yi Lee, Ping Liu, Antonio Facchetti\*\*, Yan Yao\*\*, Universal quinone electrodes for long cycle life aqueous rechargeable batteries, *Nature Materials* 2017, DOI: 10.1038/nmat4919.
  - News report in ScienceDaily, DigitalJournal, RDMag, Spaceweekly and many others.
  - Highlighted in Science China Materials.
- Hyun Deog Yoo, Yanliang Liang, Hui Dong, Junhao Lin, Hua Wang, Yisheng Liu, Lu Ma, Tianpin Wu, Yifei Li, Qiang Ru, Yan Jing, Qinyou An, Wu Zhou, Jinghua Guo, Jun Lu, Sokrates T. Pantelides, Xiaofeng Qian & Yan Yao\*\*, Fast kinetics of magnesium monochloride cations in interlayer-expanded titanium disulfide for magnesium rechargeable batteries, *Nature Communications* 2017, in press.
- Yanliang Liang, Zhihua Chen, Yan Jing, Yaoguang Rong, Antonio Facchetti\*\*, Yan Yao\*\*, Heavily n-dopable  $\pi$ -conjugated redox polymers with ultrafast energy storage capability *Journal of American Chemical Society* 2015, 137, 4956-4959.
  - Featured as ACS Editors' Choice and JACS spotlight.
  - News report in ScienceDaily, EurekaAlert, Phys.org and many others.
- Yanliang Liang, Hyun Deog Yoo, Yifei Li, Jing Shuai, Hector A. Calderon, Francisco Carlos Robles Hernandez, Lars C. Grabow, Yan Yao\*\*, Interlayer-expanded molybdenum disulfide nanocomposites for electrochemical magnesium storage, *Nano Letters* 2015, 15, 2194-2202.
- Saman Gheytani, Yanlaing Liang, Yan Jing, Jeff Xu, Yan Yao\*\*, Chromate conversion coated aluminium as light-weight and corrosion-resistant current collector for aqueous lithium-ion batteries, *Journal of Materials Chemistry A* 2015, 4, 395-399.

-Featured as Inside Front Cover of *JMCA* and *Hot Article for 2015*.

- Yaoguang Rong, Swaminathan Venkatesan, Rui Guo, Yanan Wang, Jiming Bao, Wenzhi Li, Zhiyong Fan, **Yan Yao\*\***, Critical kinetic control of intermediate phase transformation for efficient perovskite solar cells, *Nanoscale*, **2016**, 8, 12892.

- Featured as Front Cover of *Nanoscale*.

- **Yan Yao**, Jie Yao, Vijay K Narasimhan, Zhichao Ruan, Chong Xie, Shanhui Fan, Yi Cui\*\*, Broadband light management using low-Q whispering gallery modes in spherical nanoshells. *Nature Communications* **2012**, 4, 664.

- Featured in *Nature* **2012**, **482**, **278**.

- News report in *Stanford News*, *Nanowerk*, and *SLAC News*.

- **Yan Yao**, Matthew T. McDowell, Ill Ryu, Hui Wu, Nian Liu, Liangbing Hu, William D. Nix, Yi Cui\*\*, Interconnected silicon hollow nanospheres for lithium-ion battery anodes with long cycle life. *Nano Letters* **2011**, 11, 2949–54.

- Cited **630 times**.

- **Yan Yao**, Jianhui Hou, Zheng Xu, Gang Li, Yang Yang\*\*, Effects of solvent mixtures on the nanoscale phase separation in polymer solar cells. *Advanced Functional Materials* **2008**, 18, 1783–1789.

- Cited **570 times**.

- Gang Li\*, **Yan Yao\***, Hoichang Yang, Vishal Shrotriya, Guanwen Yang, Yang Yang\*\*, “Solvent annealing” effect in polymer solar cells based on poly(3-hexylthiophene) and methanofullerenes. *Advanced Functional Materials* **2007**, 17, 1636–1644.

- Cited **1,000 times**. The most cited *Advanced Functional Materials* paper in **2010**.

**(G2) JOURNAL PUBLICATIONS (\*\* corresponding author, \* equal contribution, bold: student)**

**Submitted or under review**

1. **Pu Hu, Ye Zhang, Xiaowei Chi, Fang Hao, Yan Yao\*\***, Enhancing interfacial stability with polymer-sulfide composite electrolyte, *Nano Lett.* Submitted.
2. **Swaminathan Venkatesan**, Mehedi Hassan, Junyoung Kim, Nader R. Rady, Sandeep Sohal, Eric Neier, **Yan Yao\*\*** and Alexander Zakhidov\*\*, Tailoring the nucleation and grain growth by precursor phase ratio for efficient organic lead halide perovskite optoelectronic devices, *Adv. Funct. Mater.* submitted.

**2017**

3. Yanliang Liang, Yan Jing, Saman Gheyhani, Kuan-Yi Lee, Ping Liu, Antonio Facchetti\*\*, Yan Yao\*\*, Universal quinone electrodes for long cycle life aqueous rechargeable batteries,

*Nature Materials*, 2017, DOI: 10.1038/nmat4919.

4. Hyun Deog Yoo, Yanliang Liang, Hui Dong, Junhao Lin, Hua Wang, Yisheng Liu, Lu Ma, Tianpin Wu, Yifei Li, Qiang Ru, Yan Jing, Qinyou An, Wu Zhou, Jinghua Guo, Jun Lu, Sokrates T. Pantelides, Xiaofeng Qian & Yan Yao\*\*, Fast kinetics of magnesium monochloride cations in interlayer-expanded titanium disulfide for magnesium rechargeable batteries, *Nature Communications*, *in press*.
5. Yan Jing, Yanliang Liang, Saman Gheytani, and Yan Yao\*\*, Cross-conjugated oligomeric quinones for high performance organic batteries, *Nano Energy*, **2017**, 37, 46-52.
6. Swaminathan Venkatesan, Fang Hao, Junyoung Kim, Rui Guo, Yaoguang Rong, Zhuan Zhu, Wenzhi Li, Jiming Bao and Yan Yao\*\*, Moisture-driven phase transition for improved perovskite solar cells with reduced trap-state density, *Nano Research*, **2017**, 10, 1413-1422.
7. Yifei Li, Qinyou An, Yingwen Chen, Yanliang Liang, Yang Ren, Cheng-Jun Sun, Hui Dong, Zhongjia Tang, Guosheng Li\*\*, Yan Yao\*\*, A high-voltage rechargeable magnesium-sodium hybrid battery, *Nano Energy*, **2017**, 34, 188-194.
8. Yan Yao\*\*, Taming lithium metal through seeded growth, *National Science Review*, **2017**, 4, 17-18.
9. Xiaofang Wang, Pu Hu, Lanli Chen, Yan Yao, Qingyu Kong, Guanglei Cui, Siqi Shi, Liquan Chen, Insights into the mechanism of Na-ion intercalation into  $\text{NaV}_3(\text{PO}_4)_3$  anode for sodium-ion batteries, *J. Mater. Chem. A*. **2017**, 5, 3839-3847.

## 2016

10. Yingwen Chen\*, Hee Jung Chang\*, Hui Dong\*, Daiwon Choi, Vincent Sprenkle, Jun Liu, Yan Yao\*\*, Guosheng Li\*\*, Rechargeable magnesium-lithium hybrid batteries: status and challenges, *Journal of Materials Research* **2016**, 31, 3125-3141.
11. Zhuan Zhu, Viktor G. Hadjiev, Yaoguang Rong, Rui Guo, Bo Cao, Zhongjia Tang, Fan Qin, Yang Li, Yanan Wang, Fang Hao, Swaminathan Venkatesan, Wenzhi Li, Steven Baldelli, Arnold M. Guly, Hui Fang, Yandi Hu, Yan Yao, Zhiming Wang\*\* and Jiming Bao\*\*, Interaction of organic cation with water molecule in perovskite  $\text{MAPbI}_3$ : from dynamic orientational disorder to hydrogen bonding, *Chem Mater*. **2016**, 28, 7385-7393.
12. Zelang Jian\*, Yanliang Liang\*, Ismael A. Rodriguez Perez, Yan Yao\*\*, Xiulei Ji\*\*, Poly(anthraquinonyl sulfide) cathode for potassium-ion batteries. *Electrochemistry Communications* **2016**, 71, 5-8.
13. **Yifei Li, Xiaoxue Zhang**, Hao-Bo Li, **Hyun Deog Yoo, Qinyou An**, Jieyue Liu, Meng Yu, Weichao Wang\*\*, Yan Yao\*\*, Mixed-phase mullite electrocatalyst for pH-neutral oxygen reduction in magnesium-air batteries, *Nano Energy* **2016**, 27, 8-16.
14. **Hui Dong, Yifei Li, Yanliang Liang**, Guosheng Li, Yang Ren, Chenjun Sun, Yuhao Lu\*\*, Yan Yao\*\*, A stable high-voltage hybrid magnesium-sodium-ion battery with high operational voltage, *Chemical Communications* **2016**, 52, 8263-8266.
15. **Jing Shuai, Hyun Deog Yoo, Yanliang Liang, Yifei Li, Yan Yao\*\***, Lars Grabow\*\*,

Density functional study of Li, Na, and Mg intercalation and diffusion in MoS<sub>2</sub> with controlled interlayer spacing, *Materials Research Express* **2016**, 3, 64001.

16. **Hyun Deog Yoo, Yifei Li, Yanliang Liang**, Yucheng Lan, Feng Wang, and **Yan Yao\*\***, Intercalation pseudocapacitance of exfoliated molybdenum disulphide for ultrafast energy storage, *ChemNanoMat*, **2016**, 2, 688-691.
17. **Yifei Li, Dandan Wang, Qinyou An**, Bush Ren, **Yaoguang Rong, Yan Yao\*\***, Flexible cathode for long-life rechargeable sodium-ion batteries: effect of oxygen vacancy in MoO<sub>3</sub>, *Journal of Materials Chemistry A* **2016**, 4, 5402-5405.
18. **Yaoguang Rong, Swaminathan Venkatesan, Rui Guo**, Yanan Wang, Jiming Bao, Wenzhi Li, Zhiyong Fan, **Yan Yao\*\***, Critical kinetic control of intermediate phase transformation for efficient perovskite solar cells, *Nanoscale* **2016**, 8, 12892-12899.

## 2015

19. **Yanliang Liang**, Zhihua Chen, **Yan Jing, Yaoguang Rong**, Antonio Facchetti\*\*, and **Yan Yao\*\***, Heavily n-dopable  $\pi$ -conjugated redox polymers with ultrafast energy storage capability, *Journal of American Chemical Society* **2015**, 137, 4956-4959.
20. **Yanliang Liang\***, **Hyun Deog Yoo\***, **Yifei Li, Jing Shuai**, Hector A. Calderon, Francisco Carlos Robles Hernandez, Lars C. Grabow, and **Yan Yao\*\***, Interlayer-expanded molybdenum disulfide nanocomposites for electrochemical magnesium storage, *Nano Letters* **2015**, 15, 2194-2202.
21. **Hyun Deog Yoo, Yanliang Liang, Yifei Li**, and **Yan Yao\*\***, High areal capacity hybrid magnesium–lithium-ion battery with 99.9% Coulombic efficiency for large-scale energy storage, *ACS Applied. Materials & Interfaces* **2015**, 7, 7001-7007.
22. **Qinyou An**, Fangyu Xiong, Qiulong Wei, Jinzhi Sheng, Liang He, Dongling Ma, **Yan Yao\*\***, and Liqiang Mai\*\*, Nanoflake-assembled hierarchical Na<sub>3</sub>V<sub>2</sub>(PO<sub>4</sub>)<sub>3</sub>/C microflowers: superior Li storage performance and insertion/extraction mechanism, *Advanced Energy Material* **2015**, 1401963.
23. **Qinyou An, Yifei Li, Hyun Deog Yoo**, Shuo Chen, Qiang Ru, Liqiang Mai\*\*, and **Yan Yao\*\***, Graphene decorated vanadium oxide nanowire aerogel for long-cycle-life magnesium battery cathodes, *Nano Energy* **2015**, 18, 265-272.
24. **Saman Gheytni, Yanlaing Liang, Yan Jing**, Jeff Xu, and **Yan Yao\*\***, Chromate conversion coated aluminium as light-weight and corrosion-resistant current collector for aqueous lithium-ion batteries, *Journal of Materials Chemistry A* **2015**, 4, 395-399.
25. **Yaoguang Rong**, Zhongjia Tang, Yufeng Zhao, Xin Zhong, **Swaminathan Venkatesan, Harrison Graham, Matthew Patton, Yan Jing**, Arnold M. Guloy\*\* and **Yan Yao\*\***, Solvent engineering towards controlled grain growth in perovskite planar heterojunction solar cells, *Nanoscale* **2015**, 7, 10595-10599.
26. **Yifei Li, Yanliang Liang**, Francisco C. Robles Hernandez, **Hyun Deog Yoo, Qinyou An, Yan Yao\*\***, Enhancing sodium-ion battery performance with interlayer-expanded MoS<sub>2</sub>–PEO nanocomposites, *Nano Energy* **2015**, 15, 453-461.



27. Jingjing Fan, **Yifei Li**, Hang N. Nguyen, **Yan Yao\*\***, and Debora F. Rodrigues\*\*, Toxicity of exfoliated-MoS<sub>2</sub> and annealed exfoliated-MoS<sub>2</sub> towards planktonic cells, biofilms, and mammalian cells in the presence of electron donor, *Environmental Science: Nano* **2015**, *2*, 370-379.
28. Mohammad M. Tavakoli, Leilei Gu, Yuan Gao, Claas Reckmeier, Jin He, Andrey L. Rogach, **Yan Yao**, Zhiyong Fan\*\*, Fabrication of efficient planar perovskite solar cells using a one-step chemical vapor deposition method, *Scientific Reports* **2015**, *5*, 14083.
29. Mohammad M. Takvakoli, Kwong-Hoi Tsui, Qianpeng Zhang, Jin He, **Yan Yao**, Dongdong Li, Zhiyong Fan\*\*, Highly efficient flexible perovskite solar cells with antireflection and self-cleaning nanostructures, *ACS Nano* **2015**, *9*, 10287-10295.
30. **Zelang Jian**, Mingbo Zheng, **Yanliang Liang**, **Xiaoxue Zhang**, **Saman Gheytni**, Yucheng Lan, Yi Shi, **Yan Yao\*\***, Li<sub>3</sub>VO<sub>4</sub> Anchored Graphene Nanosheets for Long-Life and High-Rate Lithium-Ion Batteries, *Chemical Communications* **2015**, *51*, 229-231.
31. Dan Sun, Yifan Jiang, Haiyan Wang\*\*, **Yan Yao**, Guoqing Xu, Kejian He, Suqin Liu, Yougen Tang, Younian Liu, Xiaobing Huang, Advanced aqueous rechargeable lithium battery using nanoparticulate LiTi<sub>2</sub>(PO<sub>4</sub>)<sub>3</sub>/C as a superior anode, *Scientific Reports* **2015**, *5*, 10733.

## 2014

32. **Zelang Jian**, Wenze Han, **Yanliang Liang**, Yucheng Lan, Zheng Fang, Yongsheng Hu, **Yan Yao\*\***, Carbon-Coated Rhombohedral Li<sub>3</sub>V<sub>2</sub>(PO<sub>4</sub>)<sub>3</sub> as Novel Electrode Materials for Lithium-Ion Batteries: Electrochemical Performance and Storage Mechanism, *Journal of Material Chemistry A* **2014**, *2*, 20231-20236.
33. Jiabo Zeng, Fusheng Zhao, Ji Qi, **Yifei Li**, Chien-Hung Li, **Yan Yao**, T. Randall Lee, and Wei-Chuan Shih\*\*, Internal and external morphology-dependent plasmonic resonance in monolithic nanoporous gold nanoparticles, *RSC Advances* **2014**, *4*, 36682-36688.
34. Qingfeng Lin, Hongtao Huang, **Yan Jing**, Huiying Fu, Paichun Chang, Dongdong Li \*\* **Yan Yao\*\***, and Zhiyong Fan\*\*, Flexible photovoltaic technologies, *Journal of Materials Chemistry C* **2014**, *2*, 1233-1247.

## 2013

35. Shaofeng Lu, Martin Drees, **Yan Yao**, Damien Boudinet, He Yan, Hualong Pan, Jingqi Wang, Yuning Li, Hakan Usta, and Antonio Facchetti\*\*, 3,6-Dithiophen-2-yl-diketopyrrolo[3,2-b]pyrrole (isoDPPT) as an acceptor building block for organic optoelectronics, *Macromolecules* **2013**, *46*, 3895–3906.

### Journal Publications before joining the University of Houston (before 2012)

36. Dong Liang; Yijie Hui, Yangsen Kang, Ken Xingze Wang, Angjia Gu, Meiyueh Tan, Zongfu Yu, Shuang Li,, Jieyang Jia, Xinyu Bao , Shuang Wang, **Yan Yao**, H.-S. Philip Wong , Shanhui Fan , Yi Cui \*\*, and James S. Harris, Optical Absorption Enhancement: Optical

- Absorption Enhancement in Freestanding GaAs Thin Film Nanopyramid Arrays, *Advanced Energy Material* **2012**, 2, 1154-1260.
37. **Yan Yao\***, Jie Yao\*, Vijay Kris Narasimhan, Zhichao Ruan, Chong Xie.; Shanhui Fan, Yi Cui\*\*, Broadband light management using low-Q whispering gallery modes in spherical nanoshells. *Nature Communications* **2012**, 4, 664.
  38. Hui Wu\*, Gerentt Chan\*, Jang Wook Choi, Ill Ryu, **Yan Yao**, Matthew T. McDowell, Lee, Seok Woo Lee, Ariel Jackson, Yuan Yang, Liangbing Hu, and Yi Cui\*\*, Stable cycling of double-walled silicon nanotube battery anodes through solid-electrolyte interphase control. *Nature Nanotechnology* **2012**, 7, 310–315.
  39. **Yan Yao**, Nian Liu, Matthew T. McDowell, Mauro Pasta, and Yi Cui\*\*, Improving the cycling stability of silicon nanowire anodes with conducting polymer coatings. *Energy & Environmental Science* **2012**, 5, 7927–7930.
  40. Nian Liu, Hui Wu, Matthew T. McDowell, **Yan Yao**, Chongmin Wang, and Yi Cui\*\*, A Yolk-shell design for stabilized and scalable Li-Ion battery alloy anodes. *Nano Letters* **2012**, 12, 3315–3321.
  41. Nian Liu, **Yan Yao**, Judy J. Cha, Matthew T. McDowell, Yu Han, and Yi Cui\*\*, Functionalization of silicon nanowire surfaces with metal-organic frameworks. *Nano Research* **2012**, 5, 109–116.
  42. **Yan Yao**, Matthew T. McDowell, Ill Ryu, Hui Wu, Nian Liu, Liangbing Hu, William D. Nix, and Yi Cui\*\*, Interconnected silicon hollow nanospheres for lithium-ion battery anodes with long cycle life. *Nano Letters* **2011**, 11, 2949–54.
  43. **Yan Yao\***, Kaifu Huo\*, Liangbing Hu, Nian Liu, Judy J. Cha, Matthew T. McDowell, Paul K. Chu, and Yi Cui\*\*, Highly conductive, mechanically robust, and electrochemically inactive TiC/C nanofiber scaffold for high-performance silicon anode batteries. *ACS Nano* **2011**, 5, 8346–8351.
  44. Nam-Soon Choi, **Yan Yao**, Yi Cui\*\* and Jaephil Cho\*\*, One dimensional Si/Sn-based nanowires and nanotubes for lithium-ion energy storage materials. *Journal of Materials Chemistry* **2011**, 21, 9825.
  45. Yuan Yang, Guihua Yu, Judy J. Cha, Hui Wu, Michael Vosgueritchian, **Yan Yao**, Zhenan Bao\*\*, and Yi Cui\*\*, Improving the performance of lithium-sulfur batteries by conductive polymer coating. *ACS Nano* **2011**, 5, 9187–9193.
  46. Hui Wu, Liangbing Hu, Thomas Carny, Zhichao Ruan, Desheng Kong, Zongfu Yu, **Yan Yao**, Judy J. Cha, Jia Zhu, Shanhui Fan, Yi Cui\*\*, Low reflectivity and high flexibility of tin-doped indium oxide nanofiber transparent electrodes. *Journal of the American Chemical Society* **2011**, 133, 27-29.
  47. Liangbing Hu, Wei Chen, Xing Xie, Nian Liu, Yuan Yang, Hui Wu, **Yan Yao**, Mauro Pasta, Husam N. Alshareef, and Yi Cui\*\*, Symmetrical MnO<sub>2</sub>-carbon nanotube-textile nanostructures for wearable pseudocapacitors with high mass loading. *ACS Nano* **2011**, 5, 8904–8913.
  48. Diego Bagnis, Luca Beverina, Hui Huang, Fabio Silvestri, **Yan Yao**, He Yan, Giorgio A. Pagani\*\*, Tobin J. Marks\*\*, and Antonio Facchetti\*\*, Marked alkyl-vsalkenyl-substituent

- effects on squaraine dye solid-state structure, carrier mobility, and bulk-heterojunction solar cell efficiency. *Journal of the American Chemical Society* **2010**, *132*, 4074–4075.
49. Leila Motiei, **Yan Yao**, Joyanta Choudhury He Yan, Tobin J. Marks\*\*, Milko E. van der Boom\*\* and Antonio Facchetti\*\*, Self-propagating molecular assemblies as interlayers for efficient inverted bulk-heterojunction solar cells. *Journal of the American Chemical Society* **2010**, *132*, 12528–12530.
  50. **Yan Yao**, Jianhui Hou, Zheng Xu, Gang Li, and Yang Yang\*\*, Effects of solvent mixtures on the nanoscale phase separation in polymer solar cells. *Advanced Functional Materials* **2008**, *18*, 1783–1789.
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  54. **Yan Yao\***, Yongye Liang\*, Vishal Shrotriya, Shengqiang Xiao, Luping Yu\*\*, and Yang Yang\*\*, Plastic near-infrared photodetectors utilizing low band gap polymer. *Advanced Materials* **2007**, *19*, 3979–3983.
  55. Gang Li\*, **Yan Yao\***, Hoichang Yang, Vishal Shrotriya, Guanwen Yang, and Yang Yang\*\*, “Solvent annealing” effect in polymer solar cells based on poly(3-hexylthiophene) and methanofullerenes. *Advanced Functional Materials* **2007**, *17*, 1636–1644.
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  57. Gang Li, Vishal Shrotriya, **Yan Yao**, Jinsong Huang, and Yang Yang\*\*, Manipulating regioregularpoly(3-hexylthiophene): [6,6]-phenyl-C61-butyric acid methyl ester blends—route towards high efficiency polymer solar cells. *Journal of Materials Chemistry* **2007**, *17*, 3126.
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  59. **Yan Yao**, Chenjun Shi, Gang Li, Vishal Shrotriya, Qibing Pei, and Yang Yang\*\*, Effects of C[<sub>70</sub>] derivative in low band gap polymer photovoltaic devices: Spectral complementation and morphology optimization. *Applied Physics Letters* **2006**, *89*, 153507.
  60. Vishal Shrotriya, Gang Li, **Yan Yao**, Tom Moriarty, Keith Emery\*\*, and Yang Yang\*\*, Accurate measurement and characterization of organic solar cells. *Advanced Functional Materials* **2006**, *16*, 2016–2023.

61. Vishal Shrotriya, Gang Li, **Yan Yao**, Chih-Wei Chu, and Yang Yang\*\*, Transition metal oxides as the buffer layer for polymer photovoltaic cells. *Applied Physics Letters* **2006**, *88*, 073508.
62. Vishal Shrotriya, Elbert Hsing-En Wu, Gang Li, **Yan Yao**, and Yang Yang\*\*, Efficient light harvesting in multiple-device stacked structure for polymer solar cells. *Applied Physics Letters* **2006**, *88*, 064104.
63. Vishal Shrotriya, **Yan Yao**, Gang Li, and Yang Yang\*\*, Effect of self-organization in polymer/fullerene bulk heterojunctions on solar cell performance. *Applied Physics Letters* **2006**, *89*, 063505.
64. Gang Li, Vishal Shrotriya, Jinsong Huang, **Yan Yao**, Tom Moriarty, Keith Emery, Yang Yang\*\*, High-efficiency solution processable polymer photovoltaic cells by self-organization of polymer blends. *Nature Materials* **2005**, *4*, 864–868.
65. Gang Li, Vishal Shrotriya, **Yan Yao**, and Yang Yang\*\*, Investigation of annealing effects and film thickness dependence of polymer solar cells based on poly(3-hexylthiophene). *Journal of Applied Physics* **2005**, *98*, 043704.
66. Zhiyong Fan, Xiaoliang Mo, Chengfei Lou, **Yan Yao**, Dawei Wang, Guorong Chen, and Jia G. Lu\*\*, Structures and electrical properties of Ag-tetracyanoquinodimethane organometallic nanowires. *IEEE Transactions on Nanotechnology* **2005**, *4*, 238–241.

### **(G3) CONFERENCE PROCEEDINGS**

1. Dongjuan Xi, Chenjun Shi, **Yan Yao**, Yang Yang\*\*, Nanostructured polymer solar cells. *IEEE Internatinal Reliability Physics Symposium* **2008**, 178-180. DOI: 10.1109/RELPHY.2008.4558881.
2. **Yan Yao**, Chenjun Shi, Qibing Pei, Yang Yang\*\*, Effect of side-chains on low band gap polymer photovoltaic devices. *Proc. SPIE Organic Photovoltaics VII* **2006**, 6334, 633415. DOI: 10.1117/12.683077.
3. Vishal Shrotriya, Gang Li, **Yan Yao**, Yang Yang\*\*, Tandem stacking structure for polymer solar cells by using semi-transparent electrodes. *Proc. SPIE Organic Photovoltaics VII* **2006**, 6334, 633416. DOI: 10.1117/12.683159.
4. Zhiyong Fan, Dawei Wang, Jia G. Lu, Xiaoliang Mo, **Yan Yao**, Guorong Chen\*\*, Silver-tetracyanoquinodimethane (Ag-TCNQ) nanostructures and nanodevice. *IEEE Nano* **2003**, *2*, 588-591. DOI: 10.1109/NANO.2003.1230979.

### **(G4) PATENTS AND PENDING APPLICATIONS**

1. US Patent 8,748,739, Conjugated polymers and their use in optoelectronic devices, issued on 6/10/2014
2. US Patent 8,598,450, Conjugated polymers and their use in optoelectronic devices, issued on 12/3/2013
3. US Patent 8,598,449, Conjugated polymers and their use in optoelectronic devices, issued on 12/3/2013

4. US Patent 8,598,448, Pyrrolo[3,2-b]pyrrole semiconducting compounds and devices incorporating same, issued on 12/3/2013.
5. US Patent 8,334,456, Conjugated polymers and their use in optoelectronic devices, issued on 12/18/2012.
6. Yan Yao, Yanliang Liang, Non-lithium metal ion battery electrode materials architecture, US Application 2014/037502.
7. Yan Yao, Yanliang Liang, Aqueous energy storage devices with organic electrode materials, US Application 2014/033652.
8. Yan Yao, Yanliang Liang, Rechargeable alkaline battery using organic materials as a negative Electrode, US Application 2016/0049659.
9. Yan Yao, Yanliang Liang, Saman Gheyhani, Yan Jing, Lead-acid batteries with fast charge acceptance, US Application US2016/033575.
10. Yan Yao, Hyun Deog Yoo, Method of activating two-dimensional materials for multivalent/polyatomic-ion intercalation battery electrodes, US Application US2016/038311.
11. Yan Yao, Yanliang Liang, High ionic conductivity rechargeable solid state batteries with an organic electrode, US2017/22025.

#### **(G5) BOOKS AND BOOK CHAPTERS**

1. Yang Yang, Yan Yao, Gang Li, Routes toward Efficient Polymer Solar Cells, Chapter 11 in Organic Electronics: Materials, Physics, Processing and Device Applications, CRC Press, Boca Raton, Florida, 2010, 319-358. Edited by Franky So.

#### **(H) PRESENTATIONS AND INVITED TALKS**

##### **(H1) CONFERENCE PRESENTATIONS**

1. (Invited talk) “Development of two-dimensional materials and quinones for rechargeable magnesium batteries”, Beyond Lithium Ion-X Symposium on Energy Storage, IBM, Almaden, CA 6/27-29/2017
2. (Invited talk) “Design quinone electrodes for proton and metal ion storage with long cycle life”, 3<sup>rd</sup> International Symposium on Energy Conversion and Storage, Nanjing University, Nanjing, China 6/24-25/2017
3. (Invited talk) “Design quinone electrodes for proton and metal ion storage with long cycle life”, Organic Battery Days, Uppsala, Sweden 6/8-10/2017
4. (Invited talk) “Transforming two-dimensional materials for high capacity rechargeable magnesium batteries”, Symposium *H03 Properties and Applications of 2-Dimensional Layered Materials*, ECS Meeting, New Orleans, LA 5/2017
5. (Invited talk) “High Performance Magnesium Rechargeable Batteries”, Symposium ES3 *Materials for Multivalent Electrochemical Energy Storage*, MRS Spring Meeting, Phoenix, AZ 4/17-21/2017
6. (Invited talk) “Organic Redox Materials for Stationary Energy Storage”, Symposium BM7 *Functional Nanostructured Polymers for Emerging Energy Technologies*, MRS Fall Meeting, Boston, 12/2016
7. (Invited talk) “A High Performance Magnesium Rechargeable Battery Enabled by a MgCl-ion Storage Mechanism”, Symposium ES1 *Materials Science and Chemistry for Grid-Scale*

- Energy Storage*, MRS Fall Meeting, Boston, 12/2016
8. (Invited talk) “Transforming two-dimensional materials for high capacity rechargeable magnesium batteries”, Symposium *Organic Inorganic Hybrid Materials*, 2016 Southwest Regional Meeting, Galveston, TX 11/2016
  9. (Invited talk) “Redox-active organic materials for sustainable energy storage”, Symposium *Colloidal & Surface Phenomena*, 2016 Southwest Regional Meeting, Galveston, TX 11/2016
  10. (Invited talk) “Research progress of rechargeable magnesium batteries”, 11<sup>th</sup> International Forum on Li battery technology and industrial development, Hefei, Anhui, 10/2016
  11. (Invited talk) “Designing Two-Dimensional Materials and Conjugated Redox Polymers for Safe and Low-Cost Energy Storage” Energy & Sustainable Materials Symposium at the University of Oregon, 9/2016
  12. (Invited talk) “Critical kinetic control of non-stoichiometric intermediate phase transformation for efficient perovskite solar cells”, Symposium B7 *Solar Fuels/Artificial Photosynthesis: Materials and Devices*, XXV International Materials Research Congress, Cancun, Mexico, 8/14-19/2016
  13. (Invited talk) “Rational Nanostructured Cathode Design for Rechargeable Magnesium Batteries”, Symposium B3 *Materials and Technologies for Energy Conversion, Saving and Storage (MATECSS)*, XXV International Materials Research Congress, Cancun, Mexico, 8/14-19/2016
  14. (Invited talk) “Designing Two-Dimensional Materials and Conjugated Redox Polymers for Safe and Low-Cost Energy Storage”, *Chinese Chemical Society Annual Conference*, Dalian, China, 7/1-4/2016.
  15. (Invited talk) “Organic Redox Materials for Stationary Energy Storage”, *International Conference of Synthetic Metal 2016*, Guangzhou, China, 6/26-30/2016
  16. (Invited talk) “Organic Redox Materials for Stationary Energy Storage”, *11<sup>th</sup> US-China Nano Forum*, Nanjing, China, 6/18-20/2016
  17. (Invited talk) “Transforming Two-dimensional Transition Metal Chalcogenides for High Capacity Rechargeable Magnesium Batteries”, *Nature Conference on Materials for Energy 2016*, Wuhan, China, 6/11-14/2016
  18. (Invited Panelist) *2016 US China Innovation and Investment Summit*, Houston, TX, 5/17/2016.
  19. (Talk) “Two-Dimensional Layered Materials with Expanded Interlayer Distance for Rechargeable Magnesium Batteries”, Symposium A5 *Electrochemistry and Batteries for Safe and Low-cost Energy Storage*, ECS Meeting, San Diego, 6/1/2016.
  20. (Poster) “Low-Cost Organic Redox Materials for Safe Energy Storage”, Symposium A5 *Electrochemistry and Batteries for Safe and Low-cost Energy Storage*, ECS Meeting, San Diego, 6/1/2016.
  21. (Invited talk) “Heavily n-Dopable  $\pi$ -Conjugated Redox Polymers for Ultrafast Energy Storage”, Symposium *ACS Award for Creative Invention: Symposium in honor of Antonio Facchetti*, ACS Meeting, San Diego, 3/14/2016
  22. (Invited talk) “Rational Nanostructure Design for High Performance Mg Rechargeable Batteries”, *Interplay of Structure & Transport Properties in Materials for Energy Applications*, ACS Meeting, San Diego, 3/16/2016
  23. (Talk) “Heavily n-Dopable  $\pi$ -Conjugated Redox Polymers with Ultrafast Energy Storage Capability”, MRS Meeting, Boston, MA, 12/2/2015
  24. (Poster) “Rational Nanostructure Design for Efficient Mg Rechargeable Batteries”, *10<sup>th</sup> Sino-*

- US Nano Forum, Wuhan, China, 6/26/2015.*
25. (Invited talk) “Modification of Magnesium Ion Cathode and Electrolyte for Mg Rechargeable Batteries”, *TMS Meeting*, Orlando, FL, USA, 3/16/2015.
  26. (Talk) “Tailoring Lithium-intercalation Host Structure for Rechargeable Magnesium Ion Cathodes”, *ACS Meeting*, San Francisco, CA, USA, 8/12/2014.
  27. (Talk) “Modification of Magnesium Ion Cathode and Electrolyte for Mg Rechargeable Batteries”, *ECS Meeting*, Orlando, FL, USA 5/15/2014.
  28. (Invited Talk) “Atomic-Level Manipulation of Magnesium Ion Intercalation Materials for High-Density Energy Storage”, *2014 Electrochemical Conference on Energy & Environment*, Shanghai, China, 3/13/2014.
  29. (Invited Talk) “Nanostructure Engineering of Layered Metal Chalcogenides for Magnesium Battery Cathode”, *TMS Meeting*, San Diego, CA, USA, 2/20/2014.
  30. (Invited Talk) “High Energy Density Silicon Anodes for Lithium-ion Batteries: Combining Hollow Nanospheres with Conductive Polymer Binder”, *245th ACS National Meeting, Division of Energy and Fuels*, New Orleans, LA, 4/7-11/2013.
  31. (Invited Talk) “Nanostructure Design for Efficient Energy Devices”, *Workshop on Materials Science and Materials Chemistry for Energy*, Beijing, China, 9/16-18/2012.
  32. (Invited Lecture) “Nanostructured Materials and Devices for Energy Harvesting and Storage”, *Master Class Lecture in Printed Electronics USA*, San Jose, CA, 12/2011.
  33. (Talk) “Resonating Enhanced Optical Absorption in Si Hollow Nanospheres Solar Cells”, *MRS meeting*, San Francisco, CA, 4/2011.
  34. (Talk) “Hollow Silicon Nanospheres for Highly Reversible and Long Cycle Life Lithium Ion Battery Anodes”, *MRS meeting*, San Francisco, CA, 4/2011.
  35. (Talk) “Self-Organization of Polymer Chains in Efficient Polymer Solar Cells”, *Symposium of Excellence in Polymer Graduate Research, ACS*, New Orleans, LA, 4/2008.
  36. (Invited talk) “Plastic Bulk-Heterojunction Solar Cells and Near-Infrared Photodetectors”, *AVS*, Seattle, WA, 10/2007.
  37. (Talk) “Plastic Near-Infrared Photodetectors Utilizing Low Band Gap Polymer”, *ICI student award symposium, ACS meeting*, Boston, MA, 8/2007.

## **(H2) UNIVERSITY COLLOQUIUMS**

1. “Two-Dimensional Materials and Organic Redox Materials for Mg Rechargeable Batteries”, School of Materials Science and Engineering, Nanjing University of Posts and Telecomm, 6/26/2017
2. “Two-Dimensional Materials and Organic Redox Materials for Mg Rechargeable Batteries”, School of Energy, Beijing University of Chemical Technology, 6/21/2017
3. “Designing Two-Dimensional Materials and Conjugated Redox Polymers for Safe and Low-Cost Energy Storage”, School of Materials Science and Engineering, South University of Science and Technology, 1/6/2017
4. “Designing Two-Dimensional Materials and Conjugated Redox Polymers for Safe and Low-Cost Energy Storage”, School of Chemical Engineering, Nantong University, 12/30/2016
5. “Designing Two-Dimensional Materials and Conjugated Redox Polymers for Safe and Low-Cost Energy Storage”, Department of Chemical Engineering and Material Science, Michigan State University, 10/27/2016
6. “Two-Dimensional Materials and Redox-Active Organic Materials for Sustainable Stationary Energy Storage”, School of Materials Science and Engineering, Tsinghua University, Beijing,

- China, 7/7/2016
7. “Two-Dimensional Materials and Redox-Active Organic Materials for Sustainable Stationary Energy Storage”, Institute of Applied Chemistry and Engineering, Nankai University, Tianjing, China, 7/5/2016
  8. “Two-Dimensional Materials and Redox-Active Organic Materials for Sustainable Stationary Energy Storage”, Institute of Fundamental and Frontier Sciences, University of Electronic Science and Technology of China, Chengdu, China, 6/23/2016
  9. “Two-Dimensional Materials and Redox-Active Organic Materials for Sustainable Stationary Energy Storage”, School of Materials Science and Engineering, Nanjing University of Science and Technology, Nanjing, China, 6/20/2016
  10. “Designing Two-Dimensional Materials and Conjugated Redox Polymers for Safe and Low-Cost Energy Storage”, Department of Chemical and Biochemical Engineering, University of Houston, Houston, TX 4/29/2016
  11. “Designing Two-Dimensional Materials and Conjugated Redox Polymers for Safe and Low-Cost Energy Storage”, Department of Electrical and Computer Engineering, Texas Tech University, Lubbock, TX, 4/1/2016
  12. “Designing Two-Dimensional Materials and Conjugated Redox Polymers for Safe and Low-Cost Energy Storage”, Department of Materials and NanoEngineering, Rice University, Houston, TX, 3/24/2016
  13. “Low-Cost and Safe Magnesium Batteries”, Tianqi Lithium Industries Co., Sichuan, China 7/6/2015.
  14. “Interlayer-Expanded Molybdenum Disulfide Nanocomposites for Electrochemical Magnesium Storage”, Florida International University, Miami, FL 3/21/2015
  15. “Advanced Aqueous Lithium Ion Batteries using Organic Materials”, ARPA-E RANGE Review Meeting, Tempe, AZ, 1/28/2015.
  16. “Modification of Magnesium Ion Cathode and Electrolyte for Mg Rechargeable Batteries”, Department of Sustainable Energy Technologies, Brookhaven National Laboratory, Upton, NY 6/13/2014
  17. “Recent Development of Magnesium Rechargeable Batteries”, School of Materials Science and Engineering, Wuhan Institute of Technology, Wuhan, China 3/10/2014
  18. “Advanced Aqueous Lithium Ion Batteries using Organic Materials”, ARPA-E RANGE Kick-off Meeting, Kennedy Space Center, Cape Canaveral, FL, 1/28/2014.
  19. “Rational Nanostructure Design for High Energy Density Batteries”, South University of Science and Technology of China, Shenzhen, China 12/13/2013.
  20. “Rational Nanostructure Design for High Energy Density Batteries”, Department of Electrical Engineering, Tsinghua University, Beijing, China 9/17/2013.
  21. “Rational Nanostructure Design for High Energy Density Batteries”, Department of Environmental Engineering, University of Shanghai for Science and Technology, Shanghai, China, 9/10/2013.
  22. “Nanostructure Design for Efficient Energy Devices”, Schlumberger Sugar Land Technology Center, Sugar Land, TX, 5/9/2013.
  23. “Nanostructure Design for Efficient Energy Devices”, Southwest Research Institute, San Antonio, TX, 3/13/2013.
  24. “Rational Nanostructure Design for High Energy Density Batteries”, Baylor College of Medicine, Houston, TX 3/4/2013.
  25. “Rational Nanostructure Design for High Energy Density Batteries”, Department of



- Mechanical Engineering, University of Houston, Houston, TX, USA, 1/17/2013.
26. "Rational Nanostructure Design for High Energy Density Batteries", School of Materials Science and Engineering, Beijing University of Technology, Beijing, China 9/19/2012.
  27. "Nanostructure Design for Efficient Energy Devices", Department of Mechanical Engineering, Yale University, New Haven, CT 5/2/2012.
  28. "Nanostructure Design for Efficient Energy Devices", Department of Materials Science and Engineering, University of Virginia, Charlottesville, VA 4/30/2012.
  29. "Nanostructure Design for Efficient Energy Devices", College of Engineering, Dartmouth College, Hanover, NH 4/26/2012.
  30. "Nanostructure Design for Efficient Energy Devices", Department of Mechanical Engineering, University of Washington, Seattle, WA 4/16/2012.
  31. "Nanostructure Design for Efficient Energy Devices", Department of Materials Science and Engineering, University of Wisconsin Madison, Madison, WI 4/5/2012.
  32. "Nanostructure Design for Efficient Energy Devices", Department of Electrical and Computer Engineering, University of Houston, Houston, TX 4/2/2012.
  33. "Nanostructure Design for Efficient Energy Devices", Department of Mechanical and Automation Engineering, Chinese University of Hong Kong, HK SAR, China 3/27/2012.
  34. "Nanostructure Design for Efficient Energy Devices", Suzhou Institute of Nanotechnology, Suzhou, China 3/23/2012.
  35. "Nanostructure Design for Efficient Energy Devices", School of Engineering, Nanjing University, Nanjing, China 3/21/2012.
  36. "Nanostructure Design for Efficient Energy Devices", Frontier Institute of Science and Technology, Xi'an Jiaotong University, Xi'an, China 3/19/2012.
  37. "Nanostructure Design for Efficient Energy Devices", Department of Mechanical Engineering, EPFL, Lausanne, Switzerland 3/8/2012.
  38. "Nanostructure Design for Efficient Energy Devices", Department of Mechanical Engineering, Johns Hopkins University, Baltimore, MD 2/16/2012.
  39. "Nanostructure Design for Efficient Energy Devices", Institute of Materials Research and Engineering, Singapore, 2/3/2012.
  40. "Nanostructure Design for Efficient Energy Devices", Nanyang Technology University, Singapore, 2/1/2012.
  41. "Nanostructure Design for Efficient Energy Devices", Department of Mechanical Engineering, University of Texas San Antonio, San Antonio, TX 1/26/2012.
  42. "Nanostructure Design for Efficient Energy Devices", Department of Materials Science and Engineering, Drexel University, Philadelphia, PA 12/13/2011.
  43. "Nanostructured Energy Devices: Polymer Solar Cells and Lithium Ion Batteries", Institute of Chemistry of Chinese Academy of Sciences, China, 9/2011.
  44. "Nanostructured Energy Devices: Polymer Solar Cells and Lithium Ion Batteries", Department of Materials Science, Fudan University, Shanghai, China, 9/2011.

## **(I) STUDENT SUPERVISION**

### **Graduate and postdoctoral mentoring (\*\* MINORITY or FEMALE)**

Current Students (Current total: 12)

1. Dr. Yanliang Liang, Research Associate, 2012.11-present.
2. Dr. Xiaowei Chi, Postdoc, 2016.3- present.

3. Yan Jing, PhD student, 2013.1- present. Dissertation: Carbonyl-based polymer materials for aqueous rechargeable batteries.
4. Saman Gheytni, PhD student, 2013.8-present. Dissertation: Long cycle life aqueous batteries.
5. Fang Hao, PhD student, 2015.8-present.
6. Hui Dong, PhD student, 2015.8-present.
7. Ye Zhang, PhD student, 2016.8-present.
8. Karun Kumar Rao, PhD student, 2017.1-present.
9. Ziyang Zhang \*\*, PhD student, 2017.1-present.
10. Haotian Zheng, PhD student, 2017.8-present
11. Michael Torre, PhD student, 2017.8-present
12. Yang Chen, ex-change PhD, 2017.8-present

Past Graduated Students and Postdoc sponsored (Past total: 13)

1. Yifei Li graduated with Ph.D. in Materials Science and Engineering (2012-2016). Dissertation title: Developing beyond lithium ion batteries for electrical energy storage. Current job: Battery Engineer at Contemporary Amperex Technology Ltd., China.
2. Kuan Yi Lee graduated with M.S. in Materials Science and Engineering (2014-2016). Thesis title: Design, synthesis, and characterization of organic redox materials for aqueous flow battery.
3. Shiyang Zhao \*\* graduated with M.S. in Electrical Engineering (2013-2015). Thesis title: Synthesis and characterization of organic materials for aqueous lithium-ion batteries. Current job: Envision Energy, Houston, USA.
4. Benjamine Emley was a part-time Ph.D. student in my group (2015.6-2016.6), who transferred to a different group in June 2016.
5. Dandan Wang \*\* was a Ph.D. student in my group for a semester (2015.1-2015.6), who transferred to the University of Michigan in June 2015.
6. Dr. Swaminathan Venkatesan, Postdoc, 2015.5-2016.5. Current job: Senior Research Engineer, Agira Photonics, Boston, MA, USA.
7. Dr. Hyun Deog Yoo, Postdoc, 2013.11-2015.5. Current job: Research Assistant Professor, University of Illinois, Chicago, USA
8. Dr. Qingyou An, Postdoc, 2014.7-2015.7). Current job: Associate Professor, Wuhan Institute of Technology, Wuhan, China
9. Dr. Yaoguang Rong, Postdoc, 2014.9-2015.9. Current job: Associate Professor, Huazhong University of Science and Technology, Wuhan, China
10. Dr. Zelang Jian, Postdoc, 2013.12-2014.8. Current job: Postdoc, Oregon State University, Oregon, USA
11. Dr. Qing Ji, Postdoc, 2016.5-2016.11
12. Dr. Pu Hu, Postdoc, 2016.6-2017.6.
13. Dr. Wenwen Deng \*\*, Postdoc, 2016.7-2017.2.

List of undergraduate mentees

- Stephanie Roohi \*\* (2017.1-2017.5), Provost Undergraduate Research Fellow
- Troy A. Pena (2017.1-2017.5), Undergraduate researcher
- Steve Guzman \*\* (2016.5-2016.8), REEMS (Research Experiences and Exploration in Materials Science program) Houston Community College, NSF REU.

- Raymond McCoy\*\* (2016.5-2016.8), REEMS (Research Experiences and Exploration in Materials Science program) Houston Community College, NSF REU.
- Junyoung Kim (2015.8-2016.5), Chemical Engineering, UH
- Kaysheva Chamupathi (2015.2-2015.12), Chemical Engineering, 2015 UH SURF
- Lateefat Alabi\*\* (2015 summer), Rice University, 2015 NSF REU
- Sarah Siemann\*\* (2015 summer), Rice University, 2015 NSF REU
- Harrison Graham (2014 summer), Trinity College, 2014 NSF REU
- Matthew Patton (2014 summer), Chemical Engineering, 2014 UH SURF
- David Pineda (2013 summer), Mechanical Engineering, 2013 UH SURF
- Joseph Whitehouse (2013 summer), UT San Antonio, 2013 NSF REU

## (J) TEACHING

I have taught following courses:

### ECE 5319/6306 Introduction to Nanotechnology

Comments: This course covers basic concepts of nanotechnology, synthesis of nanomaterials and nanostructures, and applications of nanomaterials. The course is offered to upper division undergraduates and beginning graduate students across the College of Engineering. I revised the course contents with an emphasis on sustainable energy. The enrollment has increased from 31 (Fall 2013) to 46 (Fall 2015).

### ECE 5119 Nanotechnology Laboratory

Comments: The Nanotechnology Laboratory is redesigned to provide opportunities for undergraduates to apply knowledge learned in classroom into practice. I purchased equipments to set up the lab with funding support from ECE department chair.

### ECE 6397(6308) Advanced Batteries: Principles, Materials, and Devices

Comments: This course covers the basic structure, thermodynamics and kinetics of electrochemical cells. Students should be able to use various electrochemical techniques and understand the knowledge of lithium ion batteries and various energy storage technologies. Students should relate their knowledge with the real world problems. I developed this new course from scratch, offering to graduate students in spring 2013 for the first time. This course currently becomes a permanent course.

sem/year	course	Yan Yao	College Average	Yao/College ratio
Spring/2013	ECE5397	4.33	4.27	1.01
Spring/2013	ECE6397	4.91	4.37	1.12
Fall/ 2013	ECE5319	4.56	4.23	1.08
Fall/ 2013	ECE6306	5.00	4.35	1.15
Fall/ 2013	MTLS6319	4.67	4.35	1.07
Fall/ 2013	MECE5319	5.00	4.23	1.18
Spring/2014	ECE6397	4.85	4.38	1.11
Fall/2014	ECE5319	4.29	4.28	1.00

Fall/2014	ECE6306	4.86	4.32	1.13
Fall/2014	MECE5319	4.33	4.28	1.01
Spring/2015	ECE 6397	4.75	4.37	1.09
Fall/2015	ECE6306	4.38	4.31	1.01
Fall/2016	ECE6306	4.50	4.41	1.02
Spring/2017	ECE6308	4.46	4.36	1.02

**(K) COLLABORATORS**

Antonio Facchetti (Northwestern), Arnold M. Guloy (UH), Lars C. Grabow (UH), Francisco C. Hernandez (UH), Allan J. Jacobson (UH), Xiulei Ji (Oregon State Univ.), Guosheng Li (PNNL), Yuhao Lu (Sharp Lab of America), Steve W. Martin (Iowa State Univ.), Debora F. Rodrigues (UH), Jeff Xu (Southwest Research Institute), Feng Wang (Brookhaven Nat. Lab), Weichao Wang (Nankai University).