

CURRICULUM VITAE



Department of Physics
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RESEARCH INTEREST

- Neutron and Synchrotron X-ray scattering
- Energy Storage and Conversion
- Battery Materials
- Phase Transition

EDUCATION AND PROFESSIONAL EXPERIENCE

- Assistant Professor, Department of Physics, City University of Hong Kong, 2018.3-Now
- Postdoc Research Associate, Argonne National Lab. Illinois, USA, 2014.11-2018.2
- Ph.D. Mechanical Engineering, Purdue University, Indiana, USA, 2014
- M. S. Chemical Engineering, Hunan University, China, 2008
- B. S. Chemical Engineering, Hunan University, China, 2005

AWARDS & HONORS

- Invited reviewer for research grant applications
 - LDRD proposals of Director's Competitive Grant, Argonne National Laboratory, 2016-2017
- Professional Associations
 - Member, ACS (American Chemical Society, USA)
 - Member, ECS (The Electrochemical Society, USA)
- Invited Reviewer for 5 research journals.
 - *Nano Energy*
 - *Journal of Power Source*
 - *Journal of Material Chemistry A*
 - *Electrochimica Acta*
 - *ACS Applied Materials & Interfaces*

RESEARCH GRANTS

- City University Start-up Fund, Fundamental investigation of phase transformative materials for energy application, 2018-2021, 1,800,000 HK\$. (PI)
- 24 awarded research experimental proposals (with a total value of over US \$1,500,000, being PI for 8 proposals) for synchrotron-based X-ray diffraction(11-ID-C, 11-ID-D), small-angle X-ray diffraction(12-IB-B), X-ray adsorption spectroscopy (20-BM-B), X-ray Coherent X-ray scattering(34-ID-C) and X-ray Laue diffraction microscopy (34-ID-E). 2013-2017

PARTICIPATED RESEARCH PROJECTS

- "Lithium Ion Battery Safety and Early Failure Detection Project", \$2,813,860, Naval Surface Warfare Center, Crane Division, Department of Defense. Duration: 10/1/2009-9/30/2012. (N00164-09-C-GS42)

- “Integration of Scalable Microwave Reactor with High-Energy X-ray Beamline for High Throughput Screening of Energy Nanomaterials Synthesis”, \$1,500,000, Department of Energy, Duration: 10/1/2014-9/30/2016. (Project No.: 2014-121-N0R1)
- “Framework for Integrating Multi-Modal Imaging of Materials for Energy Storage”, \$1,500,000, Department of Energy, 10/1/2015-9/30/2017. (Project No: 2015-144-R1).

PUBLICATIONS

- 39) Muhammad Rahman, Yahong Xu, Hao Cheng, Qianli Shi, Ronghui Kou, Linqin Mu, **Qi Liu**, Sihao Xia, Xianghui Xiao, Cheng-Jun Sun, Dimosthenis Sokaras, Dennis Nordlund, Jin-Cheng Zheng, Yijin Liu* and Feng Lin*. Empowering multicomponent cathode materials for sodium ion batteries by exploring three-dimensional compositional heterogeneities. *Energy Environmental Science.*, 2018, **11**, 2496-2508
- 38) **Qi Liu**^{1,2,5,6}, Xin Sun^{2,6}, Dan Lei^{3,6}, Yan Qin², Jianguo Wen⁴, Fangming Guo¹, Yimin A Wu⁴, Yangchun Rong¹, Ronghui Kou¹, Xianghui Xiao¹, Frederic Aguesse¹, Javier Bareño¹, Yang Ren¹, Wenquan Lu¹, Yangxing Li^{3,*}. Approaching the capacity limit of lithium cobalt oxide in lithium ion batteries via lanthanum and aluminum doping. *Nature Energy.*, 2018, (<https://doi.org/10.1038/s41560-018-0180-642>).
- 37) Yongjin Fang[§], **Qi Liu**^{§ (co-first author)}, Lifen Xiao, Yangchun Rong, Yadong Liu, Zhongxue Chen, Xinpeng Ai, Yuliang Cao, Hanxi Yang, Jian Xie, Chengjun Sun, Xiaoyi Zhang, Bachir Aoun, Xianran Xing, Xianghui Xiao, Yang Ren. A Fully Solidated NaVOPO₄ with layered structure of high-Voltage and Long-lifespan sodium ion batteries. *CHEM.*, 2018, **4**(5), 1167-1180.
- 36) **Qi Liu**^{§(co-first author)}, Yadong Liu[§], Fan Yang, He Hao, Xianghui Xiao, Yang Ren, Wenquan Lu, Eric A Stach, Jian Xie*. Capacity Fading Mechanism of The Commercial 18650 LiFePO₄-Based Lithium ion batteries: An In-situ Time-resolved High-Energy Synchrotron XRD study. *ACS Applied Materials & Interface.*, 2018, **10**(5), 4622-4629.
- 35) Xiaolei Liu, **Qi Liu**, Peng Wang, Yuze Liu, Baibiao Huang, Elena A Rozhkova, Qianqian Zhang, Zeyan Wang, Ying Dai, Jun Lu. Efficient photocatalytic H₂ production via rational design of synergistic spatially-separated dual cocatalysts modified Mn_{0.5}Cd_{0.5}S photocatalyst under visible light irradiation. *Chemical Engineering Journal.*, 2018, **337**, 480-487
- 34) Shitong Wang, Wei Quan, Zhi Zhu, Yong Yang, **Qi Liu**, Yang Ren, Xiaoyi Zhang, Rui Xu, Ye Hong, Zhongtai Zhang, Khalil Amine, Zilong Tang*, Jun Lu*, and Ju Li*. Lithium Titanate Hydrates with Superfast and Stable Cycling in Lithium Ion Batteries. *Nature Communications.*, 2017, **8**, 827.
- 33) Yadong Liu[§], **Qi Liu**^{§(co-first author)}, Le Xin[§], Yuze Liu, Fan Yang, Eric A. Stach and Jian Xie*. Making Li-Metal Electrode Rechargeable by Controlling the Direction of Dendrite Growth. *Nature Energy.* 2017, **2**, 17083.
- 32) **Qi Liu**[§], Guoqiang Tan[§], Peng Wang[§], Sasitha C. Abeyweera, Dongtang Zhang, Yangchun Rong, Yimin Wu, Jun Lu, Cheng-Jun Sun, Yang Ren, Yuze Liu, Ralph T. Muehleisen, Leah B. Guzowski, Jie Li*, Xianghui Xiao*, Yugang Sun*. Revealing Mechanism Responsible for Structural Reversibility of Single-Crystal VO₂ Nanorods upon Lithiation/Delithiation. *Nano Energy.*, 2017, **36**, 197-205.
- 31) Guoqiang Tan, Rui Xu, Zhenyu Xing, Yifei Yuan, Ju Lu*, Jianguo Wen, Cong Liu, Lu Ma, Chun Zhan, **Qi Liu**, Tianpin Wu, Zelang Jian, Reza Shahbazian-Yassar, Yang Ren, Dean Miller, Larry Curtiss, Xiulei

(David) Ji*, Khalil Amine*. “Burning” lithium in CS₂: compact Li₂S@Graphene Nanocapsules for Li-S Batteries. *Nature Energy*., 2017, **2**, 17090.

- 30) Yu Guang Zhu, **Qi Liu**, Yangchun Rong, Haomin Chen, Jing Yang, Li-Juan Yu, Amir Karton, Yang Ren, Xiaoxiong Xu, Stefan Adams and Qing Wang*. Proton enhanced dynamic battery chemistry for aprotic lithium-oxygen batteries. *Nature Communications*., 2017, **8**, 14308.
- 29) **Qi Liu**, Min-rui Gao, Yuzi Liu, John S. Okasinski, Yang Ren and Yugang Sun*. “Quantifying Nucleation and Growth Kinetics of Microwave Nanochemistry Enabled by in-situ High-Energy X-ray Scattering”. *Nano Letters*., 2016, **16**(1), 715-720.
- 28) **Qi Liu**[§], Zheng Li[§], John S. Okasinski, Yang Ren and Yugang Sun*. “In-situ High-energy Synchrotron X-ray Diffraction Revealing Precipitation Reaction Kinetics of Silver Ions with mixed Halide Ions”. *Journal of Materials Chemistry C*., 2015, **3**, 7492-7248.
- 27) Yongjin Fang, **Qi Liu**, Lifen Xiao, Xinping Ai, Hanxi Yang and Yuliang Cao*. High-performance olivine NaFePO₄ microsphere cathode synthesized by aqueous electrochemical displacement method for sodium ion batteries. *ACS Applied Materials Interfaces*., 2015, **7**(32), 17977-17984.
- 26) **Qi Liu**, Zhe-Fei Li, Yadong Liu, Hangyu Zhang, Yang Ren, Cheng-Jun Sun, Wenquan Lu, Yun Zhou, Lia Stanciu, Eric A. Stach and Jian Xie*. Graphene-Modified Nanostructured Vanadium pentoxide Hybrids with Extraordinary Electrochemical Performance for Li-ion Batteries. *Nature Communications*., 2015, **6**, 6127.
- 25) Zhe-Fei Li, **Qi Liu**, Yadong Liu, Le Xin, Fan Yang, Yun Zhou, Hangyu Zhang, Lia A. Stanciu, Jian Xie*. Facile Preparation of graphene/SO₂ xerogel hybrids as the anode material in Li ion batteries. *ACS Applied Materials Interfaces*., 2015, **7**, 27087-27095.
- 24) Zhe-Fei Li, Hangyu Zhang, **Qi Liu**, Yadong Liu, Lia Stanciu, Jian Xie*. Hierarchical Nanocomposites of Vanadium Oxide Thin Film Anchored on Graphene as High-Performance Cathodes in Li-Ion Batteries. *ACS Applied Materials Interfaces*., 2014, **6**, 18894-18900.
- 23) Hao He, Bo Liu, Ali Abouimrane, Yang Ren, Yuzi Liu, Qi Liu, Zi-Sheng Chao*. Dynamic lithium intercalation/deintercalation in 18650 lithium ion battery by time-resolved high energy synchrotron X-ray diffraction. *Journal of the Electrochemical Society*., 2015, **162**, A2195-A2200.
- 22) Chuankun Jia[§], **Qi Liu**[§] (*co-first author*), Cheng-Jun Sun, Fan Yang, Yang Ren, Steve M Heald, Yadong Liu, Zhe-Fei Li, Wenquan Lu, Jian Xie*. In Situ X-ray Near-Edge Absorption Spectroscopy Investigation of the State of Charge of All-Vanadium Redox Flow Batteries. *ACS Applied Materials Interfaces*., 2014, **6**, 17920.
- 21) **Qi Liu**, Yadong Liu, Cheng-jun Sun, Zhe-fei Li, Yang Ren, Wenquan Lu, Eric A. Stach, Jian Xie*. The Structural Evolution of V₂O₅ Nanocrystals during Electrochemical Cycling Studied Using In operando Synchrotron Techniques. *Electrochimica Acta*., 2014, **136**, 318-322.
- 20) **Qi Liu**, Hao He, Zhe-Fei Li, Yadong Liu, Yang Ren, Wenquan Lu, Jun Lu, Eric A. Stach, Jian Xie*. Rate-dependent, Li ion insertion/deinsertion behavior of LiFePO₄ cathodes in commercial 18650 LiFePO₄ cells. *ACS Applied Materials Interfaces*., 2014, **6**, 3282-3289.
- 19) Zhe-Fei Li, Hangyu Zhang, **Qi Liu**, Yadong Liu, Lia Stanciu, Jian Xie*. Covalently-grafted polyaniline on graphene oxide sheets for high performance electrochemical supercapacitors. *Carbon*., 2014, **71**, 257-267.

- 18) Yadong Liu, **Qi Liu**, Zhe-Fei Li, Yang Ren, Jian Xie*, Hao He, Fan Xu. Failure Study of Commercial LiFePO₄ Cells in Over-Discharge Conditions Using Electrochemical Impedance Spectroscopy. *Journal of the Electrochemistry Society.*, 2014, **161**, A1-A13.
- 17) Zhe-Fei Li, Hangyu Zhang, **Qi Liu**, Lili Sun, Lia Stanciu, and Jian Xie*. Fabrication of High-Surface Area Graphene/Polyaniline Nanocomposites and Their Application in Supercapacitors., *ACS Applied Materials Interfaces.*, 2013, **5**, 2685.
- 16) Hao He, Yadong Liu, **Qi Liu**, Zhefei Li, Fan Xu, Clif Dun, Yang Ren, Mei-xian Wang, Jian Xie*. Failure investigation of LiFePO₄ Cells in over-discharge conditions. *Journal of the Electrochemical Society.*, 2013, **160**, A793-A804.
- 15) Fan Xu, Mei-xian Wang, Lili Sun, **Qi Liu**, Hong-fang Sun, Eric A. Stach, Jian Xie*. Enhanced Pt/C catalyst stability using *p*-benzenesulfonic acid functionalized carbon blacks as catalyst supports. *Electrochimica Acta.*, 2013, **94**, 172-181.
- 14) Mei-xian Wang, **Qi Liu**, Zhe-Fei Li, Hong-fang Sun, Eric A. Stach, and Jian Xie*. Structural Modification of Graphene Sheets to Create a Dense Network of Defect Sites. *Journal of Physical Chemistry Letters.*, 2013, **4**, 1484-1488.
- 13) **Qi Liu**, Hao He, Hangyu Zhang, Meixian Wang, Lia Stanciu, Zi-Sheng Chao, Jian Xie*. Synthesis of Mesoporous Chromium Phosphates via Solid State Reaction at a Low Temperature. *New Journal of Chemistry.*, 2012, **36**, 139.
- 12) Mei-xian Wang, **Qi Liu**, Hong-fang Sun, Eric A. Stach, Hangyu Zhang, Lia Stanciu, Jian Xie*. Preparation of high surface-area carbon nanoparticle/graphene composites. *Carbon.*, 2012, **50**, 3845.
- 11) Fan Xu, Hao He, Yadong Liu, Clif Dun, Yang Ren, **Qi Liu**, Jian Xie*. Failure investigation of LiFePO₄ Cells in over-discharge conditions. *Journal of the Electrochemical Society.* 2012, **159**, A678-A687.
- 10) Mei-xian Wang, **Qi Liu**, Hong-fang Sun, Eric A Stach, Jian Xie*. Preparation of High Surface Area Nano-Structured Graphene Composites. *ECS Transactions.* 2012, **41**(22), 95-105.
- 9) Lihong Huang, **Qi Liu**, Rongrong Chen, Andrew T. Hsu*. Hydrogen production via auto-thermal reforming of bio-ethanol: The role of iron in layered double hydroxide-derived Ni_{0.35}Mg_{2.65}AlO_{4.5±δ} catalysts. *Applied Catalysis A: General.* 2011, **393**. 302-308.
- 8) Mei-xian Wang, Fan Xu, **Qi Liu**, Hong-fang Sun, Rui-hua Cheng, Hao He, Eric A. Stach, Jian Xie*. Enhancing the catalytic performance of Pt/C catalysts using steam-etched carbon blacks as a catalyst support. *Carbon.* 2011, **49**, 256.
- 7) Mei-xian Wang, Fan Xu, Hong-fang Sun, **Qi Liu**, Kateryna Artyushkova, Eric A. Stach, and Jian Xie*. Nanoscale graphite-supported Pt catalysts for oxygen reduction reactions in fuel cells. *Electrochimica Acta.* 2011, **56**, 2566-2573.
- 6) Fan Xu, Mei-xian Wang, **Qi Liu**, Hong-fang Sun, Seth Simonson, Noma Ogbeifun, Eric A. Stach, Jian Xie*. Investigation of Carbon Corrosion Process for Polymer Electrolyte Fuel Cells Using RDE Technique. *Journal of the Electrochemical Society.* 2010, **157**, B1138.

- 5) Mei-xian Wang, Fan Xu, HongFang Sun, **Qi Liu**, Kateryna Artyushkova, Eric Stach, Jian Xie*. Preparation and Characterization of Graphitic Particles as Alternative Support for Oxygen Reduction Reaction Catalysts in Fuel Cells. *ECS Transactions*. 2010, 33(1), 533-544.
- 4) Lihong Huang, **Qi Liu**, Rongrong Chen, Andrew T. Hsu*. Layered double hydroxide derived $\text{Co}_{0.3}\text{Mg}_{2.7}\text{Al}_{1-x}\text{Fe}_x\text{O}_{4.5\pm\delta}$ catalysts for hydrogen production via auto-thermal reforming of bio-ethanol. *Catalysis Communications*. 2010, 12, 40-45.
- 3) Mei-xian Wang, **Qi Liu**, Hong-fang Sun, Noma Ogbeifun, Fan Xu, Eric A. Stach, Jian Xie*. Investigation Of Carbon Corrosion in Polymer Electrolyte Fuel Cells Using Steam Etching, *Materials Chemistry and Physics.*, 2010, 123(2),761-766.
- 2) Shao-You Liu, Chun-Jiao Zhou, **Qi Liu**, Guo-Cong Liu, Cai-Juan Huang, Zi-Sheng Chao*. Synthesis of Mesoporous La-, Cu-, and Cr-Doped Aluminophosphates and Their Catalytic Behavior in the Dehydration of Glycerol, *ChemSusChem*. 2008, 1(7), 578-578.
- 1) Li Tao, Cheng-Gao Sun, Mei-Lian Fan, **Qi Liu**, Cai-Juan Huang, He-Sheng Zhai, Hai-Long Wu, Zi-Sheng Chao*. Synthesis and Characterization of Lanthanum Oxide Nanotubes Using the Dendrimers as template, *Studies in Surface Science and Catalysis*. 2007, 165, 339.