

OBJECTIVE

Ph.D. degree in the field of energy storage and conversion; nanomaterial

EDUCATION

Shanghai Jiao Tong University (SJTU), China

Sept. 2015 - Mar. 2018 (expected)

M.E. in Chemical Engineering and Technology

GPA: **3.61**/4.0 Ranking: **3/25**

Huazhong University of Science and Technology (HUST), China

Sept. 2011 - June 2015

B.E. in Chemical Engineering and Technology

Junior GPA: **3.90**/4.0 Overall GPA: **3.81**/4.0 Ranking: **5/59**

PUBLICATIONS

- [1] Pei Shi, Shaohua Fang*, Li Yang*, Shin-ichi Hirano. A novel mixture of lithium bis(oxalato)borate, γ -butyrolactone and non-flammable hydrofluoroether as a safe electrolyte for advanced lithium-ion batteries. *Journal of Materials Chemistry A*, 2017, 5, 19982.
- [2] Pei Shi, Shaohua Fang*, Li Yang*, Shin-ichi Hirano. A safe electrolyte based on propylene carbonate and non-flammable hydrofluoroether for high-performance lithium-ion batteries. *Journal of The Electrochemical Society*, 2017, 164, A1991.
- [3] Pei Shi, Shaohua Fang*, Li Yang*. A high voltage electrolyte based on tetramethylene sulfone and non-flammable hydrofluoroether for LiNi_{0.5}Mn_{1.5}O₄/graphite batteries. *Journal of Power Sources*, 2017 (Under Review).
- [4] Dong Luo, Pei Shi, Li Yang*. Unraveling the effect of exposed facets on voltage decay and capacity fading of Li-rich layered oxides. *Journal of Power Sources*, 2017, 364, 121.
- [5] Dong Luo, Pei Shi, Li Yang*. Li_{1.17}Mn_{0.50}Ni_{0.16}Co_{0.17}O₂ assembled microspheres as a high-rate and long-life cathode of Li-ion batteries. *Inorganic Chemistry Frontiers*, 2017, 4, 650.
- [6] Yi Liu, Shaohua Fang*, Pei Shi, Li Yang*. Ternary mixtures of nitrile-functionalized glyme, non-flammable hydrofluoroether and fluoroethylene carbonate as safe electrolytes. *Journal of Power Sources*, 2016, 331, 445.
- [7] Li Yang, Pei Shi, Shaohua Fang. A kind of safe electrolyte used in lithium ion batteries and lithium ion batteries using this electrolyte. **Chinese Patent** (Application Number: CN201710487721.3).
- [8] Pei Shi, Shaohua Fang*, Li Yang*, Safe electrolytes based on non-flammable hydrofluoroether for lithium-ion batteries. **The 19th National Conference on Electrochemistry, Shanghai (Poster Presentation).**

RESEARCH EXPERIENCES

- [1] **A novel mixture of lithium bis(oxalato)borate (LiBOB), gamma-butyrolactone (GBL) and nonflammable hydrofluoroether as a safe electrolyte for advanced lithium-ion batteries**
(Published in *Journal of Materials Chemistry A*)
Advised by Prof. Li Yang of SJTU *Nov. 2016 - Mar. 2017*
 - Formulated a safe electrolyte based on 1,1,2,2-tetrafluoroethyl-2,2,3,3-tetrafluoropropyl ether (F-EPE), LiBOB and GBL, and measured flash points of electrolytes.
 - Carried out the LSV, XPS and SEM characterization of electrolytes and batteries, whose test results suggested that LiF was introduced into SEI film on the graphite anode by adding F-EPE and improved cell's performances.
 - Conducted the charge-discharge (C-D) test to evaluate the batteries' performances, indicating the capacity retention of battery after 500 cycles reached 80.6% at 25 °C and the battery delivered the capacity of 74.2 mAh g⁻¹ at -40 °C.
- [2] **A safe electrolyte based on propylene carbonate (PC) and nonflammable hydrofluoroether for high-performance lithium-ion batteries**
(Published in *Journal of The Electrochemical Society*)
Advised by Prof. Li Yang of SJTU *June 2016 - Dec. 2016*

- Mixed PC with F-EPE to formulate a safe electrolyte, in which fluoroethylene carbonate was selected to improve the compatibility of the electrolyte with graphite, and compared the flash point of electrolytes.
- Carried out Cyclic Voltammetry (CV) test of electrolytes, whose results showed the synergy of F-EPE and FEC inhibited the co-intercalation of PC into graphite effectively.
- Investigated the battery performance using C-D test, manifesting this safe electrolyte well supported graphite/NMC full cell and its rate and cycle performances were comparable to those of commercial electrolytes at 25 °C.

[3] A high voltage electrolyte based on tetramethylene sulfone (TMS) and nonflammable hydrofluoroether for LiNi_{0.5}Mn_{1.5}O₄/graphite batteries

(Under Review in *Journal of Power Sources*)

Advised by Prof. Li Yang of SJTU

Jan. 2017 - May 2017

- Proposed a new high-voltage safe electrolyte composed of F-EPE and TMS for LNMO/graphite, and employed Contact Angle Measuring Instrument to confirm the high wettability of the electrolyte.
- Characterized the electrolytes and batteries with CV, XRD, SEM, and XPS test, whose results elucidated the TMS-based electrolyte had better compatibility with graphite anode using SBR/CMC as the binder compared with PVDF.
- Conducted the C-D test, showing the capacity retention of LNMO/graphite after 100 cycles reached 82.9% which was obviously higher than that of a commercial electrolyte (65.1 %).

[4] Low-viscous functionalized pyrrolidinium/imidazolium ionic liquids (ILs) electrolyte for lithium-ion batteries

Advised by Prof. Li Yang of SJTU

Feb. 2016 - May 2016

- Synthesized a series of alkyl-, alkenyl- or ether- functionalized pyrrolidinium/imidazolium ILs based on bis-(trifluoromethanesulfonyl)imide anion.
- Conducted NMR tests and verified whether the ILs were synthesized successfully.
- Prepared the ILs into electrolytes and tested the electrolytes in NMC/Li or graphite/Li cells.

[5] Synergistic enhancement of nitrogen and sulfur co-doped graphene with carbon nanosphere insertion for electro-catalytic oxygen reduction reaction

Advised by Prof. Deli Wang of HUST

Feb. 2015 - May 2015

- Employed hydrothermal and one-pot annealing methods to synthesize a nitrogen and sulfur co-doped graphene (NSGCB) nanocomposite using graphene oxide, thiourea, and acidized carbon black.
- Carried out the LSV, CV and SEM tests, whose results revealed the NSGCB had excellent oxygen reduction reaction performance which was superior to that of Pt/C in terms of long-term durability and tolerance to methanol poisoning.

TEACHING EXPERIENCE

General Chemistry Experiment

Teaching Assistant, School of Chemistry and Chemical Engineering, SJTU

Sept. 2015 - Jan. 2016

- Taught students the basic theory and operation of experiments.
- Supervised and recorded students' experimental performances, and then graded their experimental reports.

RESEARCH SKILLS

- **Tests and Characterizations:** CV, NMR (¹H, ¹³C), DSC, TGA, XRD, XPS, SEM, TEM
- **Research Operations:** assembling coin battery, synthesizing inorganic and organic compounds

AWARDS & HONORS

- National Scholarship (ranked 1st) 2013 & 2017
- First-class Academic Excellence Scholarship of SJTU (top 15%) 2015, 2016 & 2017
- Kaiyuan Encouragement Scholarship (top 1%) 2016
- First Prize in Undergraduate Chemistry Experiment Skill Competition (top 5%) 2014
- Excellent Student Cadre of HUST 2014
- Model Student of Academic Records (top 1%) 2013
- National Encouragement Scholarship (top 15%) 2012
- Outstanding Volunteer of HUST 2012