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EDUCATION

PH.D., **BIOMEDICAL ENGINEERING**, SEPT 2011
Washington University in St. Louis, MO

M.S., **CHEMISTRY**, JUNE 2007
Key Laboratory of Advanced Energy Materials Chemistry, Nankai University, China

B.S., **CHEMISTRY**, JUNE 2004
Nankai University, China

RESEARCH INTEREST

Development of rationally designed functional materials with finely tailored nanoscale architecture to tackle critical problems (such as energy density, power density, cycle and calendar life, safety, and cost) in diverse energy-related applications, including batteries, fuel cells, as well as clean and renewable energy

RESEARCH EXPERIENCE

ASSISTANT PROFESSOR, 01/2016
Thayer School of Engineering, Dartmouth College

RESEARCH SCIENTIST, 09/2015 – 12/2015
Thayer School of Engineering, Dartmouth College

POSTDOCTORAL ASSOCIATE, 10/2011 – 07/2015
Department of Materials Science & Engineering, Stanford University
Supervisor: Prof. Yi Cui

Design and synthesis of novel nanostructured materials with controlled compositions, sizes and shapes to address critical problems related to energy storage

- Designed and achieved unique sulfur-TiO_2 yolk-shell nanostructured cathodes for lithium-sulfur batteries with a record-setting level of cycling stability
- Invented a facile, one-step, highly scalable (gram level per batch) synthetic procedure for the fabrication of hollow sulfur nanospheres for high-performance sulfur cathodes
- Initiated a systematic study of using different conductive polymers as the coatings to improve the electrochemical properties of nanostructured sulfur cathodes
- Discovered the effect of lithium polysulfide as an inhibitor for lithium dendrites growth in high-energy lithium metal-based batteries
- Developed new magnetic-field controlled lithium-polysulfide semi-solid batteries for large-scale energy storage

RESEARCH ASSISTANT, 09/2007 − 09/2011
Department of Biomedical Engineering, Washington University in St. Louis
Advisor: Prof. Younan Xia

Synthesis of novel plasmonic nanostructures with well-controlled morphologies, and exploration of their optical properties and biomedical applications

- Invented new methodologies for generating dimeric silver nanostructures with controlled hot spots for surface-enhanced Raman scattering applications
- Developed diverse synthetic procedures for the fabrication of silver and gold nanostructures with well-defined shapes for optical sensing
- Demonstrated the use of gold nanocages as contrast agent and optical tracer in photoacoustic imaging for early cancer detection
- Established a novel drug delivery platform by combining gold nanocages with smart polymers or phase-change materials, and high-intensity focused ultrasound

RESEARCH ASSISTANT, 09/2004 − 06/2007
Key Laboratory of Advanced Energy Materials Chemistry, Nankai University, China
Advisor: Prof. Jun Chen

Synthesis of one-dimensional (1-D) nano- and microstructures, and exploration of their applications in electrochemical properties and energy storage

- Developed various synthetic methodologies for 1-D nanostructures of transition-metal oxides, and studied their use as electrode materials in lithium-ion batteries
- Initiated template synthesis of nickel hydroxide tubes and their derivatives at mesoscale dimensions, and investigated their use for rechargeable alkaline batteries
- Pioneered the study on the synthesis of metallic magnesium nano/microstructures, and explored their applications in metal-air batteries and hydrogen storage

TEACHING AREA

Materials Science; Electrochemical Engineering; Nanotechnology

AWARDS

- The State Natural Science Award, the State Council of the People's Republic of China, 2011
- Graduate Student Presentation Award, MRS Spring Meeting, San Francisco, CA, April 13-17, 2009
- Academic Award of Extraordinary Graduate Student, Nankai University, 2005–2006
- Outstanding Student Award, the First Class, Nankai University, 2005
- *Yangshixian* Chemistry Award, Nankai University, 2005
- *Yizhong* Enterprise Award, Nankai University, 2003

PROFESSIONAL ACTIVITIES

- Reviewer for *Nano Letters*, *Nanoscale*, *Chemical Communications*, *Chemistry–A European Journal*, *RSC Advances*, *Materials*, *Nanoscience and Nanotechnology*

Letters, *Science of Advanced Materials*, *Nature Communications*, and many others
- Member of American Chemical Society (ACS) & Materials Research Society (MRS)

PUBLICATIONS

(Citations: >6800; h-index: 37; source: Google Scholar Citation, 10/2015)

57 **Li, W.**; Liang, Z.; Lu, Z.; Tao, X.; Liu, K.; Yao, H.; Cui, Y. "Magnetic Field-Controlled Lithium Polysulfide Semiliquid Battery with Ferrofluidic Properties" *Nano Letters*, **2015,** Article ASAP, DOI: 10.1021/acs.nanolett.5b02818.

56 **Li, W.**; Yao, H.; Yan, K.; Zheng, G; Liang, Z.; Chiang, Y-. M.; Cui, Y. The Synergetic Effect of Lithium Polysulfide and Lithium Nitrate to Prevent Lithium Dendrite Growth. *Nature Communications* **2015**, *6,* 7436. DOI:10.1038/ncomms8436.

55 **Li, W.**;[†] Liang, Z.;[†] Lu, Z.; Yao, H.; Seh, Z. W.; Yan, K.; Zheng, G; Cui, Y. Sulfur Cathode with Pomegranate-Like Cluster Structure. *Advanced Energy Materials* **2015**, DOI:10.1002/AENM.201500211. ([†]Co-first author)

54 **Li, W.**; Zheng, G; Yuan, Y.; Seh, Z. W.; Liu, N.; Cui, Y. High-performance hollow sulfur nanostructured battery cathode through a scalable, room-temperature, one-step bottom-up approach. *Proceedings of the National Academy of Sciences USA* **2013**, *110*, 7148−7153.

53 Seh, Z. W.;[†] **Li, W.**;[†] Cha, J.; Zheng, G; Yuan, Y.; McDowell, M. T.; Hsu, P. C.; Cui, Y. Sulfur-TiO_2 yolk-shell nanoarchitecture with internal void space for long-cycle lithium-sulfur batteries. *Nature Communications* **2013**, *4*, 1331. ([†]Co-first author)

52 **Li, W.**; Zhang, Q.; Zheng, G; Seh, Z. W.; Yao, H.; Cui, Y. Understanding the role of different conductive polymers in improving the nanostructured sulfur cathode performance. *Nano Letters* **2013***, 13,* 5534−5540.

51 Xia, Y.[*]; **Li, W.**; Cobley, C. M.; Chen, J.; Xia, X.; Zhang, Q.; Yang, M.; Cho, E. C.; Brown, K. P.; Gold nanocages: from synthesis to theranostic applications. *Accounts of Chemical Research* **2011**, *44*, 914−924. (Invited review article, highlighted in *Chemical & Engineering News*, September 26, 2011, pp. 29−32) ([*]Corresponding author)

50 **Li, W.**; Brown, P.; Wang, L. V.; Xia, Y. Gold nanocages as contrast agents for photoacoustic imaging. *Contrast Media & Molecular Imaging* **2011**, *6*, 370−377. (Invited review article)

49 **Li, W.**; Cai, X.; Kim, C.; Sun, G.; Zhang, Y.; Deng, R.; Yang, M.; Chen. J.; Achilefu, S.; Wang, L. V.; Xia, Y. Gold nanocages covered with thermally-responsive polymers for controlled release by high-intensity focused ultrasound. *Nanoscale* **2011**, *3*, 1724−1730.

48 Cai, X.;[†] **Li, W.**;[†] Kim, C.; Yuan, Y.; Wang, L. V.; Xia, Y. *In vivo* quantitative evaluation of the transport kinetics of gold nanocages in a lymphatic system by noninvasive photoacoustic tomography. *ACS Nano* **2011**, *5*, 9658−9667. ([†]Co-first author)

47 **Li, W.**; Camargo, P. H. C.; Au, L.; Zhang, Q.; Rycenga, M.; Xia, Y. Etching and dimerization: A simple and versatile route to dimers of silver nanospheres with a range of sizes. *Angewandte Chemie International Edition* **2010**, *49*, 164−168 (VIP article, highlighted in an accompanying perspective article).

46 **Li, W.**; Xia, Y. Facile synthesis of gold octahedra by direct reduction of $HAuCl_4$ in an aqueous solution. *Chemistry-An Asian Journal* **2010**, *5*, 1312–1316.

45 Zhang, Q.;[†] **Li, W.**;[†] Moran, C.; Chen, J.; Wen, L.; Xia, Y. Seed-mediated synthesis of Ag nanocubes with controllable edge lengths in the range of 30-200 nm and comparison of their optical properties. *Journal of the American Chemical Society* **2010**, *132*, 11372–11378. ([†]Co-first author)

44 **Li, W.**; Camargo, P. H. C.; Lu, X.; Xia, Y. Dimers of silver nanospheres: Facile synthesis and their use as hot spots for surface-enhanced Raman scattering. *Nano Letters* **2009**, *9*, 485–490.

43 Yavuz, M. S.;[†] **Li, W.**;[†]; Xia, Y. Facile synthesis of gold icosahedra in an aqueous solution by reacting $HAuCl_4$ with N-vinyl pyrrolidone. *Chemistry-A European Journal* **2009**, *15*, 13181–13187. ([†]Co-first author)

42 **Li, W.**; Li, C.; Ma, H.; Chen, J. Magnesium nanowires with enhanced kinetics for hydrogen absorption and desorption. *Journal of the American Chemical Society* **2007**, *129*, 6710–6711.

41 **Li, W.**; Li, C.; Zhou, C.; Ma, H.; Chen, J. Metallic magnesium nano/mesoscale structures: Their shape-controlled preparation and Mg/air battery applications. *Angewandte Chemie International Edition* **2006,** *45*, 6009–6012.

40 **Li, W.**; Cheng, F.; Tao, Z.; Chen J. Vapor-transportation preparation and reversible lithium intercalation/deintercalation of α-MoO_3 microrods. *The Journal of Physical Chemistry B* **2006**, *110*, 119–124.

39 **Li, W.**; Xu, L.; Chen J. Co_3O_4 nanomaterials in lithium-ion batteries and gas sensors. *Advanced Functional Materials* **2005**, *15*, 851–857.

38 **Li, W.**; Zhang, S.; Chen J. Synthesis, characterization and electrochemical application of $Ca(OH)_2$, $Co(OH)_2$ and $Y(OH)_3$-coated $Ni(OH)_2$ tubes. *The Journal of Physical Chemistry B* **2005**, *109,* 14025–14032.

37 **Li, W.**; Cai, F.; Gou, X.; Gao, F.; Chen J. Synthesis, characterization and electrochemical properties of $Ni(OH)_2$ nanotubes. *Acta Chimica Sinica* **2005**, *63*, 411–415.

36 Sun, Y.; Yao, H.; **Li, W.**; Seh, Z. W.; Zheng, G; Cui, Y. In-Operando Optical Imaging of Temporal and Spatial Distribution of Polysulfides in Lithium-Sulfur Batteries. *Nano Energy* **2015**, *11*, 579–586.

35 Lu, Z.; Liu, N.; Lee, H.-W.; Zhao, J.; **Li, W.;** Li, Y.; Cui, Y. Nonfilling Carbon Coating of Porous Silicon Micrometer-Sized Particles for High-Performance Lithium Battery Anodes. *ACS Nano* **2015**, *9*, 2540.

34 Liu, C.; Hsu, P.-C.; Lee, H.-W.; Ye, M.; Zheng, G.; Liu, N.; **Li, W.**; Cui, Y. Transparent air filter for high-efficiency PM2.5 capture. *Nature Communications* **2015**, *6*, 6205.

33 Liang, Z.; Zheng, G.; Liu, C.; Liu, N.; **Li, W.**; Yan, K.; Yao, H.; Hsu, P.-C.; Chu, S.; Cui, Y. Polymer Nanofiber-Guided Uniform Lithium Deposition for Battery Electrodes. *Nano letters* **2015***, 15,* 2910–2916.

32 Liu, N.; **Li, W.**; Pasta, M.; Cui, Y. Nanomaterials for electrochemical energy storage. *Frontiers of Physics* **2014**, 9, 323–350.

31 Seh, Z. W.; Yu, J. H.; **Li, W.**; Hsu, P.-C.; Wang, H.; Sun, Y.; Yao, H.; Zhang, Q.; Cui, Y. Two-dimensional layered transition metal disulphides for effective

encapsulation of high-capacity lithium sulphide cathodes. *Nature Communications* **2014**, *5*, 5017.

30 Liang, Z.; Zheng, G.; **Li, W.**; Seh, Z. W.; Yao, H.; Yan, K.; Kong, D.; Cui, Y. Sulfur cathodes with hydrogen reduced titanium dioxide inverse opal structure. *ACS Nano* **2014**, 8, 5249–5256.

29 Yao, H.; Yan, K.; **Li, W.**; Zheng, G; Kong, D.; Seh, Z. W.; Narasimhan, V. K.; Zheng, L.; Cui, Y. Improved lithium-sulfur batteries with a conductive coating on the separator to prevent the accumulation of inactive S-related species at the cathode-separator interface. *Energy & Environmental Science* **2014**, *7*, 3381–3389.

28 Zheng, G; Lee, S. W.; Liang, Z.; Lee, H.-Y.; Yan, K.; Yao, H.; Wang, H.; **Li, W.**; Chu, S.; Cui, Y. Interconnected hollow carbon nanospheres for stable lithium metal anodes. *Nature Nanotechnology* **2014**, *9*, 618–623.

27 Yao, H.; Zheng, G.; Hsu, P. C.; Kong, D.; Cha, J. J.; **Li, W.**; Seh, Z. W.; McDowell, M. T.; Yan, K.; Liang, Z.; Narasimhan, V. K.; Cui, Y. Improving lithium-sulphur batteries through spatial control of sulphur species deposition on a hybrid electrode surface. *Nature Communications* **2014**, *5*, 3943.

26 Seh, Z. W.; Wang, H.; Hsu, P. C.; Zhang, Q.; **Li, W.**; Zheng, G.; Yao, H.; Cui, Y. Facile Synthesis of Li_2S-polypyrrole composite structures for high-performance Li_2S cathodes. *Energy and Environmental Science* **2014**, *7*, 672–676.

25 Seh, Z. W.; Wang, H.; Liu, N.; Zheng, G.; **Li, W.**; Yao, H.; Cui, Y. High-capacity Li_2S-graphene oxide composite cathodes with stable cycling performance. *Chemical Science* **2014**, *5*, 1369–1400.

24 Yao, H.; Zheng, G; **Li, W.**; McDowell, M. T.; Seh, Z. W.; Liu, N.; Lu, Z.; Cui, Y. Crab shells as sustainable templates from nature for nanostructured battery electrodes. *Nano letters* **2013***, 13,* 3385–3390.

23 Seh, Z. W.; Zhang, Q.; **Li, W.**; Zheng, G.; Yao, H.; Cui, Y. Stable cycling of lithium sulfide cathodes through strong affinity with a bifunctional binder. *Chemical Science* **2013**, *4*, 3673–3677.

22 Zheng, G; Zhang, Q.; Cha, J.; Yuan, Y.; **Li, W.**; Seh, Z. W.; Cui, Y. Amphiphilic surface modification of hollow carbon nanofibers for improved cycle life of lithium sulfur batteries. *Nano Letters* **2013***, 13,* 1265–1270.

21 Xia, X.; **Li, W.**; Zhang, Y.; Xia, Y. Silica-coated dimers of silver nanospheres as SERS tags for imaging cancer cells. *Interface Focus* **2013**, *3*, 20120092.

20 Wang, Y.; Black, K.C.; Luehmann, H.; **Li, W.**; Zhang, Y.; Cai, X.; Wan, D.; Liu, S.-Y.; Li, M.; Kim, P.; Li, Z.-Y.; Wang, L. V.; Liu, Y.; Xia, Y. Comparison study of gold nanohexapods, nanorods, and nanocages for photothermal cancer treatment. *ACS Nano* **2013**, 7, 2068–2077.

19 Zhang, H.; **Li, W.**; Jin, M.; Zeng, J.; Yu, T.; Yang, D.; Xia, Y. Controlling the morphology of rhodium nanocrystals by manipulating the growth kinetics with a syringe pump. *Nano Letters* **2011**, *11*, 898–903.

18 Kim, D. Y.; **Li, W.**; Ma, Y.; Yu, T.; Li, Z. -Y.; Park, O. O.; Xia Y. Seed-mediated synthesis of gold cctahedra in high purity, and with well-controlled sizes and optical properties. *Chemistry-A European Journal* **2011**, *17*, 4759–4764. (VIP article)

17 Zhang, H.; Jin, M.; Wang, J.; **Li, W.**; Camargo, P. H. C.; Kim, M.; Yang, D.; Xie, Z. and Xia, Y. Synthesis of Pd-Pt bimetallic nanocrystals with a concave structure

through a bromide-induced galvanic replacement reaction. *Journal of the American Chemical Society* **2011**, *133*, 6078–6089.

16 Moon, G. D.; Choi, S. -W.; Cai, X.; **Li, W.**; Cho, E. C.; Jeong, U.; Wang, L. V.; Xia Y. A new theranostic system based on gold nanocages and phase-change materials with unique features for photoacoustic imaging and controlled release. *Journal of the American Chemical Society* **2011**, *133*, 4762–4765.

15 Rycenga, M.; Cobley, C. M.; Zeng, J.; **Li, W.**; Moran, C.; Zhang, Q.; Qin, D.; Xia, Y. Controlling the synthesis and assembly of silver nanostructures for plasmonic applications. *Chemical Reviews* **2011**, 111, 3669–3712. (Invited review article)

14 Zeng, J.; Tao, J.; **Li, W.**; Grant, J.; Zhu, Y. and Xia, Y. A mechanistic study on the formation of silver nanoplates in the presence of silver seeds and citric acid or citrate ions. *Chemistry-An Asian Journal* **2011**, *6*, 376–379.

13 Ma, Y.; **Li, W.**; Cho, E. C.; Li, Z.; Yu, T.; Zeng, J.; Xie, Z.; Xia, Y. Au@Ag core-shell nanocubes with finely tuned and well-controlled sizes, shell thicknesses, and optical properties. *ACS Nano* **2010**, *4*, 6725–6734.

12 Zhang, Q.; **Li, W.**; Wen, L.-P.; Chen, J.; Xia, Y. Facile synthesis of Ag nanocubes of 30 to 70 nm in edge length with CF_3COOAg as a precursor. *Chemistry-A European Journal* **2010**, *16*, 10234–10239.

11 Ma, Y.; **Li, W.**; Zeng, J.; McKiernan, M.; Xie, Z.; Xia, Y. Synthesis of small silver nanocubes in a hydrophobic solvent by introducing oxidative etching with Fe(III) species. *Journal of Materials Chemistry* **2010**, *20*, 3586–3589.

10 Zhang, H.; Xia, X.; **Li, W.**; Zeng, J.; Dai, Y.; Yang, D.; Xia, Y. Facile synthesis of five-fold twinned, starfish-like rhodium nanocrystals by eliminating oxidative etching with a chloride-free precursor. *Angewandte Chemie International Edition* **2010**, *49*, 5296–5300. (Highlighted in *Nature Materials*, **2010**, *9*, 605)

9 Ma, Y.; Zeng, J.; **Li, W.**; McKiernan, M.; Xie, Z.; Xia, Y. Seed-mediated synthesis of truncated gold decahedrons with the AuCl/oleylamine complex as a precursor. *Advanced Materials* **2010**, *22*, 1930–1934.

8 Camargo, P. H. C.; Au, L.; Rycenga, M.; **Li, W.**; Xia, Y. Measuring the SERS enhancement factors of dimers with different structures constructed from silver nanocubes. *Chemical Physics Letters* **2010**, *484*, 304–308.

7 Dai, Y.; Lim, B.; Yang, Y.; Cobley, C. M.; Cho, E. C.; **Li, W.**; Grayson, B.; Fanson, P. T.; Campbell, C. T. and Xia, Y. A sinter-resistant catalytic system based on Platinum nanoparticles supported on TiO_2 nanofibers and covered by porous silica. *Angewandte Chemie International Edition* **2010**, *49*, 8165–8168. (VIP article)

6 Rycenga, M.; Camargo, P. H. C.; **Li, W.**; Moran, C.; Xia, Y. Understanding the SERS effects of single silver nanoparticles and their dimers, one at a time. *The Journal of Physical Chemistry Letters* **2010**, *1*, 696–703. (Invited perspective article)

5 Li, Z.; **Li, W.**; Camargo, P. H. C.; Xia, Y. Facile synthesis of branched Au nanostructures by templating against a self-destructive lattice of magnetic Fe nanoparticles. *Angewandte Chemie International Edition* **2008**, *47*, 9653–9656.

4 Li, Y.; **Li, W.**; Chou, S.; Chen, J. Synthesis, characterization and electrochemical properties of aluminum-substituted alpha-$Ni(OH)_2$ hollow spheres. *Journal of Alloys and Compounds* **2008,** *456*, 339–343.

3 Li, X.; **Li, W.**; Chen, J. Electrochemical lithium intercalation/deintercalation of single-crystalline V_2O_5 nanowires. *Journal of the Electrochemical Society* **2007**, *154*, 1, A39–A42.

2 Zhang, S.; **Li, W.**; Li, C.; Chen J. Synthesis, characterization, and electrochemical properties of $Ag_2V_4O_{11}$ and $AgVO_3$ 1-D nano/microstructures. *The Journal of Physical Chemistry B* **2006**, *110*, 24855–24863.

1 Chen, J.; Xu, L.; **Li, W.**; Gou X. α-Fe_2O_3 nanotubes in gas sensor and lithium-ion battery applications. *Advanced Materials* **2005**, *17*, 582–586.

PATENTS

- **Li, W.**; Cui, Y.; Seh, Z. W.; Zheng, G; Yuan, Y. Encapsulated sulfur cathodes for rechargeable lithium batteries, *US Patent: US20130065128 A1*.
- Chen, J.; **Li, W.**; Cai, F.; Gou, X; Gao, F. Preparation method of nickel hydroxide nanotube, *Chinese Patent: CN1267357 C*.
- Zhang, S.; **Li, W.**; Chen, J.; Tao, Z.; Ma, H. Vanadate silver electrode material and preparation method and its application, *Chinese Patent: CN1913202 B*.
- Chen, J.; Li, C.; Zhou, C.; Ma, H.; **Li, W.** Magnesium negative material and preparation method and application, *Chinese Patent: CN1913219 A*.

CONFERENCE PRESENTATIONS

- **Li, W.**,Tackling the problems of lithium-sulfur battery: from molecular understanding to nanomaterials design, presented at 4th EITA Young Investigator Conference, Massachusetts Institute of Technology, Cambridge, MA, USA, August 6-7, 2015; *Invited Talk*.
- **Li, W.**; Seh, Z. W.; Zheng, G.; Zhang, Q.; Yao, H.; Yang Y.; Cui, Y., High-performance lithium-sulfur battery: from molecular understanding to nanomaterials design, presented at 248th ACS National Meeting, San Francisco, CA, USA, August 10-14, 2014; *Oral 265*.
- **Li, W.**; Cui, Y., Understanding the role of different conductive polymers in improving the nanostructured sulfur cathode performance, presented at 2014 MRS Spring Meeting, San Francisco, CA, USA, April 21-25, 2014; *Oral O9.07*.
- **Li, W.**; Cui, Y., Monodisperse polymer-encapsulated hollow sulfur nanosphere cathode for high-energy lithium-sulfur batteries with long cycle life, presented at 2013 MRS Spring Meeting, San Francisco, CA, USA, April 1-5, 2013; *Oral E5.09*.
- **Li, W.**; Xia, Y., Dimers of Ag nanospheres for surface-enhanced Raman scattering, presented at 241st ACS National Meeting, Anaheim, CA, USA, March 27-31, 2011; *Poster 312*.
- **Li, W.**; Xia, Y., Dimers of silver nanospheres: Facile synthesis and application in surface-enhanced Raman scattering, presented at 2010 MRS Fall Meeting, Boston, MA, USA, November 30-December 2, 2010; *Poster M10.14*.
- **Li, W.**; Camargo, P. H. C.; Lu, X.; Xia, Y., Dimers of silver nanospheres as hot spots for surface-enhanced Raman scattering, presented at 2009 MRS Spring Meeting, San Francisco, CA, USA, April 13-17, 2009; *Oral Y7.8*, *Graduate Student Presentation Award*.

- **Li, W.**; Cheng, F. Y,; Chou, S. L.; Li, C. S.; Chen, J., 1-D nickel hydroxide nanomaterials: synthesis and synthesis and application in alkaline rechargeable batteries, presented at 25th Chinese Chemical Society Congress, Changchun, China, July 11-14, 2006; *Oral 06-0-029*.