

# Ju Li

**Employment** *Massachusetts Institute of Technology* Cambridge, MA 02139  
Battelle Energy Alliance Professor of Nuclear Science and Engineering,  
Full Professor (7/2011-present), Department of Nuclear Science and Engineering  
and Department of Materials Science and Engineering

*University of Pennsylvania* Philadelphia, PA 19104  
Associate Professor of Materials Science and Engineering (9/2007-6/2011)

*Ohio State University* Columbus, OH 43210  
Assistant Professor of Materials Science and Engineering (9/2002-9/2007)

*Massachusetts Institute of Technology* Cambridge, MA 02139  
Research scientist (4/2002-9/2002), postdoctoral associate (9/2000-4/2002)  
Departments of Nuclear Engineering and Materials Science and Engineering

**Education** *Massachusetts Institute of Technology* Cambridge, MA 02139  
Department of Nuclear Engineering (1994-2000) Ph.D., Sept. 2000

*University of Science and Technology of China* Hefei, Anhui 230026, P.R.C.  
Special Class for Gifted Young (1990-1994) B.S. in Physics, 1994

## Honors & Awards

Clarivate *Highly Cited Researchers* 2018 in *Materials Science* field

Fellow of the Materials Research Society (2017)

Fellow of the American Physical Society (2014)

Thomson Reuters *Highly Cited Researchers* 2014, among 147 scientists world-wide in *Materials Science* category based on papers published between 2002-2012, and among “*The World’s Most Influential Scientific Minds 2014*”

Lee Hsun Young Scientist Lecture Series on Materials Science, Institute of Metal Research, Chinese Academy of Sciences (2011)

Chinese Ministry of Education and Li Ka Shing Foundation Chang Jiang Scholar Award (2009)

TMS Robert Lansing Hardy Award (2009)

*Technology Review* TR35 award (2007)

National Academy of Engineering U.S. Frontiers of Engineering Symposium (Microsoft Research, Sept. 2007) and German-American Frontiers of Engineering Symposium (Oak Ridge, April 2010) co-sponsored by the Alexander von Humboldt Foundation.

Materials Research Society (MRS) 2006 Outstanding Young Investigator Award  
Ohio State University College of Engineering Lumley Research Award 2006  
Presidential Early Career Award for Scientists and Engineers (PECASE) 2005  
Materials Research Society (MRS) Graduate Student Silver Medalist 1998  
MIT Nuclear Engineering Department Manson Benedict Fellowship 1996-1997

## Service

Author of free molecular visualization software *AtomEye*:  
<http://www.google.com/search?q=AtomEye>

Member of Editorial Board of *Nano Research* (Mar. 2008-), *Modelling and Simulation in Materials Science and Engineering* (Feb. 2008-), *Science China: Technological Sciences* (Jan. 2013-), *Extreme Mechanics Letters* (Aug. 2014-).

3-Member Executive Board (Oct. 2010-present) and International Advisory Board (Aug. 2009-present) of Multiscale Materials Modeling (MMM) conference series.

Lead Organizer of 2013 MRS Fall Meeting Symposium YY “*Elastic Strain Engineering for Unprecedented Materials Properties*”, and Lead Guest Editor of *MRS Bulletin* February 2014 special issue on Elastic Strain Engineering

Author of multiple perspective articles in *MRS Bulletin*

## Issued Patents

4. May 29, 2018: US Patent 9985327, “[Air secondary battery](#),” Tetsuya Koido, Akihiro Kushima, Yoshiya Fujiwara, Ju Li.
3. April 24, 2018: US Patent 9954262, “[Air secondary battery including cathode having trap portion](#),” Tetsuya Koido, Akihiro Kushima, Yoshiya Fujiwara, Ju Li.
2. Mar 14, 2017, US Patent 9595624 “[Strain-engineered bandgaps](#),” Ju Li, Xiaofeng Qian, Ji Feng.
1. Nov.1, 2016: US Patent 9484489 “[Engineered band gaps](#)”, Ju Li, Xiaofeng Qian, Menghao Wu.

## Representative Publications (320+ peer-reviewed papers, 20,000+ SCI cites, h-index 74)<sup>1</sup>

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<sup>1</sup> ResearcherID: A-2993-2008    ISI Web of Knowledge search keywords: “Li J” in Author and “nucl same engn same 02139 or mat same 43210 or mat same Univ Penn or 2041 same Columbus” in Address. See also all publications [ranked by Google Scholar](#).

129. W-W. Xia, Y. Yang, Q-P. Meng, Z-P. Deng, M-X. Gong, J. Wang, D-L. Wang, Y-M. Zhu, L-T. Sun, F. Xu, J. Li and H-L. L. Xin, "Bimetallic Nanoparticle Oxidation in Three Dimensions by Chemically Sensitive Electron Tomography and in Situ Transmission Electron Microscopy," *ACS Nano* **12** (2018) 7866-7874.
128. L. Li, Y-L. Xu, X-F. Sun, R. Chang, Y. Zhang, X-N. Zhang and J. Li, "Fluorophosphates from Solid-State Synthesis and Electrochemical Ion Exchange: NaVPO<sub>4</sub>F or Na<sub>3</sub>V<sub>2</sub>(PO<sub>4</sub>)<sub>2</sub>F<sub>3</sub>?" *Advanced Energy Materials* (2018) 1801064.
127. Y. Yang, A. Kushima, W-Z. Han, H-L. Xin and J. Li, "Liquid-Like, Self-Healing Aluminum Oxide during Deformation at Room Temperature," *Nano Letters* **18** (2018) 2492-2497.
126. Y-G. Yao, Z-N. Huang, P-F. Xie, S.D. Lacey, R.J. Jacob, H. Xie, F-J. Chen, A-M. Nie, T-C. Pu, M. Rehwoldt, D-W. Yu, M.R. Zachariah, C. Wang, R. Shahbazian-Yassar, J. Li and L-B. Hu, "Carbothermal shock synthesis of high-entropy-alloy nanoparticles," *Science* **359** (2018) 1489-1494.
125. K.P. So, A. Kushima, J.G. Park, X-H. Liu, D.H. Keum, H.Y. Jeong, F. Yao, S.H. Joo, H.S. Kim, H. Kim, J. Li and Y.H. Lee, "Intragranular Dispersion of Carbon Nanotubes Comprehensively Improves Aluminum Alloys," *Advanced Science* (2018) 1800115.
124. Q-J. Li, B. Xu, S. Hara, J. Li and E. Ma, "Sample-size-dependent surface dislocation nucleation in nanoscale crystals," *Acta Materialia* **145** (2018) 19-29.
123. L-M. Suo, W-J. Xue, M. Gobet, S.G. Greenbaum, C. Wang, Y-M. Chen, W-L. Yang, Y-X. Li and J. Li, "Fluorine-donating electrolytes enable highly reversible 5V-class Li metal batteries," *PNAS* **115** (2018) 1156-1161.
122. Y. Yang, Y.G. Li, M.P. Short, C-S. Kim, K.K. Berggren and J. Li, "Nano-beam and nano-target effects in ion radiation," *Nanoscale* **10** (2018) 1598-1606.
121. G-Y. Xu, A. Kushima, J-R. Yuan, H. Dou, W-J. Xue, X-G. Zhang, X-H. Yan and J. Li, "Ad hoc Solid Electrolyte on Acidized Carbon Nanotube Paper Improves Cycle Life of Lithium-Sulfur Batteries," *Energy & Environmental Science* **10** (2017) 2544-2551.
120. L-M. Suo, D. Oh, Y-X. Lin, Z-Q. Zhuo, O. Borodin, T. Gao, F. Wang, A. Kushima, Z-Q. Wang, H-C. Kim, Y. Qi, W-L. Yang, F. Pan, J. Li, K. Xu and C-S. Wang, "How Solid-Electrolyte Interphase Forms in Aqueous Electrolytes," *J. Am. Chem. Soc.* **10** (2017) 18670-18680.
119. W-J. Xue, L-X. Miao, L. Qie, C. Wang, S. Li, J-L. Wang and J. Li, "Gravimetric and volumetric energy densities of lithium-sulfur batteries," *Current Opinion in Electrochemistry* **6** (2017) 92-99.
118. S-T. Wang, W. Quan, Z. Zhu, Y. Yang, Q. Liu, Y. Ren, X-Y. Zhang, R. Xu, Y. Hong, Z-T. Zhang, K. Amine, Z-L. Tang, J. Lu and J. Li, "Lithium titanate hydrates with superfast and stable cycling in lithium ion batteries," *Nature Communications* **8** (2017) 627.

117. Y-M. Chen, X-Y. Li, K-S. Park, W. Lu, C. Wang, W-J. Xue, F. Yang, J. Zhou, L-M. Suo, T-Q. Lin, H-T. Huang, J. Li and J.B. Goodenough, "Nitrogen-Doped Carbon for Sodium-Ion Battery Anode by Self-Etching and Graphitization of Bimetallic MOF-Based Composite," *Chem* **3** (2017) 152-163.
116. S-L. Zhang, K-J. Zhao, T. Zhu and J. Li, "Electrochemomechanical degradation of high-capacity battery electrode materials," *Progress in Materials Science* **89** (2017) 479-521.
115. Y-H. Zheng, Y-S. Wang, Y-X. Lu, Y-S. Hu and J. Li, "A high-performance sodium-ion battery enhanced by macadamia shell derived hard carbon anode," *Nano Energy* **39** (2017) 489-498.
114. G-Y. Xu, Q-B. Yan, S-T. Wang, A. Kushima, P. Bai, K. Liu, X-G. Zhang, Z-L. Tang and J. Li, "A thin multifunctional coating on a separator improves the cyclability and safety of lithium sulfur batteries," *Chemical Science* **8** (2017) 6619-6625.
113. W-J. Xue, Q-B. Yan, G-Y. Xu, L-M. Suo, Y-M. Chen, C. Wang, C-A. Wang and J. Li, "Double-oxide sulfur host for advanced lithium-sulfur batteries," *Nano Energy* **38** (2017) 12-18.
112. M-J. Lee, E-S. Lho, P. Bai, S-J. Chae, J. Li and J-P. Cho, "Low-Temperature Carbon Coating of Nanosized  $\text{Li}_{1.015}\text{Al}_{0.06}\text{Mn}_{1.925}\text{O}_4$  and High-Density Electrode for High-Power Li-Ion Batteries," *Nano Letters* **17** (2017) 3744-3751.
111. W-Z. Han, J. Zhang, M-S. Ding, L. Lv, W-H. Wang, G-H. Wu, Z-W. Shan and J. Li, "Helium Nanobubbles Enhance Superelasticity and Retard Shear Localization in Small-Volume Shape Memory Alloy," *Nano Letters* **17** (2017) 3725-3730.
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109. W-B. Li, L. Sun, J-S. Qi, P. Jarillo-Herrero, M. Dinca and J. Li, "High temperature ferromagnetism in pi-conjugated two-dimensional metalorganic frameworks," *Chemical Science* **8** (2017) 2859-2867.
108. K. Liu, P. Bai, M.Z. Bazant, C-A. Wang and J. Li, "A soft non-porous separator and its effectiveness in stabilizing Li metal anodes cycling at 10 mA  $\text{cm}^{-2}$  observed in situ in a capillary cell," *Journal of Materials Chemistry A* **5** (2017) 4300-4307.
107. M. Li, D-G. Xie, E. Ma, J. Li, X-X. Zhang and Z-W. Shan, "Effect of hydrogen on the integrity of aluminium-oxide interface at elevated temperatures," *Nature Communications* **8** (2017) 14564.
106. Y. Jin, S. Li, A. Kushima, X-Q. Zheng, Y-M. Sun, J. Xie, J. Sun, W-J. Xue, G-M. Zhou, J. Wu, F-F. Shi, R-F. Zhang, Z. Zhu, K-P. So, Y. Cui and J. Li, "Self-healing SEI enables full-cell cycling of a silicon-majority anode with a coulombic efficiency exceeding 99.9%," *Energy & Environmental Science* **10** (2017) 580-592.

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104. S-T. Wang, Y. Yang, W. Quan, Y. Hong, Z-T. Zhang, Z-L. Tang and J. Li, "Ti<sup>3+</sup>-free three-phase Li<sub>4</sub>Ti<sub>5</sub>O<sub>12</sub>/TiO<sub>2</sub> for high-rate lithium ion batteries: Capacity and conductivity enhancement by phase boundaries," *Nano Energy* **32** (2017) 294-301.
103. Y.G. Li, Y. Yang, M.P. Short, Z.J. Ding, Z. Zeng and J. Li, "Ion radiation albedo effect: influence of surface roughness on ion implantation and sputtering of materials," *Nuclear Fusion* **57** (2017) 016038.
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101. S-Z. Li, Q-Y. Li, R.W. Carpick, P. Gumbsch, X.Z. Liu, X-D. Ding, J. Sun and J. Li, "The evolving quality of frictional contact with graphene," *Nature* **539** (2016) 541-545.
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99. K.P. So, X-H. Liu, H. Mori, A. Kushima, J.G. Park, H.S. Kim, S. Ogata, Y.H. Lee and J. Li, "Ton-scale metal-carbon nanotube composite: The mechanism of strengthening while retaining tensile ductility," *Extreme Mechanics Letters* **8** (2016) 245-250.
98. X-H. Liu, J-F. Gu, Y. Shen and J. Li, "Crystal metamorphosis at stress extremes: how soft phonons turn into lattice defects," *NPG Asia Materials* **8** (2016) e320.
97. J-Y. Zhang, Y-W. Mao, D. Wang, J. Li and Y-Z. Wang, "Accelerating ferroic ageing dynamics upon cooling," *NPG Asia Materials* **8** (2016) e319.
96. Q-J. Li, J. Li, Z-W. Shan and E. Ma, "Surface Rebound of Relativistic Dislocations Directly and Efficiently Initiates Deformation Twinning," *Phys. Rev. Lett.* **117** (2016) 165501.
95. Q-J. Li, J. Li, Z-W. Shan and E. Ma, "Strongly correlated breeding of high-speed dislocations," *Acta Materialia* **119** (2016) 229-241.
94. Z-Q. Liu, Z-Y. Yin, C. Cox, M. Bosman, X-F. Qian, N. Li, H-Y. Zhao, Y-P. Du, J. Li and D.G. Nocera, "Room temperature stable CO<sub>x</sub>-free H<sub>2</sub> production from methanol with magnesium oxide nanophotocatalysts," *Science Advances* **2** (2016) e1501425.
93. H-T. Zhang, J. Tersoff, S. Xu, H-X. Chen, Q-B. Zhang, K-L. Zhang, Y. Yang, C-S. Lee, K-N. Tu, J. Li and Y. Lu, "Approaching the ideal elastic strain limit in silicon nanowires," *Science Advances* **2** (2016) e1501382.

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91. H. Wang, G-Y. Gou and J. Li, "Ruddlesden-Popper perovskite sulfides A<sub>3</sub>B<sub>2</sub>S<sub>7</sub>: A new family of ferroelectric photovoltaic materials for the visible spectrum," *Nano Energy* **22** (2016) 507-513.
90. K.P. So, D. Chen, A. Kushima, M-D. Li, S-T. Kim, Y. Yang, Z-Q. Wang, J.G. Park, Y.H. Lee, R.I. Gonzalez, M. Kiwi, E.M. Bringa, L. Shao and J. Li, "Dispersion of carbon nanotubes in aluminum improves radiation resistance," *Nano Energy* **22** (2016) 319-327.
89. W-B. Li and J. Li, "Ferroelasticity and domain physics in two-dimensional transition metal dichalcogenide monolayers," *Nature Communications* **7** (2016) 10843.
88. X. Ge, C-D. Gu, Z-Y. Yin, X-L. Wang, J-P. Tu and J. Li, "Periodic stacking of 2D charged sheets: Self-assembled superlattice of NiAl layered double hydroxide (LDH) and reduced graphene oxide," *Nano Energy* **20** (2016) 185-193.
87. S-T. Kim, S.J. Choi, K-J. Zhao, H. Yang, G. Gobbi, S-L. Zhang and J. Li, "Electrochemically driven mechanical energy harvesting," *Nature Communications* **7** (2016) 10146.
86. N-Q. Zhang, Z-L. Zhu, H. Xu, X-P. Mao and J. Li, "Oxidation of ferritic and ferritic-martensitic steels in flowing and static supercritical water," *Corrosion Science* **103** (2016) 124-131.
85. W-B. Li and J. Li, "Piezoelectricity in two-dimensional group-III monochalcogenides," *Nano Research* **8** (2015) 3796-3802.
84. A. Kushima, T. Koido, Y. Fujiwara, N. Kuriyama, N. Kusumi and J. Li, "Charging/Discharging Nanomorphology Asymmetry and Rate-Dependent Capacity Degradation in Li-Oxygen Battery," *Nano Letters* **15** (2015) 8260-8265.
83. W. Guo, Z. Wang and J. Li, "Diffusive versus Displacive Contact Plasticity of Nanoscale Asperities: Temperature- and Velocity-Dependent Strongest Size," *Nano Letters* **15** (2015) 6582-6585.
82. S-Z. Li, Y-G. Li, Y-C. Lo, T. Neeraj, R. Srinivasan, X-D. Ding, J. Sun, L. Qi, P. Gumbsch and J. Li, "The interaction of dislocations and hydrogen-vacancy complexes and its importance for deformation-induced proto nano-voids formation in alpha-Fe," *Int. J. Plasticity* **74** (2015) 175-191.
81. D-G. Xie, Z-J. Wang, J. Sun, J. Li, E. Ma and Z-W. Shan, "In situ study of the initiation of hydrogen bubbles at the aluminium metal/oxide interface," *Nature Materials* **14** (2015) 899-903.
80. J. Li, "DISLOCATION NUCLEATION: Diffusive origins," *Nature Materials* **14** (2015) 656-657. News & Views.

79. W-B. Li, J.M. Rieser, A.J. Liu, D.J. Durian and J. Li, "Deformation-driven diffusion and plastic flow in amorphous granular pillars," *Phys. Rev. E* **91** (2015) 062212.
78. X-F. Qian, L. Fu and J. Li, "Topological crystalline insulator nanomembrane with strain-tunable band gap," *Nano Research* **8** (2015) 967-979.
77. C. Wang, X-S. Wang, Y. Yang, A. Kushima, J-T. Chen, Y-H. Huang and J. Li, "Slurryless Li<sub>2</sub>S/Reduced Graphene Oxide Cathode Paper for High-Performance Lithium Sulfur Battery," *Nano Letters* **15** (2015) 1796-1802.
76. A. Kushima, X-F. Qian, P. Zhao, S.L. Zhang and J. Li, "Ripplocations in van der Waals Layers," *Nano Letters* **15** (2015) 1302-1308.
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73. J. Li, Z-W. Shan and E. Ma, Guest Editors, "Elastic strain engineering for unprecedented materials properties," *MRS Bulletin* **39** (2014) 108-114.
72. M-H. Wu, X-F. Qian and J. Li, "Tunable Exciton Funnel Using Moire Superlattice in Twisted van der Waals Bilayer," *Nano Letters* **14** (2014) 5350-5357.
71. W-B. Li, H-Y. Fan and J. Li, "Deviatoric Stress-Driven Fusion of Nanoparticle Superlattices," *Nano Letters* **14** (2014) 4951-4958.
70. J-J. Niu, A. Kushima, X-F. Qian, L. Qi, K. Xiang, Y-M. Chiang and J. Li, "In Situ Observation of Random Solid Solution Zone in LiFePO<sub>4</sub> Electrode," *Nano Letters* **14** (2014) 4005-4010.
69. P-Y. Zhao, J. Li and Y-Z. Wang, "Extended defects, ideal strength and actual strengths of finite-sized metallic glasses," *Acta Materialia* **73** (2014) 149-166.
68. X-W. Fu, C. Su, Q. Fu, X-L. Zhu, R. Zhu, C-P. Liu, Z-M. Liao, J. Xu, W-L. Guo, J. Feng, J. Li and D-P. Yu, "Tailoring Exciton Dynamics by Elastic Strain-Gradient in Semiconductors," *Advanced Materials* **26** (2014) 2572-2579.
67. B-Y. Liu, J. Wang, B. Li, L. Lu, X-Y. Zhang, Z-W. Shan, J. Li, C-L. Jia, J. Sun and E. Ma, "Twinning-like lattice reorientation without a crystallographic twinning plane," *Nature Communications* **5** (2014) 3297.
66. J.P. Lin, X.D. Li, G.J. Qiao, Z. Wang, J. Carrete, Y. Ren, L.Z. Ma, Y.J. Fei, B.F. Yang, L. Lei and J. Li, "Unexpected High-Temperature Stability of beta-Zn<sub>4</sub>Sb<sub>3</sub> Opens the Door to Enhanced Thermoelectric Performance," *J. Am. Chem. Soc.* **136** (2014) 1497-1504.

65. M. Gu, A. Kushima, Y.Y. Shao, J-G. Zhang, J. Liu, N.D. Browning, J. Li and C.M. Wang, "Probing the Failure Mechanism of SnO<sub>2</sub> Nanowires for Sodium-Ion Batteries," *Nano Letters* **13** (2013) 5203-5211.
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59. A. Kushima, J.Y. Huang and J. Li, "Quantitative fracture strength and plasticity measurements of lithiated silicon nanowires by in situ TEM tensile experiments," *ACS Nano* **6** (2012) 9425-9432.
58. J. Li and L-Y. Bai, "DNA Nanotechnology: A metamaterial with memory," *Nature Nanotechnology* **7** (2012) 773-774.
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