

Zheng Jia

Address: 200 Latrobe Hall, 3400 N. Charles St, Baltimore, MD 21218

Email: cristianojz@gmail.com

Homepage: zhengjia.weebly.com

PROFESSIONAL EMPLOYMENT

- 2017.01-present **Postdoctoral Fellow**,
Hopkins Extreme Materials Institute, Johns Hopkins University
Advisor: Dr. Vicky Nguyen
- 2015.01-2016.12 **Postdoctoral Fellow**,
The Department of Mechanical Engineering, Northwestern University
Advisor: Dr. Wing Kam Liu

EDUCATION AND TRAINING

- 2009.09-2014.12 **Ph.D.**, Mechanical Engineering, University of Maryland-College Park
Advisor: Dr. Teng Li
- 2014.03-2014.07 **Visiting Ph.D.**, Engineering Sciences, Harvard University
Advisor: Dr. Zhigang Suo
- 2005.09-2009.07 **Bachelor**, Engineering Mechanics, Zhejiang University, China

RESEARCH INTERESTS

- **Mechanics of energy materials:** Si-based anodes in Li-ion batteries, black phosphorus anodes in Na-ion batteries, charging/discharging-induced stress/fracture/instability, lithiation kinetics
- **Mechanics of soft materials/devices:** tough/active interpenetrating polymers and hydrogels, dielectric elastomers, soft composites, experimental characterization of soft materials, collagen fibril
- **Applications of stimuli-responsive materials:** advanced manufacturing, energy storage, soft robotics, stretchable electronics
- **Mechanics of flexible and wearable electronics:** thin-film mechanics, multi-layer structures/composites, ITO electrodes, fracture, delamination, bifurcation, plasticity

ACADEMIC HONORS AND AWARDS

- Distinguished Dissertation Award, University of Maryland, 2014 (*sole recipient from the area of engineering, physical sciences and mathematics*)
- Graduate School Dean's Dissertation Fellowship, University of Maryland, 2013 (*sole recipient in College of Engineering, 11 out of 4000+ doctoral students across campus*)
- Ann G. Wylie Dissertation Fellowship, University of Maryland, 2013
- A.J. Clark School Future Faculty Fellow, University of Maryland, 2012
- Haythornthwaite Foundation Travel Award, ASME Applied Mechanics Division, 2011
- NSF Student Travel Award, NSF CMMI Conference, Atlanta, 2011
- Distinguished Undergraduate Student of Zhejiang Province, Zhejiang Provincial Government, 2009
- Distinguished Undergraduate Student of Zhejiang University, Zhejiang University, 2009
- National Scholarship, Chinese Ministry of Education, 2008
- Zhilun Xu Excellent Student of Mechanics, The Chinese Society of Theoretical and Applied Mechanics, 2008
- First-class Scholarship of Outstanding Undergraduate Student, Zhejiang University, 2006, 2008

JOURNAL PUBLICATIONS (Google citations>710; H-index=12)

indicates equal contribution * indicates corresponding author

1. H.Y. Guo, J. Cheng, J.Y. Wang, L. Wang, P. Huang, **Z. Jia**, X.Y. Chen, K.Y. Sui, T. Li, Z.H. Nie, Reprogrammable ultra-fast shape-transformation of macroporous composited hydrogel sheets, *Journal of Materials Chemistry B*, accepted (2017)
2. Y. Li, Z.L. Liu, **Z. Jia**, W.K. Liu, et al. Modular-based multiscale modeling on viscoelasticity of polymer nanocomposites, *Computational Mechanics*, 59:187 (2017)
3. **Z. Jia***, W.K. Liu*, Rate-dependent stress evolution in nanostructured Si anodes upon lithiation, *Applied Physics Letters*, 109, 163903 (2016)
4. **Z. Jia**, T. Li, Intrinsic stress mitigation via elastic softening during two-step electrochemical lithiation of amorphous silicon, *Journal of the Mechanics and the Physics of Solids*, 91, 278–290 (2016)
5. **Z. Jia***, W.K. Liu*, Analytical model on stress-regulated lithiation kinetics and fracture of Si-C yolk-shell anodes for lithium-ion batteries, *Journal of the Electrochemical Society*, 163 (6), A940-A946 (2016)
6. **Z. Jia**, T. Li, Failure mechanics of a wrinkling thin film anode on a substrate under cyclic charging and discharging, *Extreme Mechanics Letters*, 8, 273-282 (2016)
7. H.L. Zhu#, S.Z. Zhu#, **Z. Jia#(co-first author)**, S. Parvinian, Y.Y. Li, O. Vaaland, L.B. Hu, T. Li, Anomalous scaling law of strength and toughness of cellulose nanopaper, *Proceedings of the National Academy of Sciences*, vol. 112 no.29, 8971-8976 (2015)

Reported by [UMDRightNow](#), [PhysOrg](#), [The Economic Times](#), [R&D](#), [WorldNews](#), [NanoWerk](#), [GEEK](#)

8. **Z. Jia**, T. Li, Stress-modulated driving force for lithiation reaction in hollow nano-anodes, *Journal of Power Sources*, 275, 866–876 (2015)
9. X.G. Han#, Y. Liu#, **Z. Jia#(co-first author)**, Y.C. Chen, J.Y. Wan, N. Weadock, K.J. Gaskell, T. Li, L.B. Hu, Atomic-layer-deposition oxide nano-glue for sodium-ion batteries, *Nano Letters*, 14(1), 139-147 (2014)
10. Z.J. Wei, **Z. Jia**, J. Athas, P. Huang, T. Li, C.Y. Wang and Z.H. Nie, Hybrid hydrogel sheets that undergo pre-programmed shape transformations, *Soft Matters*, 10, 8157-8162 (2014)
11. J.Y. Wan#, A.F. Kaplan#, **Z. Jia#(co-first author)**, X.G. Han, Y.C. Chen, N. Faenza, N.J. Weadock, T. Li, J. Guo, L.B. Hu, Two dimensional silicon nanowalls for lithium ion batteries, *Journal of Materials Chemistry A*, 2, 6051-6057 (2014)
12. H.L. Zhu#, **Z. Jia#(co-first author)**, Y.C. Chen, J.Y. Wan, N.J. Weadock, Y.Y. Li, O. Vaaland, X.G. Han, T. Li, L.B. Hu, Tin anode for sodium-ion batteries using natural wood fiber as a mechanical buffer and electrolyte reservoir, *Nano Letters*, 13(7), 3093-3100 (2013)

Reported by [NSF](#), [NPR](#), [The Economist](#), [Forbes](#), [PhysOrg](#), [NewScientist](#), [NanoWerk](#), [UMD Right Now](#), [ACS](#), [Science Daily](#), [The Times of India](#)

13. **Z. Jia**, T. Li, Necking limit of substrate-supported metal layers under biaxial in-plane loading, *International Journal of Plasticity*, 51, 65-79 (2013)
14. C.F. Sun#, K. Karki#, **Z. Jia#(co-first author)**, H.W. Liao, Y. Zhang, J. Cummings, T. Li, Y. Qi, Y.H. Wang, A beaded-string silicon anodes, *ACS Nano*, 7(3), 2717-2724 (2013)

Reported by [PhysOrg](#), [Nano Werk](#), [IEEE Spectrum](#), [CMNS News](#), [Maryland NanoCenter](#)

15. K. Karki, E. Epstein, J. Cho, **Z. Jia**, T. Li, S.T. Picraux, C. Wang, J. Cumings, Lithium-assisted electrochemical welding in silicon nanowire battery electrodes, *Nano Letters*, 12, 1392-1397 (2012)
16. C. Peng, **Z. Jia**, D. Bianculli, T. Li, J. Lou, In situ electro-mechanical experiments and mechanics modeling of fracture in indium tin oxide-based multilayer electrodes, *Advanced Engineering Materials*, 15:250-256 (2012)
17. **Z. Jia**, C. Peng, J. Lou, T. Li, A map of competing buckling-driven failure modes of substrate-supported thin brittle films, *Thin Solid Films*, 520, 6576-6580 (2012)
18. O. Graudejus, **Z. Jia**, T. Li, S. Wagner, Size-dependent rupture strain of elastically stretchable metal conductors, *Scripta Materilia*, 66, 919-922 (2012)
19. C. Peng, **Z. Jia**, D. Bianculli, T. Li, J. Lou, In situ electro-mechanical experiments and mechanics modeling of tensile cracking in indium tin oxide thin films on polyimide substrates, *Journal Applied Physics*, 109, 103530 (2011)
20. **Z. Jia**, M. B. Tucker, T. Li, Failure mechanics of organic-inorganic multilayer permeation barriers in flexible electronics, *Composites Science and Technology*, 71, 365-372 (2011)

Publications in Preparation

21. **Z. Jia**, T. Li, Bifurcation instability in substrate-supported metal layers under biaxial loading, *in preparation*
22. **Z. Jia**, T. Li, Effect of interfacial stiffness on deformation instability in substrate-supported metal layers under biaxial in-plane loading, *in preparation*
23. J. Cheng, **Z. Jia**, T. Li, Dielectric-elastomer-based force sensor with enhanced sensitivity, *in preparation*

PRESENTATIONS**Invited Presentations at Peer Institutes**

1. Extreme deformation in highly deformable materials: from fundamental physics to advanced applications, *School of Mechanical and Aerospace Engineering, Nanyang Technological University, Singapore*, November, 2016
2. Electro-chemo-mechanics in advanced materials: lithium-ion batteries and beyond, *Department of Engineering Mechanics, Zhejiang University, China*, May, 2016
3. Electro-chemo-mechanics in advanced materials: lithium-ion batteries and beyond, *University of Michigan – Shanghai Jiao Tong University Joint Institute, China*, May, 2016

Invited Conference Presentations

1. Z. Jia, T. Li, Intrinsic stress mitigation via elastic softening during two-step electrochemical lithiation of amorphous silicon, *SES2016*, University of Maryland, College Park, MD, 2016

Peer-reviewed Conference Presentations

1. Z. Jia, W.K. Liu, Rate-dependent stress evolution in nanostructured Si anodes upon lithiation, *SES2016*, University of Maryland, College Park, MD, 2016
2. Z. Jia, T. Li, Failure Mechanics of a wrinkling thin film anode on a substrate under cyclic charging and discharging, *SES2016*, University of Maryland, College Park, MD, 2016
3. Z. Jia, T. Li, Wrinkling, ratcheting and necking: A failure mode of tin anodes in sodium-ion battery, *USNCTAM 2014*, Michigan State University, East Lansing, MI, 2014
4. Z. Jia, T. Li, Stress-modulated driving force for lithiation reaction in hollow nano-anodes, *Materials Research Society 2013 Fall Meeting*, Boston, MA, 2013
5. Z. Jia, C.F. Sun, K. Karki, H.W. Liao, Y. Zhang, J. Cummings, T. Li, Y. Qi, Y.H. Wang, A beaded-string silicon anode for lithium ion battery, *ASME International Mechanical Engineering Congress*, San Diego, CA, 2013
6. Z. Jia, T. Li, Bifurcation instability in substrate-supported metal layers under biaxial loading, *ASME International Mechanical Engineering Congress*, San Diego, CA, 2013
7. Z. Jia, Z.J. Wei, J. Athas, P. Huang, T. Li, C.Y. Wang and Z.H. Nie, Programmable morphologies of chemical gel-physical gel hybrids, *ASME International Mechanical Engineering Congress*, San Diego, CA, 2013

8. Z. Jia, J.Y. Wan, A.F. Kaplan, X.G. Han, Y.C. Chen, N. Faenza, N.J. Weadock, T. Li, J. Guo, L.B. Hu, Silicon nanowall anodes for lithium-ion batteries, *ASME International Mechanical Engineering Congress*, San Diego, CA, 2013
9. Z. Jia, T. Li, Stress-modulated driving force for lithiation reaction in hollow nano-anodes, *ASME 2013 International Mechanical Engineering Congress*, San Diego, CA, 2013
10. Z. Jia, T. Li, Stress-modulated driving force for lithiation reaction in hollow nano-anodes, *SES50th Annual Technical Meeting and ASME-AMD Annual Summer Meeting*, Providence, RI, 2013
11. Z. Jia, T. Li, Bifurcation instability in substrate-supported metal layers under biaxial loading, *SES50th Annual Technical Meeting and ASME-AMD Annual Summer Meeting*, Providence, RI, 2013
12. Z. Jia, T. Li, Necking limit of substrate-supported thin metal films under biaxial deformation, *Materials Research Society 2012 Fall Meeting*, Boston, MA, 2012
13. Z. Jia, T. Li, C. Peng, H. Neilson, J. Lou, Indium tin oxide-based multi-layers: A solution toward transparent conducting electrodes of high electro-mechanical durability, *Materials Research Society 2012 Fall Meeting*, Boston, MA, 2012
14. Z. Jia, T. Li, Necking limit of polymer-supported metal films under arbitrary in-plane loads, *ASME 2012 International Mechanical Engineering Congress & Exposition*, Houston, TX, 2012
15. Z. Jia, T. Li, C. Peng, H. Neilson, J. Lou, In situ electromechanical experiments and mechanics modeling of fracture in indium tin oxide-based multilayer electrodes, *ASME 2012 International Mechanical Engineering Congress & Exposition*, Houston, TX, 2012
16. Z. Jia, M. B. Tucker, T. Li, Failure mechanics of functional hybrid multilayers in flexible electronics, *NSF CMMI Grantee Conference*, Boston, MA, 2012
17. Z. Jia, T. Li, Cheng Peng, Dan Bianculli, Jun Lou, In situ experiments and mechanics modeling of tensile cracking and buckling-driven failure in indium tin oxide thin films on polyimide substrates, *ASME 2011 International Mechanical Engineering Congress & Exposition*, Denver, CO, 2011
18. Z. Jia, M. B. Tucker, T. Li, Failure mechanics of multilayer permeation barriers in flexible electronics, *NSF CMMI Grantee Conference*, Atlanta, GA, 2011

TEACHING EXPERIENCE

- ENME670: Continuum Mechanics, University of Maryland, Fall 2013 (co-instructor)
- ENME670: Continuum Mechanics, University of Maryland, Fall 2012 (teaching assistant)

SYNERGISTIC ACTIVITIES

Conference Symposium Organizer

- Co-organizer, Symposium on Mechanics and Electrochemistry of Energy Materials, SES 53rd Annual Technical Meeting, College Park, 2016.10
- Co-organizer, Symposium on Mechanics of Integrated Structures and Materials in Advanced Technologies, ASME International Mechanical Engineering Congress, Houston, 2015.11

Reviewer for 10+ Journals

Nature Scientific Reports, Extreme Mechanics Letters, International Journal of Solids and Structures, Mechanics of Materials, Computational Mechanics, Nanoscale, Physical Chemistry Chemical Physics, Journal of Materials Chemistry A, Chemical Communications, RSC Advances, Journal of Physics D: Applied Physics, Microelectronics Reliability, New Journal of Chemistry, Journal of Electrochemical Energy Conversion and Storage, Materials Research Express