

## Feifei Fan

Department of Mechanical Engineering  
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[Lab Webpage](#) | [Google Scholar](#) | [Scopus Author](#)

### EDUCATION

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<b>Ph.D. Mechanical Engineering</b> , Georgia Institute of Technology Area: Mechanics of Materials	06/2015
<b>M.S. Mechanical Engineering</b> , University of Nevada, Reno Area: Mechanical Behavior of Materials	03/2008
<b>B.S. Engineering Mechanics</b> , Shanghai Jiao Tong University	07/2005

### EMPLOYMENT

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<b>Assistant Professor</b> Department of Mechanical Engineering, University of Nevada, Reno	07/2015 – present
<b>Seismic/Stress Analysis Engineer</b> The Shaw Group Inc., U.S. DOE's Savannah River Site	04/2008 – 06/2010

### HONORS & AWARDS

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2020	National Science Foundation Faculty Early Career Award
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### FEDERALLY FUNDED RESEARCH (*Fan portion: \$1.019M*)

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Project	Role of Heterogeneities in Electro-Chemo-Mechanics of Electrodes and Interfaces
Source	<b>National Science Foundation CAREER</b>
Team	<b>PI: F Fan</b>
Amount	\$500K ( <i>Fan portion: \$500K</i> )
Duration	03/2020 – 02/2025
Project	Designing and Processing Microstructurally Tailored Graphene Aerogels with An Understanding of Deformation and Failure Mechanisms
Source	<b>National Science Foundation (CMMI-MOMS)</b>
Team	<b>PI: F Fan; Co-PI: G Xiong (UNR)</b>
Amount	\$470K ( <i>Fan portion: \$235K</i> )
Duration	09/2019 – 08/2022
Project	High Energy Density Battery Materials at Low Temperatures for Future NASA Missions
Source	<b>National Aeronautics and Space Administration (EPSCOR-CAN)</b>
Team	Administrative PI: L Fenstermaker (DRI); <b>Science PI: F Fan</b> ; Co-PIs: D Chidambaram (UNR), X Wang (DRI), Q Zhu (UNLV)
Amount	\$1.125M (NASA: \$750K; State Match: \$375K) ( <i>Fan portion: \$284K</i> )
Duration	07/2019 – 06/2022

### TEACHING

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<b>University of Nevada, Reno</b> , Department of Mechanical Engineering
<ul style="list-style-type: none"><li>• Computational Structural Analysis (ME751), 2015F, 2016F, 2017F, 2020F</li><li>• Finite Element Analysis (ME493, ME457), 2016S, 2017S, 2018S, 2019S, 2020S</li></ul>

- Mechanics of Composite Materials (ME446/646), 2018F, 2019F, 2020F

## PROFESSIONAL SERVICE

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<b>Panelist</b>	NSF (Division of Civil, Mechanical and Manufacturing Innovation · Division of Chemical, Bioengineering, Environmental and Transport Systems)
<b>Peer Reviewer</b>	ACS Applied Materials & Interfaces · ACS Nano · Applied Surface Science · Chemistry of Materials · Current Opinion in Chemical Engineering · Engineering Fracture Mechanics · Extreme Mechanics Letters · Journal of Materials Engineering and Performance · Journal of the Electrochemical Society · Materials Characterization · Metallurgical and Materials Transactions A · RCS Advances, Scripta Materialia

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## PUBLICATIONS (Google Scholar: citations 3300+ H-index 22; Scopus: citations 2600+ H-index 22)

Student and post-doctoral advisees are underscored. <sup>c</sup> Corresponding author. \* Equal contributions.

### Journal Articles

[2020]

1. L Cao, **F Fan**<sup>c</sup>. Deformation and instability of three-dimensional graphene honeycombs under in-plane compression: atomistic simulations. *Extreme Mechanics Letters* 39, 100861.
2. L Cao, Z Zeng, **F Fan**<sup>c</sup>. Effect of lattice defects on the plastic Poisson's ratio of nanoporous gold. *Scripta Materialia* 185, 175-180.

[2019]

3. L Cao, H Yang, **F Fan**<sup>c</sup>. Stress generation during anisotropic lithiation in silicon nanopillars: a reactive force field study. *Physics Letters A* 383 (33), 125955.
4. J Zhu, M Guo, Y Liu, X Shi, **F Fan**, M Gu<sup>c</sup>, H Yang<sup>c</sup>. In situ TEM study of lithiation/delithiation behaviors of phosphorus-doped silicon nanowires. *ACS Applied Materials and Interfaces* 11 (19), 17313-17320.
5. P Sun<sup>c</sup>, J Davis III, L Cao, Z Jiang, JB Cook, H Ning, J Liu, S Kim, **F Fan**, RG Nuzzo, P Braun<sup>c</sup>. High capacity 3D structured tin-based electroplated Li-ion battery anodes. *Energy Storage Materials* 17, 151-156.

[2018]

6. X Shi, J Zhu, Y Xia, **F Fan**, F Zhang, M Gu<sup>c</sup>, H Yang<sup>c</sup>. Ultra-high malleability of the lithiation-induced LixSi phase. *ACS Applied Energy Materials* 1 (8), 4211-4220.
7. **F Fan**<sup>c</sup>, H Yang, Z Zeng. An atomistic perspective on lithiation-induced stress in silicon nanopillars. *Scripta Materialia* 152, 74-78.
8. D Wu<sup>c</sup>, A Ren, W Zhang, **F Fan**, P Liu, X Fu, J Terpeny. Cybersecurity for digital manufacturing. *Journal of Manufacturing Systems* 48, 3-12.

[2016]

9. J Wang<sup>c</sup>, H Luo, Y Liu, Y He, **F Fan**, Z Zhang, SX Mao<sup>c</sup>, C Wang<sup>c</sup>, T Zhu. Tuning the outward to inward swelling in lithiated silicon nanotubes via surface oxide coating. *Nano Letters* 16 (9), 5815-5822.
10. Y He, L Zhong, **F Fan**, C Wang<sup>c</sup>, T Zhu<sup>c</sup>, SX Mao<sup>c</sup>. In situ observation of shear-driven amorphization in silicon crystals. *Nature Nanotechnology* 11 (10), 866-871.

[2015]

11. X Wang, Z Pan, **F Fan**, J Wang, Y Liu, SX Mao, T Zhu, S Xia<sup>c</sup>. Nanoscale deformation analysis with high-resolution transmission electron microscopy and digital image correlation. *Journal of Applied Mechanics* 82 (12), 121001.
12. F Wu, JT Lee, **F Fan**, N Nitta, H Kim, T Zhu, G Yushin<sup>c</sup>. A hierarchical particle-shell architecture for long-term cycle stability of Li<sub>2</sub>S cathodes. *Advanced Materials* 27 (37), 5579-5586.

13. X Wang, **F Fan**, J Wang, H Wang, S Tao, A Yang, Y Liu, HB Chew, SX Mao, T Zhu<sup>c</sup>, S Xia<sup>c</sup>. High damage tolerance of electrochemically lithiated silicon. *Nature Communications* 6, 8417.
14. H Yin, HJ Qi, **F Fan**, T Zhu, B Wang, Y Wei<sup>c</sup>. Griffith criterion for brittle fracture in graphene. *Nano Letters* 15 (3), 1918-1924.  
[2014]
15. H Yang, **F Fan**, W Liang, X Guo, T Zhu, S Zhang<sup>c</sup>. A chemo-mechanical model of lithiation in silicon. *Journal of the Mechanics and Physics of Solids* 70, 349-361.
16. Y Liu\*, **F Fan\***, J Wang, Y Liu, H Chen, KL Jungjohann, Y Xu, Y Zhu, D Bigio, T Zhu<sup>c</sup>, C Wang<sup>c</sup>. In situ transmission electron microscopy study of electrochemical sodiation and potassiation of carbon nanofibers. *Nano Letters* 14 (6), 3445-3452.
17. P Zhang, L Ma, **F Fan**, Z Zeng, C Peng, PE Loya, Z Liu, Y Gong, J Zhang, X Zhang, PM Ajayan, T Zhu<sup>c</sup>, J Lou<sup>c</sup>. Fracture toughness of graphene. *Nature Communications* 5, 3782.
18. L Chen, **F Fan**, L Hong, J Chen, YZ Ji, SL Zhang, T Zhu, LQ Chen<sup>c</sup>. A phase-field model coupled with large elasto-plastic deformation: application to lithiated silicon electrodes. *Journal of The Electrochemical Society* 161 (11), F3164-F3172.
19. J Wang, **F Fan**, Y Liu, KL Jungjohann, SW Lee, SX Mao<sup>c</sup>, X Liu<sup>c</sup>, T Zhu<sup>c</sup>. Structural evolution and pulverization of tin nanoparticles during lithiation-delithiation cycling. *Journal of The Electrochemical Society* 161 (11), F3019-F3024.  
[2013]
20. W Liang, L Hong, H Yang, **F Fan**, Y Liu, H Li, J Li, JY Huang, LQ Chen, T Zhu, S Zhang<sup>c</sup>. Nanovoid formation and annihilation in gallium nanodroplets under lithiation-delithiation cycling. *Nano Letters* 13 (11), 5212-5217.
21. **F Fan**, S Huang, H Yang, M Raju, D Datta, VB Shenoy, ACT Van Duin, S Zhang, T Zhu<sup>c</sup>. Mechanical properties of amorphous LixSi alloys: a reactive force field study. *Modelling and Simulation in Materials Science and Engineering* 21 (7), 074002.
22. S Huang, **F Fan**, J Li, S Zhang, T Zhu<sup>c</sup>. Stress generation during lithiation of high-capacity electrode particles in lithium ion batteries. *Acta Materialia* 61 (12), 4354-4364.
23. W Liang, H Yang, **F Fan**, Y Liu, XH Liu, JY Huang, T Zhu<sup>c</sup>, S Zhang<sup>c</sup>. Tough germanium nanoparticles under electrochemical cycling. *ACS Nano* 7 (4), 3427-3433.
24. J Wang, Y He, **F Fan**, XH Liu, S Xia, Y Liu, CT Harris, H Li<sup>c</sup>, JY Huang, SX Mao<sup>c</sup>, T Zhu<sup>c</sup>. Two-phase electrochemical lithiation in amorphous silicon. *Nano letters* 13 (2), 709-715.
25. XH Liu<sup>c</sup>, **F Fan**, H Yang, S Zhang, JY Huang<sup>c</sup>, T Zhu<sup>c</sup>. Self-limiting lithiation in silicon nanowires. *ACS Nano* 7 (2), 1495-1503.  
[2012]
26. XH Liu, JW Wang, S Huang, **F Fan**, X Huang, Y Liu, S Krylyuk, J Yoo, SA Dayeh, AV Davydov, SX Mao, ST Picraux, S Zhang, J Li, T Zhu<sup>c</sup>, JY Huang<sup>c</sup>. In situ atomic-scale imaging of electrochemical lithiation in silicon. *Nature Nanotechnology* 7 (11), 749-756.
27. H Yang, S Huang, X Huang, **F Fan**, W Liang, XH Liu, LQ Chen, JY Huang, J Li<sup>c</sup>, T Zhu<sup>c</sup>, S Zhang<sup>c</sup>. Orientation-dependent interfacial mobility governs the anisotropic swelling in lithiated silicon nanowires. *Nano Letters* 12 (4), 1953-1958.  
[2009]
28. S Kalnaus, **F Fan**, Y Jiang<sup>c</sup>, AK Vasudevan. An experimental investigation of fatigue crack growth of stainless steel 304L. *International Journal of Fatigue* 31 (5), 840-849.  
[2008]
29. **F Fan**, S Kalnaus, Y Jiang<sup>c</sup>. Modeling of fatigue crack growth of stainless steel 304L. *Mechanics of Materials* 40 (11), 961-973.
30. S Kalnaus, **F Fan**, AK Vasudevan, Y Jiang<sup>c</sup>. An experimental investigation on fatigue crack growth of AL6XN stainless steel. *Engineering Fracture Mechanics* 75 (8), 2002-2019.

**Book Chapters**

[2016]

1. **F Fan**<sup>c</sup>, T Zhu. Modeling of lithiation in silicon electrodes. In CR Weinberger, GJ Tucker (Eds.). *Multiscale Materials Modeling for Nanomechanics*, 489-506. Springer International Publishing.

**Manuscripts under Review/in Preparation**

1. **L Cao**, **F Fan**<sup>c</sup>. Influence of mechanics on lithium dendrite growth in solid state batteries: a phase-field study.
2. **F Fan**<sup>c</sup>, Z Zeng. Modeling of plasticity and hardening in gradient nano-grained copper.

**GRADUATED PHD STUDENTS**

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| Luoxia Cao | Thesis: Understanding deformation mechanisms in architected nanomaterials by predictive modeling and simulations, Graduation: 12/2019. |
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