SHENGQIANG CAI

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Mechanical and Aerospace Engineering
Material Science Program
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EMPLOYMENT

University of California, San Diego (11/2012-present)
Assistant professor

EDUCATION

Harvard University (8/2007-7/2011)
PhD, Mechanical Engineering
Advisor: Zhigang Suo

University of Science and Technology of China (9/2004-7/2007)
Master of Engineering, Solid Mechanics
Advisor: Yuanming Xia

University of Science and Technology of China (9/2000-7/2004)
Bachelor of Science, Theoretical and Applied Mechanics

RESEARCH INTERESTS

Solid Mechanics
Mechanics of soft materials
Mechanics of biological materials
Active materials and structures
Fracture and fatigue properties of polymer
Instability
Multifield coupling phenomena

AWARDS AND HONORS

2016 National Science Foundation CAREER Award
2016 Hellman Fellowship
2014 ASME AMD award: The Robert M. and Haythornthwaite Foundation Research Initiation
2012 Chinese Government Award for Outstanding Self-Financed Students Abroad
2012 Shapiro Fellowship, **MIT**
2008 Robert L. Wallace Prize Fellowhsip, **Harvard**
2006 Guanghua Scholarships for Graduates, **USTC**
2005 "Three Good" Student in Anhui Province, **Anhui Province**
2005 Outstanding graduate student of University of Science and Technology of China.
2004 Base Camp of Mechanics Scholarship, **Chinese Academy of Sciences**
2003 Samsung Scholarship, **USTC**

INVITATED TALKS

2017 "**Liquid Crystal Elastomer as a Soft Actuating Material**", Dept. of Civil and Environmental Engineering, University of Illinois Urbana-Champaign

2017 "**Active deformation and instabilities in soft materials**", Center for Mechanics of Solids, Structures and Materials, The University of Texas at Austin

2016 "**Mechanical instability and morphology**" Dept. of Mechanical and Aerospace Engineering, University of California, San Diego

2016 "**Mechanical instabilities in soft materials**" Society of engineering science 53rd annual technical meeting, College Park, VA

2015 "**Instabilities in soft active materials undergoing large deformation**", Dept. of Materials Science and Engineering, UCLA

2013 "**Large deformation and instabilities in soft materials**", Caltech

2013 "**Soft materials for soft machines**", Dept. of Material Science and Engineering, University of Science and Technology of China, China

2012 "**Soft materials for soft Machines**" Dept. of Mechanical Engineering, Zhejiang University, China

2012 "**Mechanical instabilities in soft materials**" International Symposium on Current Problems in Solid Mechanics in Honor of Professor R. J. Clifton, Symi, Greece

2012 "**Thermodynamics of soft active materials**" Dept. of Macromolecular Science, Fudan University, China

2012 "**Soft materials for soft Machines**" Dept. of Mechanical and Aerospace Engineering, University of California, San Diego

2011 "**Mechanics of soft active materials**" Dept. of Mechanical and Aerospace Engineering, Cornell University

REVIEWER FOR JOURNAL PUBLICATIONS:

International Journal of Solids and Structures
Journal of the Mechanics and Physics of Solids
Journal of Applied Mechanics
Mechanics of Materials
Polymer international
Energy and Environmental Science
Extreme Mechanics Letters
Applied Physics Letter
Soft Matter
Advanced Materials
Advanced Functional Materials
Polymer
International Journal of Applied Mechanics
Smart and Nano Materials
Proceeding of Royal Society A
Nature Communications
Journal of Mechanical Behavior of Biomedical Materials
ACS Applied Materials & Interfaces
Journal of Intelligent Material Systems and Structures
Composites Part B
International Journal of Fracture
Journal of Polymer Science, Part B: Polymer Physics
ACS Macro Letters

PEER REVIEWED PUBLICATIONS

1. Y. Zheng, Al Crosby, **S. Q. Cai**, "Indentation of a stretched elastomer," *Journal of the Mechanics and Physics of Solids*, pp. 145-159,2017.

2. J. Kang, C. Wang, **S. Q. Cai,** "Cavitation to Fracture Transition in a Soft Solid," *Soft Matter*, DOI: 10.1039/C7SM01479A, 2017.

3. J. Hu, S. Jafari, Y. Han, A J Grodzinsky, **S. Q. Cai**, M. Guo, "Size and speed dependent mechanical behavior in living mammalian cytoplasm," *Proceedings of the National Academy of Sciences*, 2017.

4. X. Liang, Z. Zhang, A. Sathisha, **S. Q. Cai**, P. Bandaru, "Light induced reversible and irreversible mechanical responses in nanotube-polymer composites," *Composites Part B: Engineering*, 2017

5. X. Liang, **S. Q. Cai**, "New electromechanical instability modes in dielectric elastomer balloons," *International Journal of Solids and Structures*, 2017

6. Z. Wang, H. Tian, Q. He, **S. Q. Cai**, "Reprogrammable, reprocessible and self-healable liquid crystal elastomer with exchangeable disulfide bonds," *ACS Applied Materials & Interfaces*, 2017.

7. A. Minori, S. Jadhav, Q. He, **S. Q. Cai**, M.T.Tolley, "Reversible actuation of origami inspired composites using liquid crystal elastomers," *Conference on Smart Materials, Adaptive Structures and Intelligent Systems*, Snowbird, Utah, 2017**.**

8. Caleb Christianson, Nathaniel Goldberg, **S. Q. Cai**, Michael T. Tolley, "Fluid electrodes for submersible robotics based on dielectric elastomer actuators," *Proc. SPIE 10163, Electroactive Polymer Actuators and Devices (EAPAD)* 2017.

9. Wingert, M. C., Jiang, Z., Chen, R., & **S. Q. Cai**, "Strong size-dependent stress relaxation in electrospun polymer nanofibers," *Journal of Applied Physics*, 121(1), 015103,2017.

10. Alvin W Su, Yunchan Chen, Dustin Wailes, Van Wong, **S. Q. Cai**, Albert C Chen, William D Bugbee, Robert Sah. "Impact Insertion of Osteochondral Grafts: Interference Fit and Central Graft Reduction Affect Biomechanics and Cartilage Damage," *Journal of Orthopaedic Research*, DOI: 10.1002/jor.23645, 2017.

11. H. Wang, K. Wang, W. Fan, **S. Q. Cai**, "Rupture of swollen styrene butadiene rubber," *Polymer Testing*, 2017.

12. W. Fan, Y. Wang, **S. Q. Cai**, "Fatigue fracture of a highly stretchable acrylic elastomer," *Polymer Testing*, Vol. 61, pp.373-377, 2017.

13. B. Sun, Z. Wang, Q. He, W. Fan , **S. Q. Cai**, "Porous double network gel with high toughness, high stretchability and superfast solvent-absorption," *Soft Matter*, DOI: 10.1039/c7sm01102d,2017.

14. K. Li and **S.Q.Cai**, "Modelling of Light-driven bending vibration of a liquid crystal elastomer beam," *Journal of Applied Mechanics*, vol 83, pp.1-6,2016.

15. S. Cui, C.Ahn, D. Leung, M. C. Wingert, **S. Q. Cai** and R.K. Chen, " Bio-inspired Effective and Regenerable Building Cooling Using Tough Hydrogels," *Applied Energy*, vol 268, pp.332-339,2016.

16. Liang, X., Tao, F., and **S. Q. Cai**, "Creasing of an everted elastomer tube," *Soft Matter*, 12, 7726-7730,2016.

17. Wingert, M. C., Kwon, S., **S. Q. Cai**., & Chen, R, "Fluid-like Surface Layer and Its Flow Characteristics in Glassy Nanotubes," *Nano Letters*, 2016.

18. He, Q., Wang, Z., Yan, Y., Zheng, J., & **S. Q. Cai**. " Polymer nanofiber reinforced double network gel composites: strong, tough and transparent," *Extreme Mechanics Letters*,2016.

19. Fan, W, Wang, Z., & **S. Q. Cai**, "Rupture of Polydomain and Monodomain Liquid Crystal Elastomer," *International Journal of Applied Mechanics*, 2016.

20. Wang, Z., Fan, W., He, Q., Wang, Y., Liang, X., & **S. Q. Cai**, "A simple and robust way towards reversible mechanochromism: Using liquid crystal elastomer as a mask," *Extreme Mechanics Letters*,2016.

21. X. D. Liang and **S. Q. Cai**, "Gravity induced crease-to-wrinkle transition in soft materials," *Applied Physics Letters*, vol. 106, Jan 26 2015.

22. X. D. Liang, K. Li, and **S. Q. Cai**, "Drying-Induced Deformation in Fiber-Embedded Gels to Mimic Plant Nastic Movements," *International Journal of Applied Mechanics,* vol. 7, Apr 2015.

23. H. M. Wang and **S. Q. Cai**, "Cavitation in a swollen elastomer constrained by a non-swellable shell," *Journal of Applied Physics,* vol. 117, Apr 21 2015.

24. H. M. Wang and **S. Q. Cai**, "Drying-induced cavitation in a constrained hydrogel," *Soft Matter,* vol. 11, pp. 1058-1061, 2015.

25. **S. Q. Cai,** "Bending a beam by a generalized ideal elastomeric gel," *Proceedings of the Royal Society of London A,* vol. 471, pp. 1-10, 2015.

26. X. D. Liang and **S. Q. Cai**,, "Shape bifurcation of a spherical dielectric elastomer balloon under the actions of internal pressure and electric voltage," *Journal of Applied Mechanics,* vol. 82, pp. 1-8, 2015.

27. C.H. Ahn, X. D. Liang and **S. Q. Cai**, "Inhomogeneous stretch induced patterning of molecular orientation in liquid crystal elastomers," *Extreme Mechanics Letter*, vol.5, pp.30-36,2015.

28. K. Li and **S. Q. Cai**, "Wet adhesion between two soft layers," *Soft Matter*, vol. 10, pp. 8202-8209, 2014.

29. K. Li, P. Y. Wu, and **S. Q. Cai**, "Chemomechanical oscillations in a responsive gel induced by an autocatalytic reaction," *Journal of Applied Physics,* vol. 116, Jul 28 2014.

30. K. Li, K. W. Ding, and **S. Q. Cai**, "Diffusion-induced wrinkling instability in a circular poroelastic plate," *Applied Physics Letters,* vol. 102, Jun 17 2013.

31. H. M. Wang, M. Lei, and **S. Q. Cai**, "Viscoelastic deformation of a dielectric elastomer membrane subject to electromechanical loads," *Journal of Applied Physics,* vol. 113, Jun 7 2013.

32. F. Weiss, **S. Q. Cai**, Y. H. Hu, M. K. Kang, R. Huang, and Z. G. Suo, "Creases and wrinkles on the surface of a swollen gel," *Journal of Applied Physics,* vol. 114, Aug 21 2013.

33. N. Zalachas, **S. Q. Cai**, Z. G. Suo, and Y. Lapusta, "Crease in a ring of a pH-sensitive hydrogel swelling under constraint," *International Journal of Solids and Structures,* vol. 50, pp. 920-927, Mar 15 2013.

34. T. Q. Lu, **S. Q. Cai**, H. M. Wang, and Z. G. Suo, "Computational model of deformable lenses actuated by dielectric elastomers," *Journal of Applied Physics,* vol. 114, Sep 14 2013.

35. **S. Q. Cai**, D. Y. Chen, Z. G. Suo, and R. C. Hayward, "Creasing instability of elastomer films," *Soft Matter,* vol. 8, pp. 1301-1304, 2012.

36. **S. Q. Cai** and Z. G. Suo, "Equations of state for ideal elastomeric gels," *Epl,* vol. 97, Feb 2012.

37. C. C. Foo, **S. Q. Cai**, S. J. A. Koh, S. Bauer, and Z. G. Suo, "Model of dissipative dielectric elastomers," *Journal of Applied Physics,* vol. 111, Feb 1 2012.

38. H. M. Wang, **S. Q. Cai**, F. Carpi, and Z. G. Suo, "Computational Model of Hydrostatically Coupled Dielectric Elastomer Actuators," *Journal of Applied Mechanics-Transactions of the Asme,* vol. 79, May 2012.

39. D. Y. Chen, **S. Q. Cai**, Z. G. Suo, and R. C. Hayward, "Surface Energy as a Barrier to Creasing of Elastomer Films: An Elastic Analogy to Classical Nucleation," *Physical Review Letters,* vol. 109, Jul 16 2012.

40. Y. C. Lou, A. Robisson, **S. Q. Cai**, and Z. G. Suo, "Swellable elastomers under constraint," *Journal of Applied Physics,* vol. 112, 2012.

41. K. Li, D. L. Ge, and **S. Q. Cai**, "Gravity-induced wrinkling of thin films on soft substrates," *Europhysics Letter,* vol. 100, Dec 2012.

42. **S. Cai**, D. Breid, A. J. Crosby, Z. Suo, and J. W. Hutchinson, "Periodic patterns and energy states of buckled films on compliant substrates," *Journal of the Mechanics and Physics of Solids,* vol. 59, pp. 1094-1114, May 2011.

43. **S. Q. Cai** and Z. G. Suo, "Mechanics and chemical thermodynamics of phase transition in temperature-sensitive hydrogels," *Journal of the Mechanics and Physics of Solids,* vol. 59, pp. 2259-2278, Nov 2011.

44. L. H. Jin, **S. Q. Cai**, and Z. G. Suo, "Creases in soft tissues generated by growth," *Epl,* vol. 95, Sep 2011.

45. J. Zhu, T. F. Li, **S. Q. Cai**, and Z. G. Suo, "Snap-through Expansion of a Gas Bubble in an Elastomer," *Journal of Adhesion,* vol. 87, pp. 466-481, 2011.

46. K.J. Zhao, M. Pharr, **S. Q. Cai**, J.J. Vlassak and Z. G. Suo, "Large Plastic Deformation in High- Capacity Lithium-Ion Batteries Caused by Charge and Discharge," *Journal of American Ceramic Society,* vol. 94(s1), pp. 226-235, 2011.

47. **S. Q. Cai,** K. Bertoldi, H. M. Wang, and Z. G. Suo, "Osmotic collapse of a void in an elastomer: breathing, buckling and creasing," *Soft Matter,* vol. 6, pp. 5770-5777, 2010.

48. **S. Q. Cai**, Y. H. Hu, X. H. Zhao, and Z. G. Suo, "Poroelasticity of a covalently crosslinked alginate hydrogel under compression," *Journal of Applied Physics,* vol. 108, Dec 1 2010.

49. **S. Q. Cai**, Y. C. Lou, P. Ganguly, A. Robisson, and Z. G. Suo, "Force generated by a swelling elastomer subject to constraint," *Journal of Applied Physics,* vol. 107, May 15 2010.

50. R. Marcombe, **S. Q. Cai**, W. Hong, X. H. Zhao, Y. Lapusta, and Z. G. Suo, "A theory of constrained swelling of a pH-sensitive hydrogel," *Soft Matter,* vol. 6, pp. 784-793, 2010.

51. J. W. Yoon, **S. Q. Cai**, Z. G. Suo, and R. C. Hayward, "Poroelastic swelling kinetics of thin hydrogel layers: comparison of theory and experiment," *Soft Matter*, vol. 6, pp. 6004-6012, 2010

52. J. Zhu, **S. Q. Cai**, and Z. G. Suo, "Nonlinear oscillation of a dielectric elastomer balloon," *Polymer International*, vol. 59, pp. 378-383, Mar 2010.

53. J. Zhu, **S. Q. Cai**, and Z. G. Suo, "Resonant behavior of a membrane of a dielectric elastomer," *International Journal of Solids and Structures*, vol. 47, pp. 3254-3262, Dec 1 2010.

54. **S. Q. Cai**, Y. Wang, and Y. M. Xia, "Experimental study for the influence of twining on the plastic deformation of pure polycrystalline titanium ," *Journal of Experimental Mechanics*, vol. 22, pp. 97-103, 2007.

55. **S. Q. Cai**, Z. R. Li, and Y. M. Xia, "Evolution equations of deformation twins in metals - Evolution of deformation twins in pure titanium," *Physica B-Condensed Matter*, vol. 403, pp. 1660-1665, May 1 2008.