

ZHAOHE DAI

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CURRENT POSITION

Peking University, Beijing

Jun. 2025–present

Assistant Professor, Department of Mechanics, School of Mechanics and Engineering Science

PREVIOUS EMPLOYMENT

Peking University, Beijing

Mar. 2022–Jun. 2025

Assistant Professor, Department of Mechanics and Engineering Science, College of Engineering

University of Oxford, Oxford

Sep. 2020–Mar. 2022

Postdoctoral research associate, Mathematical Institute

Sponsored by Marie Skłodowska-Curie individual fellowship, supervised by Dominic Vella

EDUCATION

Ph.D., The University of Texas at Austin, Austin

Sep. 2016–Jun. 2020

Department of Engineering Mechanics, supervised by Nanshu Lu

M.S., University of Chinese Academy of Sciences, Beijing

Sep. 2013–Jun. 2016

Institute of Mechanics, supervised by Yueguang Wei

B.S., University of Science and Technology of China, Hefei

Aug. 2009–Jun. 2013

Institute of Mechanics, supervised by Zhong Zhang

RESEARCH INTERESTS

I have been fortunate to gain research experience in a number of exciting topics in continuum mechanics and materials science, including thin films, surface phenomena, 2D materials, and fracture. My published work primarily focuses on the mechanics of thin solids and liquids, with particular emphasis on elasticity metrology, elastocapillarity, wrinkling instabilities, wetting, adhesion, and friction. My research interest lies in understanding the deformation behaviors of soft and slender solids during interactions with other continua, as well as developing functional devices by exploiting such deformation.

PUBLICATIONS

Note: † denotes equal contribution, * stands for correspondence;

Selected Journal Articles

1. **Z. Dai***. Jump of an atomic force microscope probe towards an elastic substrate in a liquid environment. *Journal of Fluid Mechanics* 1013, A49 (2025)
2. W. Zheng and **Z. Dai***. Universal pull-off force for separating a rigid sphere from a membrane. *Journal of the Mechanics and Physics of Solids* 201, 106163 (2025)
3. C. Yu, W. Zeng, Z. Kou, W. Wang, L. Wang, Q. Li, X. Liu, **Z. Dai***. Transparency of graphene to solid-solid van der Waals interactions. *Physical Review Letters* 135, 156202 (2025)
4. C. Yu, W. Zeng, B. Wang, X. Cui, Z. Gao, J. Yin, L. Liu, X. Wei, Y. Wei, **Z. Dai***. Stiffer is stickier: Adhesion in elastic nanofilms. *Nano Letters* 25, 5, 1876–1882 (2025)
5. C. Yu and **Z. Dai***. Premature jump-to-contact with elastic surfaces. *Journal of the Mechanics and Physics of Solids* 193, 105919 (2024)
6. **Z. Dai**, L. Liu*, and Z. Zhang*. Strain engineering of two-dimensional materials: Issues and opportunities at the interface. *Advanced Materials* 31, 1805417 (2019)

7. G. Wang†, **Z. Dai†**, J. Xiao†, S. Feng, C. Weng, L. Liu*, Z. Xu*, R. Huang*, and Z. Zhang*. Bending of multilayer van der Waals materials. *Physical Review Letters* 123, 11, 116101 (2019)
8. **Z. Dai**, Y. Hou, D. A. Sanchez, G. Wang, C. J. Brennan, Z. Zhang, L. Liu*, and N. Lu*. Interface-Governed Deformation of Nanobubbles and Nanotents Formed by Two-Dimensional Materials. *Physical Review Letters* 121, 266101 (2018)
9. D. A. Sanchez†, **Z. Dai†**, P. Wang, A. Cantu-Chavez, C. J. Brennan, R. Huang*, and N. Lu*. Mechanics of spontaneously formed nanoblister trapped by transferred 2D crystals. *Proceedings of the National Academy of Sciences* 115, 7884–7889 (2018)
10. G. Wang†, **Z. Dai†**, Y. Wang, P. Tan, L. Liu*, Z. Xu*, Y. Wei, R. Huang*, and Z. Zhang*. Measuring Interlayer Shear Stress in Bilayer Graphene. *Physical Review Letters* 119, 036101 (2017)

All Journal Articles

2026

1. W. Zheng†, Z. Gao†, C. Yu, J. Yin*, **Z. Dai***. Revealing Surface Tension in Elastic Membranes via Indentation. *Extreme Mechanics Letters* (2026)
2. Z. Gao†, W. Zheng†, X. Liu, Z. Kou, Z. Liu, X. Wang, Y. Long, C. Yu, B. Li, J. Li, X. Li, R. Qiao, X. Liu, L. Wang, **Z. Dai***, J. Yin*. Visualizing Elastocapillary Expansion of Graphene through Bulge Tests. *Nano Letters* 26, 3, 1118–1124 (2026)
3. W. Zeng, **Z. Dai***, Y. Wei*. Adhesion of elastic membranes Part I: A generalized Tabor parameter. *Proceedings of the Royal Society A* 482 (2330), 20250932 (2026)
4. J. Cao, **Z. Dai***, C. Yu, W. Wang, X. Wei, and Y. Wei*. Fracture mechanics of 2D crystal blisters with irregular geometry. *Advanced Functional Materials* 36, 1, e09438 (2026)

2025

5. C. Yu, W. Zeng, Z. Kou, W. Wang, L. Wang, Q. Li, X. Liu, **Z. Dai***. Transparency of graphene to solid-solid van der Waals interactions. *Physical Review Letters* 135, 156202 (2025) Featured on Journal Cover and selected for an Editors' Suggestion and for a Synopsis in Physics Magazine.
6. B. Wang, C. Yu, Y. Jiang, C. Tian, J. Tian, S. Li, Z. Fang, M. Li, W. Wu, **Z. Dai**, T. Taniguchi, K. Watanabe, Q. Chen, X. Wei*. Dielectric Strength Weakening of Hexagonal Boron Nitride Nanosheets under Mechanical Stress. *Nature Communications* 16, 8078 (2025)
7. B. Shan†, Y. Guo†, Y. Wang†, P. Zhao, Y. Wang, Z. Wang, L. He, Y. Liu, Y. Wang, W. Guo, Y. Zhang, **Z. Dai***, X. Yu*, and D. Wang*. Fully Transparent Haptic Interface for High-Resolution Tactile Feedback on Touchscreens. *Advanced Science* 12, e11874 (2025)
8. H. Lu, J. Qian, and **Z. Dai***. Interplay of dry and capillary adhesion in elastic solids and structures. *Journal of Applied Mechanics* 92, 111006 (2025)
9. H. Li and **Z. Dai***. Peeling from elastomeric layers: Does material compressibility matter? *International Journal of Mechanical Sciences* 302, 110331 (2025) Short answer to the question just posed: YES in theory but likely NO in practice.
10. H. Qian†, J. Wang*†, **Z. Dai†**, Y. Guo, K. Liu, X. Li, M. Hu, Y. Yu, J. Wang, Y. Lai, K. Ren, J. Ji*. Pressure-driven microinjection (PMI) of porous-coated balloon for ultrafast endoluminal drug delivery across biological barriers. *Science Advances* 11, eadv1182 (2025)
11. **Z. Dai***. Jump of an atomic force microscopy probe towards an elastic substrate in a liquid environment. *Journal of Fluid Mechanics* 1013, A49 (2025)
12. W. Zheng and **Z. Dai***. Universal pull-off force for separating a rigid sphere from a membrane. *Journal of the Mechanics and Physics of Solids* 201, 106163 (2025)

13. W. Wang, S. Chen, J. Cao, X. Wei and **Z. Dai***. Round and pleated blisters: Interface delamination in thin film deposition. *International Journal of Smart and Nano Materials* 16, 2, 343-358 (2025) Invited paper in a special issue on Advances in Smart Interfacial Science and Engineering.
14. E. Chen and **Z. Dai***. Elastic sheets on Winkler foundations: Indentation stiffness and nonlinearities. *International Journal of Solids and Structures* 315, 113346 (2025)
15. X. Wang†, E. Chen†, Q. Wu†, X. Yuan, T. Zhang, S. Zhu*, **Z. Dai***, Y. Gao*. Probing the elastic coupling at van der Waals interfaces of two-dimensional materials. *Physical Review B* 111, 125418 (2025)
16. C. Yu, W. Zeng, B. Wang, X. Cui, Z. Gao, J. Yin, L. Liu, X. Wei, Y. Wei, and **Z. Dai***. Stiffer is stickier: Adhesion in elastic nanofilms. *Nano Letters* 25, 5, 1876–1882 (2025) Selected as featured article.
17. W. Wang, Z. Wei, Y. Li, J. You, X. Li, J. He, H. Mao, J. Jin*, L. Sun*, and **Z. Dai***. Multifunctional complementary field-effect transistors based on MoS₂/SWNTs heterostructures. *Applied Physics Letters* 126, 023501 (2025) Selected as featured article.
18. Z. Zou, Z. Li, Y. Zhou, G. Zhou, W. Xu, M. Huang, W. Wu, H. Zhang, **Z. Dai**, X. Li*. A Real-Time Imaging Sensing System to Visualize Elastomer Surface Profile Evolution for Dynamic Tactile Recognition. *Advanced Functional Materials* 35, 2416731 (2025)
19. H. Li and **Z. Dai***. Adhesion of elastic microbeams on thin deformable substrates. *Engineering Fracture Mechanics* 313, 110634 (2025)
20. J. Li, G. Zhang, L. Wang, and **Z. Dai***. Indentation of a Plate on a Thin Transversely Isotropic Elastic Layer. *Acta Mechanica Solida Sinica* 38, 331–340 (2025) Invited paper in the special issue Experimental Mechanics at the Micro/Nanoscale.

2024

21. C. Yu and **Z. Dai***. Premature jump-to-contact with elastic surfaces. *Journal of the Mechanics and Physics of Solids* 193, 105919 (2024)
22. H. Li, C. Yu, and **Z. Dai***. Regimes in the axisymmetric stiction of thin elastic plates. *International Journal of Mechanical Sciences* 284, 109740 (2024)
23. W. Li, L. Kong, M. Xu, J. Gao, L. Luo, Y. Li, K. Wang, Y. Zhou, L. Li, Y. Wei, X. Zhang, R. Zhao, M. Chen, Y. Yan, X. Luo, **Z. Dai**, L. Zheng*, X. Wang*, and W. Huang*. Microsecond-Scale Transient Thermal Sensing Enabled by Flexible Mo_{1-x}W_xS₂ Alloys. *Research* 7, 0452 (2024)
24. C. Yu, J. Cao, S. Zhu, and **Z. Dai***. Preparation and Modeling of Graphene Bubbles to Obtain Strain-Induced Pseudomagnetic Fields. *Materials* 17(12), 2889 (2024) Invited paper in a special issue Nanodevices in 2D Materials.
25. L. Yang*, S. Yue, Y. Tao, S. Qiao, H. Li, **Z. Dai**, B. Song, Y. Chen, J. Du*, D. Li, and P. Gao. Suppressed thermal transport in silicon nanoribbons by inhomogeneous strain. *Nature* 629, 1021–1026 (2024)
26. **Z. Dai***. Analytical solutions for circular elastic membranes under pressure. *Journal of Applied Mechanics* 91(8), 081002 (2024)
27. B. Wang, J. Li, Z. Fang, Y. Jiang, S. Li, F. Zhan, **Z. Dai**, Q. Chen*, and X. Wei*. Large and Pressure-Dependent *c*-Axis Piezoresistivity of Highly Oriented Pyrolytic Graphite Near Zero Pressure. *Nano Letters* 24(16), 4965–4971 (2024) Featured on the journal Cover.
28. W. Dong, **Z. Dai***, L. Liu*, and Z. Zhang. Toward clean 2D materials and devices: Recent progress in transfer and cleaning methods. *Advanced Materials* 36, 2303014 (2024) Invited review.
29. Z. Zou, Z. Li, Y. Zhou, G. Zhou, W. Xu, W. Wu, H. Zhang, Z. Chen, **Z. Dai**, and X. Li*. Monitoring Soft Shape Surface Deformation via Optical Images for the Distinction of Contact State. *Advanced Intelligent Systems* 6(3), 2300535 (2024) Featured on the journal Cover.

2023

30. C. Yu and **Z. Dai***. Characterizing the wetting behavior of 2D materials: a review. *Journal of Materials Informatics* 3, 20 (2023) **Invited review**
31. E. Chen and **Z. Dai***. Axisymmetric peeling of thin elastic films: A perturbation solution. *Journal of Applied Mechanics* 90(10), 101011 (2023)
32. S. Liu, J. He, Y. Rao, **Z. Dai**, H. Ye, J. C. Tanir, Y. Li, and N. Lu. Conformability of flexible sheets on spherical surfaces. *Science Advances* 9, eadf2709 (2023)
33. Y. Rao, E. Kim, **Z. Dai**, J. He, Y. Li, and N. Lu. Size-dependent shape characteristics of 2D crystal blisters. *Journal of the Mechanics and Physics of Solids* 175, 105286 (2023) **Emerging Topics in Mechanics: On the Occasion of the 60th Anniversary of Professor Yonggang Huang.**
34. Z. Fang, **Z. Dai**, B. Wang, Z. Tian, C. Yu, Q. Chen, and X. Wei. Pull-to-peel of two-dimensional materials for the simultaneous determination of elasticity and adhesion. *Nano Letters* 23(2), 742–749 (2023) **Featured on the journal Cover.**

2022

35. **Z. Dai**, Y. Rao, and N. Lu*. Two-dimensional crystals on adhesive substrates subjected to uniform transverse pressure. *International Journal of Solids and Structures* 257, 111829 (2022) **Special Issue in the honour Dr Stelios Kyriakides.**
36. **Z. Dai** and D. Vella*. Droplets on lubricated surfaces: The slow dynamics of skirt formation. *Physical Review Fluids* 7, 054003 (2022)
37. T. Yang, X. Jiang, Y. Huang, Q. Tian, L. Zhang, **Z. Dai**, and H. Zhu*. Mechanical sensors based on two-dimensional materials: Sensing mechanisms, structural designs and wearable applications. *iScience* 25(1), 103728 (2022)
38. W. Wang, X. Ma, **Z. Dai**, S. Zhang, Y. Hou, G. Wang, Q. Li, Z. Zhang, Y. Wei*, and L. Liu*. Mechanical Behavior of Blisters Spontaneously Formed by Multilayer 2D Materials. *Advanced Materials Interfaces* 9(12), 2101939 (2022) **Featured on the journal Cover**

2021

39. Y. Hou†, **Z. Dai†**, S. Zhang†, S. Feng, G. Wang, L. Liu*, Z. Xu*, Q. Li*, and Z. Zhang*. Elastocapillary cleaning of twisted bilayer graphene interfaces. *Nature Communications* 12, 5069 (2021)
40. F. Shuang, **Z. Dai**, and K. E. Aifantis*. Strengthening in metal/graphene composites: Capturing the transition from interface to precipitate hardening. *ACS Applied Materials & Interfaces* 13(22), 26610–26620 (2021)
41. Y. Rao†, S. Qiao†, **Z. Dai**, and N. Lu*. Elastic wetting: Substrate-supported droplets confined by soft elastic membranes. *Journal of the Mechanics and Physics of Solids* 151, 104399 (2021)
42. **Z. Dai*** and N. Lu*. Poking and bulging of suspended thin sheets: Slippage, instabilities, and metrology. *Journal of the Mechanics and Physics of Solids* 149, 104320 (2021)
43. D. A. Sanchez, **Z. Dai**, and N. Lu*. 2D material bubbles: Fabrication, characterization, and applications. *Trends in Chemistry* 3(3), 204–217 (2021) **Invited review.**
44. G. Wang, Z. Zhang, Y. Wang, E. Gao, X. Jia, **Z. Dai**, C. Weng, L. Liu*, Y. Zhang*, and Z. Zhang*. Out-of-plane deformations determined mechanics of vanadium disulfide (VS₂) sheets. *ACS Applied Materials & Interfaces* 13(2), 3040–3050 (2021)
45. J. Shi, W. Zeng, **Z. Dai**, L. Wang, Q. Wang, S. Lin, Y. Xiong, S. Yang, S. Shang, W. Chen, L. Zhao, X. Ding, X. Tao*, and Y. Chai*. Piezocatalytic foam for highly efficient degradation of aqueous organics. *Small Science* 1(2), 2000011 (2021)

2020

46. **Z. Dai**, N. Lu, K. M. Liechti, and R. Huang*. Mechanics at the interfaces of 2D materials: Challenges and opportunities. *Current Opinion in Solid State & Materials Science* 24, 100837 (2020) **Special Issue: 2D**

47. **Z. Dai**, D. A. Sanchez, C. J. Brennan, and N. Lu*. Radial buckle delamination around 2D material tents. *Journal of the Mechanics and Physics of Solids* 137, 103843 (2020)
48. Y. Hou, X. Ren, J. Fan, G. Wang, **Z. Dai**, C. Jin, W. Wang, Y. Zhu, S. Zhang, L. Liu*, and Z. Zhang*. Preparation of Twisted Bilayer Graphene via the Wetting Transfer Method. *ACS Applied Materials & Interfaces* 12, 40958–40967 (2020)
49. C. Weng, T. Xing, H. Jin, G. Wang, **Z. Dai**, Y. Pei, L. Liu*, and Z. Zhang*. Mechanically robust ANF/MXene composite films with tunable electromagnetic interference shielding performance. *Composites Part A: Applied Science and Manufacturing* 135, 105927 (2020)
50. H. Jang, **Z. Dai**, K.-H. Ha, S. K. Ameri, and N. Lu*. Stretchability of PMMA-supported CVD graphene and of its electrical contacts. *2D Materials* 7, 014003 (2020)

2019

51. G. Wang†, **Z. Dai†**, J. Xiao†, S. Feng, C. Weng, L. Liu*, Z. Xu*, R. Huang*, and Z. Zhang*. Bending of multilayer van der Waals materials. *Physical Review Letters* 123, 11, 116101 (2019) Highlighted as an Editors' Suggestion, featured on the journal Cover, and covered by news media; ESI highly cited paper.
52. **Z. Dai†**, G. Wang†, Z. Zheng, Y. Wang, S. Zhang, X. Qi, P. Tan, L. Liu*, Z. Xu*, Q. Li, Z. Cheng*, and Z. Zhang*. Mechanical responses of boron-doped monolayer graphene. *Carbon* 147, 594–601 (2019)
53. **Z. Dai**, L. Liu*, and Z. Zhang*. Strain engineering of two-dimensional materials: Issues and opportunities at the interface. *Advanced Materials* 31, 1805417 (2019) Selected as the journal Frontispiece; ESI highly cited paper.
54. C. Weng, G. Wang, **Z. Dai**, Y. Pei, L. Liu*, and Z. Zhang*. Buckled AgNW/MXene hybrid hierarchical sponges for high-performance electromagnetic interference shielding. *Nanoscale* 11, 22804–22812 (2019)
55. J. Shi, S. Lv, L. Wang, **Z. Dai**, S. Yang, L. Zhao, H. Tian, M. Du, H. Li*, and Y. Fang*. Crack control in biotemplated gold films for wide-range, highly sensitive strain sensing. *Advanced Materials Interfaces* 6, 1901223 (2019)
56. H. Jeong, L. Wang, T. Ha, R. Mitbender, X. Yang, **Z. Dai**, S. Qiao, L. Shen, N. Sun, and N. Lu*. Modular and reconfigurable wireless e-tattoos for personalized sensing. *Advanced Materials Technologies* 4, 1900117 (2019)
57. X. Yang, Y. Huang, **Z. Dai**, J. Barber, P. Wang, and N. Lu*. “Cut-and-paste” method for the rapid prototyping of soft electronics. *Science China Technological Sciences* 62, 2, 199–208 (2019)
58. C. Weng, **Z. Dai**, G. Wang, L. Liu*, and Z. Zhang*. Elastomer-free, stretchable, and conformable silver nanowire conductors enabled by 3D buckled microstructures. *ACS Applied Materials & Interfaces* 11, 6541–6549 (2019)
59. L. Zhao, J. Zhao*, C. Zhang, Y. Liu, J. Shi, **Z. Dai**, Y. Guo, B. Li, H. Zhang, X. Feng, J. Zhang, and Z. Zhang*. Engineering surface patterns with shape memory polymers: Multiple design dimensions for diverse and hierarchical structures. *ACS Applied Materials & Interfaces* 11, 1563–1570 (2019)

2018

60. **Z. Dai**, Y. Hou, D. A. Sanchez, G. Wang, C. J. Brennan, Z. Zhang, L. Liu*, and N. Lu*. Interface-Governed Deformation of Nanobubbles and Nanotents Formed by Two-Dimensional Materials. *Physical Review Letters* 121, 266101 (2018) Highlighted as an Editors' Suggestion, featured on the journal Cover.
61. D. A. Sanchez†, **Z. Dai†**, P. Wang, A. Cantu-Chavez, C. J. Brennan, R. Huang*, and N. Lu*. Mechanics of spontaneously formed nanoblisters trapped by transferred 2D crystals. *Proceedings of the National Academy of Sciences* 115, 7884–7889 (2018)
62. Y. Chen, **Z. Dai**, C. Weng, G. Wang, Y. Hou, X. Liu, X. Cong, P. Tan, L. Liu*, and Z. Zhang*. Engineering the Interface in Mechanically Responsive Graphene-Based Films. *RSC Advances* 8, 36257–36263 (2018)

63. J. Shi, L. Wang, **Z. Dai**, L. Zhao, M. Du, H. Li*, and Y. Fang*. Multiscale Hierarchical Design of a Flexible Piezoresistive Pressure Sensor with High Sensitivity and Wide Linearity Range. *Small* 14, 1800819 (2018)
64. Y. Wang, Y. Qiu, S. K. Ameri, H. Jang, **Z. Dai**, Y. Huang*, and N. Lu*. Low-cost, μm -thick, tape-free electronic tattoo sensors with minimized motion and sweat artifacts. *npj Flexible Electronics* 2, 6 (2018)
65. W. Li, L. Zhao, **Z. Dai**, H. Jin*, F. Duan, J. Liu, Z. Zeng, J. Zhao*, and Z. Zhang*. A temperature-activated nanocomposite metamaterial absorber with a wide tunability. *Nano Research* 11, 3931–3942 (2018)
66. M. K. Choi, J. Yang, D. C. Kim, **Z. Dai**, J. Kim, H. Seung, V. S. Kale, S. J. Sung, C. R. Park, N. Lu, T. Hyeon*, and D.-H. Kim*. Extremely Vivid, Highly Transparent, and Ultrathin Quantum Dot Light-Emitting Diodes. *Advanced Materials* 30, 1703279 (2018) Highlighted by Advanced Science News.

2017

67. G. Wang†, **Z. Dai†**, Y. Wang, P. Tan, L. Liu*, Z. Xu*, Y. Wei, R. Huang*, and Z. Zhang*. Measuring Interlayer Shear Stress in Bilayer Graphene. *Physical Review Letters* 119, 036101 (2017) Highlighted as an Editors' Suggestion; also featured by news media including APS Physics Focus, Physicsworld, PhysOrg, Chinese Academy of Science, and Nanotechweb (see Altmetric); ESI highly cited paper.
68. G. Wang, X. Li, Y. Wang, Z. Zheng, **Z. Dai**, X. Qi, L. Liu*, Z. Cheng*, Z. Xu*, P. Tan*, and Z. Zhang*. Interlayer Coupling Behaviors of Boron Doped Multilayer Graphene. *The Journal of Physical Chemistry C* 121, 26034–26043 (2017)
69. J. Shi, J. Hu, **Z. Dai**, W. Zhao, P. Liu, L. Zhao, Y. Guo, T. Yang, L. Zou, K. Jiang, H. Li*, and Y. Fang*. Graphene welded carbon nanotube crossbars for biaxial strain sensors. *Carbon* 123, 786–793 (2017)
70. Y. Hou, Y. Zhu, X. Liu, **Z. Dai**, L. Liu, and Z. Zhang*. Elastic–plastic properties of graphene engineered by oxygen functional groups. *Journal of Physics D: Applied Physics* 50, 385305 (2017)
71. G. Wang, E. Gao, **Z. Dai**, L. Liu*, Z. Xu*, and Z. Zhang*. Degradation and recovery of graphene/polymer interfaces under cyclic mechanical loading. *Composites Science and Technology* 149, 220–227 (2017)
72. Y. Li, K. Jiang, J. Feng, J. Liu, R. Huang, Z. Chen, J. Yang, **Z. Dai**, Y. Chen, N. Wang, W. Zhang, W. Zheng*, G. Yang*, and X. Jiang*. Construction of Small-Diameter Vascular Graft by Shape-Memory and Self-Rolling Bacterial Cellulose Membrane. *Advanced Healthcare Materials* 6, 1601343 (2017)
73. Q. Wu, **Z. Dai**, Y. Su*, A. A. Volinsky*, L. Liu, and Z. Zhang. Cyclic microbridge testing of graphene oxide membrane. *Carbon* 116, 479–489 (2017)

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74. **Z. Dai**, G. Wang, L. Liu*, Y. Hou, Y. Wei*, and Z. Zhang*. Mechanical behavior and properties of hydrogen bonded graphene/polymer nano-interfaces. *Composites Science and Technology* 136, 1–9 (2016)
75. **Z. Dai**, C. Weng, L. Liu*, X. Zhao, J. Kuang, J. Shi, Y. Wei*, J. Lou*, and Z. Zhang*. Multifunctional Polymer-Based Graphene Foams with Buckled Structure and Negative Poisson's Ratio. *Scientific Reports* 6, 32989 (2016)
76. **Z. Dai**, Y. Wang, L. Liu*, X. Liu, P. Tan, Z. Xu*, J. Kuang, Q. Liu, J. Lou, and Z. Zhang*. Hierarchical graphene based films with dynamic self-stiffening for biomimetic artificial muscle. *Advanced Functional Materials* 26, 7003 (2016)
77. **Z. Dai**, L. Liu*, J. Kuang, Y. Wei, H. Zhu*, and Z. Zhang*. Three-dimensional Sponges with Super Mechanical Stability: Harnessing True Elasticity of Individual Carbon Nanotubes in Macroscopic Architectures. *Scientific Reports* 6, 18930 (2016)
78. G. Wang, Z. Zhang, Y. Wang, E. Gao, X. Jia, **Z. Dai**, C. Weng, L. Liu*, Y. Zhang, and Z. Zhang*. Tuning the interfacial mechanical behaviors of monolayer graphene/PMMA nanocomposites. *ACS Applied Materials & Interfaces* 8, 22554–22562 (2016)
79. W. Feng, W. Zhou, **Z. Dai**, A. Yasina, and H. Yang*. Tough Polypseudorotaxane Supramolecular Hydrogel with Dual-responsive Shape Memory Property. *Journal of Materials Chemistry B* 4, 1924 (2016) Featured on the journal Cover

80. J. Shi, X. Li*, H. Cheng, Z. Liu, L. Zhao, T. Yang, **Z. Dai**, Z. Cheng, E. Shi, L. Yang, Z. Zhang, A. Cao, H. Zhu*, and Y. Fang*. Graphene Reinforced Carbon Nanotube Networks for Wearable Strain Sensors. *Advanced Functional Materials* 26, 2078–2084 (2016) Featured on the journal Cover ESI highly cited paper.
81. J. Kuang, **Z. Dai**, L. Liu*, Z. Yang, M. Jin, and Z. Zhang*. Synergistic effects from graphene and carbon nanotubes endow ordered hierarchical structure foams with a combination of compressibility, super-elasticity and stability and potential application as pressure sensors. *Nanoscale* 7, 9252–9260 (2015)
82. G. Wang, L. Liu*, **Z. Dai**, Q. Liu, H. Miao, and Z. Zhang*. Biaxial Compressive Behavior of Embedded Monolayer Graphene inside Flexible Poly(methyl methacrylate) Matrix. *Carbon* 86, 69–77 (2015)
83. Q. Liu, L. Liu*, K. Xie, Y. Meng, H. Wu, G. Wang, **Z. Dai**, Z. Wei, and Z. Zhang*. Synergistic effect of a r-GO/PANI nanocomposite electrode based air working ionic actuator with a large actuation stroke and long-term durability. *Journal of Materials Chemistry A* 3, 8380–8388 (2015)
84. J. Shang, Y. Chen, Y. Zhou, L. Liu*, G. Wang, X. Li, J. Kuang, Q. Liu, **Z. Dai**, H. Miao, L. Zhi*, and Z. Zhang*. Effect of folded and crumpled morphologies of graphene oxide platelets on the mechanical performances of polymer nanocomposites. *Polymer* 68, 131 (2015)
85. Q. Liu, L. Liu*, J. Kuang, **Z. Dai**, J. Han, and Z. Zhang*. Nanostructured carbon materials based electrothermal air pump actuators. *Nanoscale* 6, 6932–6938 (2014)
86. **Z. Dai**, Y. Gao, L. Liu*, P. Pötschke, J. Yang, and Z. Zhang*. Creep-resistant behavior of MWCNT-polycarbonate melt spun nanocomposite fibers at elevated temperature. *Polymer* 54, 3723 (2013)

Other writings

87. Y. Li, G. Wang, **Z. Dai**, Y. Hou, H. Miao, L. Liu, and Z. Zhang. Measurement of Young's modulus for 2D materials by in situ through-hole bubble method. *Journal of Experimental Mechanics* 34(5), 739–747 (2019) (in Chinese)
88. J. Xiao, G. Wang, **Z. Dai**, H. Miao, L. Liu, and Z. Zhang. Nanoindentation of multilayer two-dimensional materials: an experimental study. *Journal of Experimental Mechanics* 33(5), 675–684 (2018) (in Chinese)
89. H. Jeong, T. Ha, I. Kuang, L. Shen, **Z. Dai**, N. Sun, and N. Lu. NFC-enabled, tattoo-like stretchable biosensor manufactured by “cut-and-paste” method. *Annu. Int. Conf. IEEE Eng. Med. Biol. Soc. (EMBC)* 2017, 4094–4097 (2017)

INVITED TALKS

Slender body theory

Capillary instability

Capillary instability of solid thin films, Northwestern Polytechnical University, Xi'an, Dec. 2025

Surfaces and interfaces

Fracture and adhesion of thin film interfaces, Beijing University of Technology, Beijing, Apr. 2025

Perturbation theory for van der Waals forces in soft matter, Shanghai University, Shanghai. Oct. 2024

Adhesion problems of elastic films, Tsinghua University, Beijing. Nov. 2023

Statics and dynamics of droplets on lubricated surfaces, University of Oxford, Online, Apr. 2022

Adhesion of thin films and plates

How atomically thin materials stick together, LOMA CNRS, Bordeaux, Jul. 2025

Adhesion mechanics of ultra-thin films, Zhejiang University, Hangzhou. Mar. 2023

Mechanics of 2D materials

Adhesion mechanics of atomically thin materials, Nanyang Technological University, Singapore. Mar. 2023

Elastocapillarity of nanofilms, Wuhan University, Wuhan. Feb. 2023

Elastocapillarity of nanofilms, University of Science and Technology of China, Hefei. Feb. 2023

Elastocapillarity of 2D materials, National Center for NanoScience and Technology, Beijing. Nov. 2022

Elastocapillarity of 2D materials, CAS Institute of Mechanics, Beijing. Apr. 2022

Elastocapillarity of 2D materials, University of Pennsylvania, Online. 2021

Slippery problems for 2D materials, North meets South colloquium, Mathematical Institute, Oxford. Oct. 2020
Mechanics of Atomically Thin Films – 2D Materials, Dalian University of Technology, Dalian. Jan. 2019

TEACHING

Mechanics of Materials, see lecture notes here

Description: compulsory for undergraduate students in the College of Engineering

Terms: 2023 Spring (Zhou Peiyuan College), 2024 Spring, 2025 Spring (Zhou Peiyuan College)

Fracture Mechanics, see lecture notes here

Description: optional course for undergraduate students in the College of Engineering

Terms: 2024 Spring, 2026 Spring

Mechanics and Physics of Surfaces and Interfaces, see lecture notes here

Description: optional course for graduate students in the School of Mechanics and Engineering Science

Terms: 2022 Fall, 2023 Fall, 2025 Spring

PROJECTS

National Natural Science Foundation of China

Jan. 2025–Dec. 2029

Role: co-principal investigator; Value: ¥2.4M (share 25%)

Description: Key program of NSFC, developing multiscale models and experiments for the design of high-strength and toughness nanostructured metals.

National Natural Science Foundation of China

Jan. 2024–Dec. 2027

Role: principal investigator; Value: ¥510,000

Description: General program of NSFC, using AFM and multiscale theory to understand the adhesion of nanofilms.

New Engineering Interdisciplinary Youth Special Project

Jan. 2023–Dec. 2023

Role: principal investigator; Value: ¥170,000

Description: Granted by PKU, designing high-performance resonators based on strained 2D crystals.

Distinguished Overseas Young Talents

Mar. 2022–Mar. 2025

Role: principal investigator; Value: ¥3M

Description: Granted by NSFC, exploiting theoretical models and nanoscale experiments to understand the static and dynamic deformation of thin films (particularly 2D materials).

Peking University Discipline Construction Project

Mar. 2022–Dec. 2024

Role: principal investigator; Value: ¥1M

Description: Granted by PKU, exploiting theoretical models to understand liquid-mediated solid-solid interactions.

Marie Skłodowska-Curie Individual Fellowship

Sep. 2020–Mar. 2022

Role: principal investigator; Value: €224,933.76

Description: Granted by the European Commission, aiming to develop mathematical models for the dynamics of thin solid-liquid film interactions.

GROUP ALUMNI

Post-Doctoral Researchers

PhD Students

Master Students

AWARDS

2025 First prize, 24th Peking University Faculty Teaching Competition

2025 Best lecture notes award, 24th Peking University Faculty Teaching Competition

2025 Best teaching demonstration award, 24th Peking University Faculty Teaching Competition

2025 Most popular award among students, 24th Peking University Faculty Teaching Competition

2024 Outstanding Advisor in the College of Engineering, Peking University (¥5,000)

2019 University Graduate Continuing Fellowship, UT Austin (\$30,000)

2019 Outstanding self-financed students abroad, China Scholarship Council (\$6,000)

2019 Eric Baker Becker III Memorial Graduate Scholarship, UT Austin (\$2,500)
2018 Warren A. and Alice L. Meyer Endowed Scholarship in Engineering, UT Austin (\$2,500)
2018 Student Travel Award for attending IMECE, Haythornthwaite Foundation (\$1,000)
2017 Global Research Fellowship, UT Austin \$5,000
2017 Warren A. and Alice L. Meyer Endowed Scholarship in Engineering, UT Austin (\$3,500)
2016 Yung-Huai Kuo Endowed Scholarship in Mechanics, CAS (¥3,000)
2016 Presidential scholarship of the Chinese Academy of Sciences, CAS (¥5,000)
2015 National scholarships for graduate students, Institute of Mechanics, CAS (¥10,000)

OTHER ACADEMIC ACTIVITIES

Journal Sevicees

- *Extreme Mechanics Letters*, Early Career Editorial Board
- *Acta Mechanica Solida Sinica*, Early Career Editorial Board

Conference Session Chair

- 4th Conference on Soft Matter Mechanics, Heifei, Nov. 2025
- National Conference on Plasticity Mechanics, Beijing, Aug. 2025
- 3th Conference on Soft Matter Mechanics, Xi'an, Nov. 2024

Peer Review

I have served as a referee for over 200 manuscripts across a range of high-impact journals, such as *Nature Materials*, *Nature Communications*, *Science Advances*, *ACS Nano*, *Nano Letters*, *Journal of the Mechanics and Physics of Solids*, *International Journal of Mechanical Sciences*, *International Journal of Solids and Structures*, *Physical Review B*, and *Composites Science and Technology*.

Seminar Organizing

- Shengping Shen (Xi'an Jiaotong University), Wang Ren Mechanics Seminar, Dec. 2025
- Chuanzeng Zhang (Ningbo University), Wang Ren Mechanics Seminar, Nov. 2025
- Yuri Petrov (St. Petersburg State University), Engineering Science Seminar, Oct. 2025
- Alexander Freidin (Russian Academy of Sciences), Departmental Seminar, Oct. 2025
- Zhan Kang (Dalian University of Technology), Wang Ren Mechanics Seminar, Sep. 2025
- Yannis Dafalias (University of California, Davis), Departmental Seminar, Jul. 2025
- K. Jimmy Hsia (Nanyang Technological University), Engineering Science Seminar, Mar. 2025
- Yong-Wei Zhang (A-Star, Singapore), Wang Ren Mechanics Seminar, Dec. 2024
- Fei Shuang (Delft University of Technology), Departmental Seminar, Dec. 2024
- Wei Feng (University of Science and Technology of China), Departmental Seminar, Sep. 2024
- John Biggins (University of Cambridge), Departmental Seminar, Sep. 2023
- Wengen Ouyang (Wuhan University), Departmental Seminar, Jul. 2023
- Changhong Linghu (Nanyang Technological University), Departmental Seminar, May 2023
- Mingchao Liu (University of Birmingham), Departmental Seminar, Apr. 2023
- Yibin Fu (Keele University), Wang Ren Mechanics Seminar, Jan. 2023

PhD Thesis Committee

- Haoyu Wang (Advisor: Shan Tang), Dalian University of Technology (2025)
- Kuanjie Ding (Advisor: Yueguang Wei), Peking University (2025)

- Qingao Wang (Advisor: Qunyang Li), Tsinghua University (2025)
- Keyan Huo (Advisor: Haifeng Zhao), UCAS (2025)
- Chengyang Liu (Advisors: Ruizhi Li & Xiaotian Zhang), Beihang University (2025)
- Bin Xie (Advisor: Ruizhi Li), Beihang University (2025)
- Xusheng Hai (Advisor: Xiaoding Wei), Peking University (2025)
- Yehui Bie (Advisor: Yueguang Wei), Peking University (2025)
- Wei Shen (Advisor: Mingjing Qi), Beijing University (2025)
- Mingquan Zhu (Advisors: Hui Zhang & Zhong Zhang), NCNST (2025)
- Chen Zhang (Advisors: Yuren Wang & Weibin Li), Institute of Mechanics (2025)
- Xiaoyi Yuan (Advisor: Shuze Zhu), Zhejiang University (2025)
- Jie Xu (Advisor: Zheng Li), Peking University (2025)
- Jueyong Zhu (Advisor: Zheng Li), Peking University (2025)
- Fengming Liu (Advisor: Zheng Li), Peking University (2025)
- QianQian Zhou (Advisor: Yueguang Wei), Peking University (2024)
- Xiaoxue Wang (Advisor: Rongqiao Wang), Beihang University (2024)
- Xiaojie Ma (Advisor: Yueguang Wei), Peking University (2023)
- Hao Qiu (Advisor: Faxin Li), Peking University (2023)
- Jinglan Liu (Advisor: Pei Zhao), Zhejiang University (2023)
- Zheng Fang (Advisor: Xianlong Wei), Peking University (2023)
- Suchun Ji (Advisors: Xin Yi & Huiling Duan), Peking University (2022)
- Zeming Wu (Advisor: Xin Yi), Peking University (2022)
- Quanfeng Han (Advisor: Huiling Duan), Peking University (2022)
- Ying Liu (Advisor: Huiling Duan), Peking University (2022)