Curriculum Vitae

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https://scholar.google.de/citations?user=6bKYdCEAAAAJ&hl=de&oi=ao

EDUCATION

Ph.D. in Solid Mechanics, *Sep. 2015-Nov. 2019*

- Department of Mechanics and Engineering Science, Peking University, Beijing, China
- Supervisor: **Prof. Dr. Huiling Duan**, Solid Mechanics, Dean of College of Engineering, Peking University
- Thesis title: Mechanical Properties of 3D Printed Composites with Phase Change Inclusions

B.S. in Theoretical and Applied Mechanics, *Sep. 2011-June 2015*

- Department of Modern Mechanics, University of Science and Technology of China (USTC), Hefei, China
- Thesis title: Capillary Characteristics of Micro-nano Structure

RESEARCH EXPERIENCE

Assistant Professor in State Key Laboratory of Lunar and Planetary Sciences (SKLPlanets), Macau University of Science and Technology

Jul. 2026-Present

Postdoc in Robotic Materials Department, Max Planck Institute for Intelligent Systems, Germany

Supervisor: **Prof. Dr. Christoph M. Keplinger**, Director, Max Planck Institute for Intelligent Systems, Head of the Robotic Materials Department

Mar. 2022-Jun. 2026

Postdoc in Department of Mechanics and Engineering Science, Peking University, China

Supervisor: **Prof. Dr. Huiling Duan**, Solid Mechanics, Dean of College of Engineering, Peking University

Jan. 2020-Mar. 2022

PUBLICATIONS

Notes: † denotes equal contribution, * stands for correspondence.

[1] **X. Li**, S. Wang, L. Wang*. Surface effects on the electromechanical response of miniaturized dielectric elastomer membranes. ***International Journal of Mechanical Sciences***, 2015 Accepted. (**JCR: Q1, IF=2.188**)

[2] J. M. Zhang†, **X. Li**†, Q. Ji, S. T. Thoroddsen, H. L. Duan*. Tip-mode microfluidics for highly viscous small

droplets. ***Chemical Engineering Journal***, 2025, 508, 160843. (**JCR: Q1, IF=13.2**)

[3] **X. Li**, J. M. Zhang*, H. L. Duan*. Enhanced sensitivity and versatile detection: dual-sized microsphere-type pressure sensors for soft robotics and wearable electronics. ***ACS Applied Materials & Interfaces***, 2025, 17(7), 11268-11277. (**JCR: Q1, IF=8.2**)

[4] S. Wang, **X. Li***. Soft composites with liquid inclusions: Functional properties and theoretical models, ***Journal of Physics Condensed Matter***, 2024, 36, 493003. (**JCR: Q3, IF=2.5**)

[5] **X. Li**, S. Wang, L. Lu, P. Lv, H. L. Duan*. A micromechanical model for phase-change composites. ***Proceedings of the Royal Society A***, 2022, 478(2261), 20220054. (**JCR: Q2, IF=3.3**)

[6] **X. Li**, H. L. Duan, P. Lv*, and X. Yi*, Soft actuators based on liquid-vapor phase change composites. ***Soft Robotics***, 2021, 8(3): 251-261. (**JCR: Q1, IF=6.1**)

[7] **X. Li**, J.M. Zhang*, X. Yi*, Z. Huang, P. Lv, H. L. Duan, Multimaterial Microfluidic 3D Printing of Textured Composites with Liquid Inclusions. ***Advanced Science***, 2019, 6(3), 1800730. (**Inside back cover of the issue**). (**JCR: Q1, IF=14.1**)

[8] **X. Li**, Y. Xue, M. Zou, D. Zhang, A. Cao*, H. L. Duan*, Direct oil recovery from saturated carbon nanotube sponges. ***ACS Applied Materials & Interfaces***, 2016, 8(19), 12337-12343. (**JCR: Q1, IF=8.2**)

[9] M. Wang, **X. Li**, X. Yi*. Deformation, shape transformations, and stability of elastic rod loops within spherical confinement. ***Journal of the Mechanics and Physics of Solids***, 2024, 191, 105771. (**JCR: Q1, IF=6.0**)

[10] **X. Li**, Y. Xue, H. L. Duan*. Electrocapillary rise in nanoporous media. *Procedia IUTAM*, 2017, 21: 71-77. (**EI**)

[11] Y. Xue, Y. Yang, H. Sun, **X. Li**, S. Wu, A. Cao*, H. L. Duan*, A switchable and compressible carbon nanotube sponge electrocapillary imbiber. ***Advanced Materials***, 2015, 27(44): 7241-7246. (**JCR: Q1, IF=28.9**)

[12] C. Hua, Y. Shang*, **X. Li**, X. Hu, Y. Wang, X. Wang, Y. Zhang, X. Li, H. L. Duan, A. Cao*, Helical graphene oxide fibers as a stretchable sensor and an electrocapillary sucker. ***Nanoscale***, 2016, 8(20), 10659-10668. (**JCR: Q2, IF=5.1**)

[13] Q. Ji, J.M. Zhang, Y. Liu, **X. Li**, P. Lv, D. Jin, H. L. Duan*. A modular microfluidic device via multimaterial 3D printing for emulsion generation. ***Scientific Reports***, 2018, 8(1), 4791. (**JCR: Q1, IF=3.9**)

[14] P. Goel, M. Dutta Choudhury, A. Aqeel, **X. Li**, L. H. Shao*, H. L. Duan*. The effect of thermal conductivity on enhanced evaporation of water droplet from heated graphene-PDMS composite surface. ***Langmuir***, 2019, 35(21), 6916-6921. (**JCR: Q2, IF=3.9**)

[15] Q. Li, Z. Xu, S. Ji, P. Lv, **X. Li**, W. Hong*, H. L. Duan*. Kinetics-induced morphing of three-dimensional-printed gel structures based on geometric asymmetry. ***Journal of Applied Mechanics***, 2020, 87(7). (**JCR: Q2, IF=2.8**)

[16] S. Wang, **X. Li**, Y. Xin*, H. L. Duan*. Morphological changes of nanofiber cross-sections due to surface tension. ***Extreme Mechanics Letters***, 2021, 44: 101211. (**JCR: Q1, IF=4.5**)

[17] G. Wang, **X. Li**, X. Tan, S. Ji, J. Huang, H. L. Duan, P. Lv*. Motion enhancement of spherical surface walkers with microstructures. ***Advanced Intelligent Systems***, 2021, 2000226. (**JCR: Q1, IF=6.1**)

[18] S. Ji, **X. Li**, Q. Chen, P. Lv, H. L. Duan*. Enhanced locomotion of shape morphing microrobots by surface coating. ***Advanced Intelligent Systems***, 2021, 2000270. (**JCR: Q1, IF=6.1**)

[19] Y. Zou, Z. Huang, **X. Li**, P. Lv*. 4D printing pre-strained structures for fast thermal actuation. ***Frontiers in Materials***, 2021, 8: 661999. (**JCR: Q3, IF=2.9**)

[20] M. Yu, **X. Li**, P. Lv, H. L. Duan*. Solid-liquid composites with high impact resistance. ***Acta Mechanica Solida Sinica***, 2021, 34, 911-921. (**JCR: Q2, IF=2.7**)

[21] W. Zhou, **X. Li**, H. L. Duan, P. Lv*, Multi-material integrated three-dimensional printing of cylindrical Li-Ion battery. ***ASME Journal of Manufacturing Science and Engineering***, 2021, 144(6): 064501. (**JCR: Q2, IF=2.9**)

[22] Y. Zhang, X. Tan, **X. Li**, P. Lv, T. Y. Huang, J. Yang, H. L. Duan*. 3D propulsions of rod-shaped micropropellers. ***Advanced Intelligent Systems***, 2021, 3(11), 2100083. (**JCR: Q1, IF=6.1**)

[23] S. Ji, **X. Li**, S. Wang, H. Li, H. L. Duan, X. Yang*, P. Lv*. Physically entangled antiswelling hydrogels with high stiffness. ***Macromolecular Rapid Communications***, 2022, 43(19), 2200272. (**JCR: Q2, IF=4.3**)

[24] Y. Cao, X. Feng, S. Wang*, Q. Li, **X. Li**, H. Li, W. Hong, H. L. Duan, P. Lv*. Multiple configuration transitions of soft actuators under single external stimulus. ***Soft Matter***, 2022, 18(45), 8633-8640. (**JCR: Q2, IF=2.8**)

[25] Y. Zou, Q. Chen, L. Lu, **X. Li**, H. Li, L.-H. Shao, H. L. Duan, P. LV*. Ring origami spring capable of eversion morphing. ***Journal of Mechanisms and Robotics***, 2024, 16, 081004-1. (**JCR: Q2, IF=3.2**)

[26] M. Wang, **X. Li**, X. Yi*. Deformation, shape transformations, and stability of elastic rod loops within spherical confinement. ***Journal of the Mechanics and Physics of Solids***, 2024, 191, 105771. (**JCR: Q1, IF=6.0**)

[27] Y. Fang, C. Zhang, **X. Li**, Y. Man, X. Yi*. Surface-tension-driven dynamic buckling and multimodal oscillations of inhomogeneous rod loops. ***International Journal of Mechanical Sciences***, 2026, 325(1), 111841(**JCR: Q1, IF=2.188**)

[28] H.-J. Joo, T. Fukushima, X. Li, A. S. Shomron, S. J. A. Koh, P. Rothemund*, C. Keplinger*. Ultralight soft electrostatic actuators based on solid-liquid-gas architectures. ***Nature Communications***, 2026, 17, 1929 (**JCR: Q1, IF=15.7**).

Papers under revision

[1] X. Wang†, **X. Li**†, S. L. Zhang, Y.-J. Park, N. Sanchez-Tamoyo, D. Macari, P. Rothemund*, C. Keplinger*. Electrostatic gliding actuators, submitted to ***Science***, under 2nd review.

[2] I. Schmidt, **X. Li**, Y.-J. Park, Z. Yoder, N. Sanchez-Tamoyo, C. Keplinger*. A system architecture for fast modular electrohydraulic soft continuum robots, submitted to ***Nature Communications***, under 1st review.

Papers under preparing

[1] **X. Li**†, X. Wang†, S. Zhang, A. Koh, P. Rothemund, C. Keplinger*. Materials design for high-performance electrostatic gliding (EGL) actuators. (Preparing to ***Nature Materials***)

[2] **X. Li**†, X. Wang†, S. Zhang, C. Keplinger*. High frequency electrostatic gliding actuators. (Preparing to ***Nature Communications***)

[3] **X. Li**, J. M. Zhang, Q. Ji, H. L. Duan*. Deformation of droplets laden with particles flowing through a narrow channel. (Preparing to ***Physics of Fluids***)

[4] **X. Li**, L. Wang, S. Wang*. Electromechanical Behavior of Dielectric Elastomer Tube Actuators Considering Surface Effects. (Preparing to ***International Journal of Mechanical Sciences***)

PATENTS

[1] Y. Xue, **X. Li**, H. L. Duan, Electric Control Oil Drive Technology of Carbon Nanotube Sponge for Recovering Oil. *Chinese Patent*, Authorized in 2018, Ref. no. ZL201510632688.X.

[2] J. M. Zhang, H. L. Duan, Q. Ji, **X. Li**. Fixture for Modular Microfluidic Chips. *Chinese patent*, Authorized in 2020, Ref. no. ZL201710435940.7.

[3] J. M. Zhang, H. L. Duan, Z. Zhou, **X. Li**, Microfluidic Chip Based on 3D Printing and Application in Emulsion Generating Device. *Chinese Patent*, Authorized in 2020, Ref. no. ZL201710312209.5.

[4] H. L. Duan, Y. Cao, **X. Li**, H. Yuan, H. Li, X. Liu, P. Lv, Preparation Method of Fluorescent Microspheres.

Chinese Patent, Authorized in 2021, Ref. no. ZL201911266663.7.

RESEARCH EXPERIENCE

Postdoc Period Mar. 2022-Present

- Design, fabrication, and analysis of new types of electrostatic gliding actuators

- Propose new types of electrostatic actuators based on electrode gliding.
- Present dynamic models for theoretically analyzing the performance of electrostatic actuators.
- Optimize the high frequency actuating behavior of the electrostatic actuators from materials aspect and structure design.
- Set up printing platforms for fabricating the electrostatic actuators.

Jan. 2020-Mar. 2022

- Mechanism analysis of phase-change composites and applications in soft actuators

- Present a micromechanical model describing the mechanical properties of the phase-change composite with the consideration of the phase transition.
- Propose a thick and curved bilayer structure design strategy for liquid-vapor phase-change composites to enhance the deformation and stability.
- Achieve the complex deformation and locomotion by a modular assembly of the thick and curved bilayer units.
- Design magnetic phase-change composites with re-configurable magnetic properties through the phase transition.

PhD Period Sep. 2015-Nov. 2019

- Droplet microfluidics 3D printing method and its application in composite preparation

- Propose a droplet microfluidics 3D printing method, and realize the effective control of inclusion size, composition and distribution inside the composite through the *in-situ* and controllable production of liquid inclusions by microfluidics.
- Give the optimal selection range of the printing parameters with a combination of theoretical and experimental analysis.
- Fabricate functional liquid composites with features of self-healing and controllable thermal response through the proposed printing method.

- Droplet generation and deformation regulation based on microfluidic technology

- Propose a new 3D asymmetric hydrodynamic focusing configuration for microfluidics and discover a new droplet generation regime.
- Reveal the mechanism of the new droplet generation regime and its weak dependence on the viscosity by interface equilibrium analysis.
- Fabricate polymer microspheres with controlled sizes through the new setup and apply these elastic microspheres into sensors with high sensitivity.
- Reveal the transition from fluidity to elasticity of the graphene oxide coating outside the droplets in response to different deformation rate through *in-situ* observation and fluid analysis.
- Propose the conditions for the safe transport of droplets coating with graphene oxide in narrow channels.

- Flow control in carbon nanotube sponges

- Realize controlled on-off switching of fluid flow in carbon nanotube sponges with fast rate and high capacity.
- Achieve direct oil recovery from fully saturated bulk carbon nanotube sponges through surfactant-assisted electrocapillary imbibition at low potentials (up to -1.2 V).
- Reveal the mechanism of the oil recovery in carbon nanotube sponges based on the electrowetting and Gibbs adsorption theory.

SKILLS

Experimental Skills	High speed camera; Microfluidics; Interface tension and contact angle measuring device; 3D printing, including direct ink writing, inkjet printing, Digital Light Processing, et al.; Fabrication of functional materials, including carbon nanotube sponges, hydrogels, liquid crystal elastomers, et al.;
Software Skills	Mathematica, MATLAB, LaTeX, COMSOL Multiphysics, SolidWorks, et al.

AWARDS AND HONORS

Excellent PhD Thesis, the Chinese Society for Composite Materials	2021
Excellent Graduate, Peking University	2020
Award for Scientific Research, Peking University	2018-2019
Award for Academic Excellents, Peking University	2017-2018
Exceptional Award for Academic Innovation, Peking University	2015-2016
Merit Student Pacesetter, Peking University	2015-2016
Leo Koguan Scholarship, Peking University	2015-2016