

Bo Ni

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EDUCATION

Ph.D. in Solid Mechanics	Brown University	2020
Thesis: <i>Mechanics of fracture and toughening in 2D materials</i>	Advisor: Huajian Gao	
M.Sc. in Solid Mechanics	Xi'an Jiaotong University (XJTU)	2013
Thesis: <i>Analytical study of surface-related dislocation nucleation under Hertzian contact in 2D</i>	Advisor: Lifeng Ma	
B.Sc. in Engineering Mechanics	XJTU	2011

RESEARCH INTERESTS & EXPERIENCES

Research assistant (Advisor: Prof. Huajian Gao), Brown University Providence, RI

- Fracture and toughening of 2D materials

- Study nonlinear coupling between *topological defects*, *curvature* and *crack* in 2D materials
- Propose a *mechanism-guided* design library for *topological toughening* of 2D materials
- Unveil the interaction between *asymmetric edge stress* and crack in *h*-BN theoretically
- Study the effect of *interlayer friction* on intralayer fracture in multilayered 2D materials

- Metamaterial design of 3D nanolattices

- Implement *snap-through* instability in *3D graphene* nanolattice through numerical simulation
- Propose theoretical model for rational design of *pseudo plasticity* in 3D graphene

- Advanced simulation of thin shell fracture

- Implement *phase field* fracture model for thin shell structures using *isogeometric analysis*
- Include the effects of large deformation, *anisotropic fracture energy* and *surface effect*

- Fracture mechanics in lithium batteries

- Theoretically study the effect of *applied T-stress* on *crack-inclusion interaction*

- Deep learning approach to inverse problems in mechanics

- Leverage *deep learning* models to solve *inverse problems* in *non-destructive evaluations*

PUBLICATIONS

Published

7. Kai Guo*, **Bo Ni***, Huajian Gao (2020). Tuning crack-inclusion interaction with an applied T-stress. *International Journal of Fracture*, 1-11 (*Co-first authors).
6. **Bo Ni**, Huajian Gao (2020). Harness the Power of Fracture: Controlled Fragmentation of Graphene via Substrate Necking. *Matter*, 2(3), 521-524.
5. **Bo Ni**, Huajian Gao (2020). Engineer Energy Dissipation in 3D Graphene Nanolattice Via Reversible Snap-Through Instability. *Journal of Applied Mechanics*, 87(3).
4. **Bo Ni**, Xing Liu, Zhigong Song, Huajian Gao (2020). A Century of Fracture Mechanics: from Griffith Theory to Machine Learning Based Modelling. *2020 Adhesion Society Annual Meeting*, (for the plenary talk delivered by Prof. Huajian Gao).
3. **Bo Ni***, Teng Zhang*, Jiaoyan Li, Xiaoyan Li, Huajian Gao (2019). Topological design of graphene. *Handbook of Graphene, Volume 2: Physics, Chemistry, and Biology*, Chapter 1 (*Co-first authors).
2. Jiaoyan Li, **Bo Ni**, Teng Zhang, Huajian Gao (2018). Phase field crystal modeling of grain boundary structures and growth in polycrystalline graphene. *Journal of the Mechanics and Physics of Solids*, 120, 36-48.
1. Emily Hacopian*, Yingchao Yang*, **Bo Ni***, Yilun Li, Xing Li, Qing Chen, Hua Guo, James Tour, Huajian Gao, Jun Lou (2018). Toughening Graphene by Integrating Carbon Nanotubes. *ACS nano*, 12(8), 7901-7910 (*Co-first authors).

Under review

8. **Bo Ni**, Huajian Gao (2020). A deep learning approach to the inverse problem of modulus identification in elasticity. *under review*.
9. Guoxin Cao, Yunpeng Renb, **Bo Ni**, Tao Wang, Zhuo Zhuang (2020). Indentation response of freestanding two-dimensional materials with an adhesive boundary condition. *under review*.
10. Yingchao Yang, Zhigong Song, Guangyuan Lu, Qinghua Zhang, **Bo Ni**, Chao Wang, Xiaoyan Li, Lin Gu, Xiaoming Xie, Huajian Gao, Jun Lou (2020). Lattice Asymmetry Induced Intrinsic Toughening and Stable Crack Propagation in Monolayer *h*-BN. *under review*.

In preparation

- **Bo Ni**, Jiaoyan Li, Teng Zhang, Huajian Gao (2020). Topological toughening of graphene, *in preparation*.
- **Bo Ni**, Huajian Gao (2020). Crack propagation in multilayered 2D materials in the presence of interlayer sliding, *in preparation*.
- **Bo Ni**, Zhigong Song, Huajian Gao (2020). Phase field modeling of crack propagation under asymmetric surface stress, *in preparation*.

PRESENTATIONS**Topics on topological toughening of 2D materials**

Aspen center for physics 2020 winter conference: low-dimensional solids in hard and soft condensed matter: mechanics, thermodynamics and electrons, Aspen, CO	Feb 2020
56th Annual Technical Meeting of the Society of Engineering Science (<i>SES</i>), St. Louis, MO	Oct 2019
18th National Congress for Theoretical and Applied Mechanics (<i>USNC-TAM</i>), Chicago, IL	Jun 2018
<i>AVS</i> 64th International Symposium & Exhibition, Tampa, FL	Nov 2017
53th Annual Technical Meeting of the Society of Engineering Science (<i>SES</i>), Maryland, MD	Oct 2016

Topics on tuning crack-inclusion interaction via applied T-stress

56th Annual Technical Meeting of the Society of Engineering Science (<i>SES</i>), St. Louis, MO	Oct 2019
Engineering mechanics institute conference (<i>EMI</i>) 2019, Pasadena, CA	Jun 2019

Topics on 3D architected graphene nanolattices

54th Annual Technical Meeting of the Society of Engineering Science (<i>SES</i>), Boston, MA	Jul 2017
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TEACHING

Teaching assistant , Brown University		Providence, RI
-ENGN 1750: <i>Advanced Mechanics of Solids</i>	Prof. Allan Bower	Fall 2018
-ENGN 1300: <i>Structural Analysis</i>	Prof. Huajian Gao	Spring 2018
-ENGN 2410: <i>Thermodynamics of Materials</i>	Prof. David Paine	Fall 2017

REVIEWERSHIP/SERVICES

- Serve as a **reviewer** for *Physics Review Letter (PRL)*, *Journal of the Mechanics and Physics of Solids (JMPS)*, *Physics Review B (PRB)*, *Modelling and Simulation in Materials Science and Engineering (MSMSE)* and *Journal of Materials Research (JMR)*.
- Assisted the advisor with **grant writing** for the application of National Science Foundation (NSF) Award #1634492, titled *topological design of tough multi-functional 2D materials*.

HONORS AND AWARDS

-Travel award, Aspen center for physics 2020 winter conference	Feb 2020
-Student travel award, 2D materials Focus topic, AVS-64 international symposium	Nov 2017
-The Scholarship in the name of <i>Tang Zhaoqian</i> , XJTU, China	2011
-National Scholarship for Encouragement, XJTU, China	2010
-National Scholarship, XJTU, China	2009
-National Scholarship, XJTU, China	2008
-The First Prize, Competition of Fundamental Mechanics, Shaanxi Province, China	2008