



# Dongwoo Lee

Assistant Professor

School of Mechanical Engineering, Sungkyunkwan University  
2066 Seobu-ro, Jangan-gu, Suwon, Gyeonggi-do 16419, KoreaPhone: +82-31-290-7435 Email: [dongwoolee@skku.edu](mailto:dongwoolee@skku.edu)Homepage: <https://dleeelab.org>

## EDUCATION

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May 2016	<b>HARVARD UNIVERSITY (ADVISOR: PROF. JOOST VLASSAK)</b> <i>Ph.D. in Applied Physics</i>	Cambridge, MA
May 2011	<b>HARVARD UNIVERSITY (ADVISOR: PROF. JOOST VLASSAK)</b> <i>S.M. in Engineering Sciences</i>	Cambridge, MA
Aug 2009	<b>YONSEI UNIVERSITY</b> <i>B.E. in Mechanical Engineering</i>	Seoul, Korea

## PROFESSIONAL APPOINTMENTS

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Sep 2017 -	<b>SUNGKYUNKWAN UNIVERSITY</b> <i>Assistant Professor, School of Mechanical Engineering</i>	South Korea
Mar 2017 - Aug 2017	<b>SUNGKYUNKWAN UNIVERSITY</b> <i>Postdoctoral Fellow, School of Mechanical Engineering</i>	South Korea
May 2016 - Feb 2017	<b>HARVARD UNIVERSITY (ADVISOR: PROF. JOOST VLASSAK)</b> <i>Postdoctoral Fellow, School of Engineering and Applied Sciences</i>	Cambridge, MA
Mar 2011 - Feb 2012	<b>HARVARD UNIVERSITY</b> <i>Research Associate, School of Engineering and Applied Sciences</i>	Cambridge, MA

## RESEARCH INTERESTS

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- Data driven development of novel materials
  - Big data acquisition using high-throughput experiments
  - Machine learning analysis for material property prediction
  - Metallic glasses, High entropy alloys, Plasma facing materials, Ultra-high temperature ceramics, Magneto-caloric materials, Solid-state electrolyte, etc.
- Design of mechanical metamaterials and composites
- Properties of small-scale materials
  - Mechanical properties
  - Thermophysical properties: heat capacity, atomic transport, formation, stability, and structure
- Material characterization methods
  - Combinatorial nanocalorimetry
  - Nanoindentation & in-situ SEM mechanical tester
  - Atomistic simulations: First-principles (*ab-initio*) theoretical studies

## HONORS AND AWARDS

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July 2020	<b>Young Investigator Award in Experimental Mechanics</b> (실험역학젊은연구자상), KOREAN SOCIETY OF MECHANICAL ENGINEERING
Nov 2019	<b>BEST POSTER AWARD</b> , INTERNATIONAL CONFERENCE ON MATERIALS AND RELIABILITY
Oct 2019	<b>BEST POSTER AWARD</b> , KOREAN INSTITUTE OF METALS AND MATERIALS
Apr 2019	<b>BEST PAPER AWARD</b> , KOREAN SOCIETY OF MECHANICAL ENGINEERING
Aug 2018	<b>BEST PAPER AWARD</b> , EMERGING TECHNOLOGY OF MECHANICAL ENGINEERING
Dec 2015	<b>OUTSTANDING PRESENTATION AWARD</b> , MATERIALS RESEARCH SOCIETY FALL MEETING

## PROFESSIONAL ACTIVITIES

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May 2021 -	<b>Editorial Board</b> , Current Applied Physics, ELSEVIER
Nov 2020	<b>ORGANIZING COMMITTEE</b> , ASIA-PACIFIC CONFERENCE ON FRACTURE AND STRENGTH 2020 JEJU, SOUTH KOREA
2018 - present	<b>EDITORIAL BOARD</b> , KOREAN SOCIETY OF MECHANICAL ENGINEERS, RELIABILITY DIVISION
2018 - present	<b>EDITORIAL BOARD</b> , KOREAN SOCIETY OF MECHANICAL ENGINEERS, MATERIALS AND FRACTURE DIVISION
May 2018	<b>LOCAL ORGANIZING COMMITTEE</b> , THE 12 <sup>TH</sup> INTERNATIONAL CONFERENCE ON BULK METALLIC GLASSES (MG XII), SEOUL, SOUTH KOREA

## PUBLICATIONS

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### PHD THESIS

**Dongwoo Lee**, “Nanocalorimetry Experiments and First-Principles Theoretical Studies of Solid-State Reactions in Nanolaminates” (Feb 2016)  
- *Dissertation committee: Profs. Frans Spaepen, David Clarke, Joanna Aizenberg, and Joost Vlassak*

### JOURNAL ARTICLES

1. Donggun Lee, Daegun You, **Dongwoo Lee**, Xin Li, Sooran Kim, “Machine-Learning-Guided Prediction Models of Critical Temperature of Cuprates,” *Submitted*
2. Taeho Min<sup>†</sup>, Euimin Cheong<sup>†</sup>, Changryeol Lee, Baekgyeom Kim, Hugo Rodrigue, Je-Sung Koh\*, and **Dongwoo Lee\***, “Print-and-Spray Electro-Mechanical Metamaterials,” *Submitted*
3. Junbyeong Lee<sup>1†</sup>, Agha Aamir Jan<sup>1†</sup>, Shraddha Prakash Ganorkar <sup>†</sup>, Jungwan Cho, **Dongwoo Lee\***, and Seunghyun Baik\*, “Tunable solid-state thermal rectification by asymmetric nonlinear radiation,” *Materials Horizons (accepted)*
4. Injun Oh<sup>†</sup>, Donghyun Park<sup>†</sup>, Euimin Cheong, Haechan Jo, Sanghun Park, Daegun You, Taeyeop Kim, Yuhyun Park, Kyunghoon Kim, Gi-Dong Sim, Chansun Shin\* and **Dongwoo Lee\***, “Anisotropic He-ion irradiation damages in nanocolumnar W thin films,” *Extreme Mechanics Letters*, 41, 100984 (2020)
5. Daegun You, Shraddha Ganorkar, Sooran Kim, Keonwook Kang, Won-Yong Shin\*, **Dongwoo Lee\***, “Machine Learning-based Prediction Models for Formation Energies of Interstitial Atoms in HCP Crystals,” *Scripta Materialia*, 183, 1-5 (2020)
6. Daegun You, Shraddha Ganorkar, Minsoo Joo, Donghyun Park, Sooran Kim, Keonwook Kang\*, and **Dongwoo Lee\***, “Ab initio study of H, B, C, N, O, and self-interstitial atoms in hcp-Zr,” *Journal of Alloys and Compounds*, 787, 631-637 (2019)

7. **Dongwoo Lee** and Joost J. Vlassak, "Diffusion kinetics in binary CuZr and NiZr alloys in the super-cooled liquid and glass states studied by nanocalorimetry," *Scripta Materialia*, 165, 73-77 (2019)
8. Juanjuan Zheng, Yucong Miao, Haitao Zhang, Shi Chen, **Dongwoo Lee**, Raymundo Arroyave, Joost J. Vlassak, "Phase transformations in equiatomic CuZr shape memory thin films analyzed by differential nanocalorimetry," *Acta Materialia*, 159, 320-331 (2018)
9. Haitao Zhang, **Dongwoo Lee**, Ye Shen, Jinhye Bae, Jan Schroers, Yong Xiang, Joost J. Vlassak, "Combinatorial temperature resistance sensors for the analysis of phase transformations demonstrated for metallic glasses," *Acta Materialia*, 156, 486-495 (2018)
10. **Dongwoo Lee**, Bingge Zhao, Eric Perim, Haitao Zhao, Pan Gong, Yanhui Liu, Stefano Curtarolo, Jan Schroers, and Joost J. Vlassak, "Crystallization Behavior upon Heating and Cooling in Cu<sub>50</sub>Zr<sub>50</sub> Metallic Glass Thin Films," *Acta Materialia*, 121, 68-77 (2016)
11. Eric Perim<sup>†</sup>, **Dongwoo Lee**<sup>†</sup>, Yanhui Liu<sup>†</sup>, Cormac Toher, Pan Gong, Yanglin Li, W. Neal Simmons, Ohad Levy, Joost J. Vlassak, Jan Schroers, and Stefano Curtarolo, "Spectral Descriptors for Bulk Metallic Glasses Based on the Thermodynamics of Competing Crystalline Phases," *Nature Communications*, 7, 12315 (2016)  
 - "Can artificial intelligence create the next wonder material?," News Feature, *Nature* 533, 22-25 (May 2016)  
 - "Crystallization frustration predicts metallic glass formation," *EurekAlert!* (Aug 2016)  
 - "Paving the way toward novel strong, conductive materials," *Harvard News* (July 2016)
12. Gi-Dong Sim, Yong Seok Choi, **Dongwoo Lee**, Kyu Hwan Oh, and Joost J. Vlassak, "High tensile strength of sputter-deposited ZrB<sub>2</sub> ceramic thin films measured up to 1016 K," *Acta Materialia* 113, 32-40 (2016)
13. **Dongwoo Lee**, Joost J. Vlassak\*, and Kejie Zhao\*, "First-principles Analysis on the Catalytic Role of Additives in Low-temperature Synthesis of Zirconium Diboride," *ACS Applied Materials & Interfaces* 8, 10995-11000 (2016)
14. Matt Pharr, Yong Seok Choi, **Dongwoo Lee**, Kyu Hwan Oh, and Joost J. Vlassak, "Measurements of Stress and Fracture in Germanium Electrodes of Lithium-ion Batteries During Electrochemical Lithiation and Delithiation," *Journal of Power Sources* 304, 164-169 (2016)
15. **Dongwoo Lee**, Gi-Dong Sim, Kejie Zhao, and Joost J. Vlassak, "Kinetic Role of Carbon in Solid-state Synthesis of Zirconium Diboride via Nano-laminates: Nanocalorimetry Experiments and First-Principles Calculations," *Nano Letters* 15, 8266-8270 (2015)
16. **Dongwoo Lee**, Joost J. Vlassak\*, and Kejie Zhao\*, "First-Principles Theoretical Studies and Nanocalorimetry Experiments on Solid-State Alloying of Zr-B," *Nano Letters* 15, 6553-6558 (2015)
17. **Dongwoo Lee**, Gi-Dong Sim, Kechao Xiao, and Joost J. Vlassak, "Low-Temperature Synthesis of Ultra-High-Temperature Coatings of ZrB<sub>2</sub> Using Reactive Multilayers," *The journal of Physical Chemistry C* 118, 21192-21198 (2014)
18. Kechao Xiao, **Dongwoo Lee**, and Joost J. Vlassak, "Kinetics of Solid-Gas Reactions Characterized by Scanning AC Nano-Calorimetry with Application to Zr Oxidation," *Applied Physics Letters* 105, 171901 (2014)
19. **Dongwoo Lee**, Gi-Dong Sim, Kechao Xiao, Yong Seok Choi, and Joost J. Vlassak, "Scanning AC Nanocalorimetry Study of Zr/B Reactive Multilayers," *Journal of Applied Physics* 114, 214902 (2013)

20. **Dongwoo Lee**, Jungwan Park, Dongjun Hyun, GyungHwan Yook, and Hyunseok Yang, “Novel Mechanisms and Simple Locomotion Strategies for an In-pipe Robot That Can Inspect Various Pipe Types,” *Mechanism and Machine Theory* **56**, 52-68 (2012)

#### CONFERENCE PROCEEDING ARTICLES (FULL-LENGTH PAPERS)

1. **Dongwoo Lee**, Sinbae Kim, Yong-Lae Park, and Robert J. wood, “Design of Centimeter-scale Inchworm Robots with Bidirectional Claws,” IEEE International Conference on Robotics and Automation (ICRA 2011), Shanghai, China, May 2011 (Accepted for an oral session)
2. Jungwan Park, Sangyong Park, **Dongwoo Lee**, and Hyunseok Yang, “Prediction method of an in-pipe robot's orientation to pass in a curved pipe,” ICROS-SICE International Joint Conference 2009 (ICCAS-SICE 2009), Fukuoka, JAPAN, Aug 2009

#### TEACHING

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ES120: Introduction to the Mechanics of Solids, Harvard University (Teaching Fellow), Spring 2013  
EME3055: Solid Mechanics Design Laboratory, Sungkyunkwan University, Fall 2017, 2018, 2019  
GEDA002: Engineering Numerical Analysis, Sungkyunkwan University, Fall 2017, 2018, 2019  
EME2013: Engineering Materials, Sungkyunkwan University, Spring 2018  
EME3028: Advanced Solid Mechanics, Spring 2019

#### OTHER ACTIVITIES

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##### JOURNAL REVIEW

Acta Materialia, Scientific Reports, Metals, International Journal of Thermal Sciences, MRS Advances, Journal of Advanced Ceramics, IEEE Transactions on Mechatronics