

Burak Aksak

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EDUCATION

- Sept '08** Ph.D. in Mechanical Engineering
Carnegie Mellon University, Pittsburgh, PA
 Thesis: "A Design Methodology for Biologically Inspired Dry Fibrillar Adhesives"
 Advisor: Prof. Metin Sitti
 Highlights: Contact Mechanics, Numerical Optimization, MEMs Fabrication, Adhesion Characterization
- May '05** M.S. in Mechanical Engineering
Carnegie Mellon University, Pittsburgh, PA
 Thesis: "Adhesion between Identical Fibrillar Surfaces"
 Advisor: Prof. Metin Sitti
 Highlights: Contact Mechanics, MEMs Fabrication, Modular Robotics, Adhesion Characterization
- June '03** B.S. in Mechanical Engineering
Middle East Technical University, Ankara, Turkey
 Thesis: "Design and Manufacturing of an Autonomous Gap Crossing Robot"

WORK EXPERIENCE

- Jan '12 – Present** Assistant Professor
Mechanical Engineering Department
Texas Tech University, Lubbock, TX
- May '10 – Jan '12** Lead Research Engineer
nanoGripteck LLC, Pittsburgh, PA
- May '09 – May '10** Senior Research Engineer/Co-founder
nanoGripteck LLC, Pittsburgh, PA
- Sept '08 – May '09** Post Doctoral Fellow
Carnegie Mellon University, Pittsburgh, PA

TEACHING EXPERIENCE

Texas Tech University, Lubbock, TX

- Fall '12 - Spring '14** Instructor: Mechanics of Solids

Carnegie Mellon University, Pittsburgh, PA

- Fall '04** Teaching Assistant: Feedback Control Systems
- Spring '04** Teaching Assistant: Electro-Mechanical Systems
- Fall '03** Teaching Assistant: Introduction to Solid Mechanics I

PUBLICATIONS (total citations=975, h-index=13, source:google scholar)***Journal Publications***

- 1) B. Aksak, K. Sahin, and M. Sitti, "The Optimal Shape of Elastomer Mushroom-Like Fibers for High and Robust Adhesion," *Beilstein Journal of Nanotechnology*, 5 (1): 630-638, 2014.
- 2) B. Aksak, C-Y. Hui, and M. Sitti, "The Effect of Aspect Ratio on Adhesion and Stiffness for Soft Elastic Fibres," *Journal of the Royal Society Interface*, 8(61): 1166-1175, 2011.
- 3) J. A. Yoon, S. A. Bencherif, B. Aksak, E. K. Kim, T. Kowalewski, J. K. Oh, and K. Matyjaszewski, "Thermoresponsive Hydrogel Scaffolds with Tailored Hydrophilic Pores," *Chemistry – An Asian Journal*, 6: 128–136, 2011.
- 4) B. Sumer, B. Aksak, K. Şahin, K. Chuengsatiansup, and M. Sitti, "Piezoelectric Polymer Fiber Arrays for Tactile Sensing Applications," *Sensor Letters*, 9(2): 457-463, 2010.
- 5) B. Sumer, C. Onal, B. Aksak, and M. Sitti, "An Experimental Analysis of Elliptical Adhesive Contact," *Journal of Applied Physics*, 107(11): 113512, 2010.
- 6) M. Sitti, B. Cusick, B. Aksak, A. Nese, Hyung-il Lee, H. Dong, T. Kowalewski, and K. Matyjaszewski, "Dangling Chain Elastomers as Repeatable Fibrillar Adhesives," *ACS Applied Materials & Interfaces*, 1(10):2277-2287, 2009.
- 7) A. Nese, H.I. Lee, H. Dong, B. Aksak, B. Cusick, T. Kowalewski, K. Matyjaszewski, and M. Sitti, "Enhanced Adhesion of PDMS Surfaces Functionalized by Poly (N-Butyl Acrylate) Brushes Inspired By Gecko Foot Hairs," *Polymer Preprints*, 49(2): 107, 2008.
- 8) M. Murphy, B. Aksak, and M. Sitti, "Gecko-Inspired Directional and Controllable Adhesion," *Small*, 5(2):170-175, 2008.
- 9) B. Aksak, M. P. Murphy, and M. Sitti, "Adhesion of Biologically Inspired Vertical and Angled Polymer Microfiber Arrays," *Langmuir*, 23(6):3322–3332, 2007.
- 10) B. Aksak, M. Sitti, A. Cassell, J. Li, M. Meyyappan, and P. Callen, "Friction of Partially Embedded Vertically Aligned Carbon Nanofibers inside Elastomers," *Applied Physics Letters*, 91(6):061906, 2007.
- 11) M. P. Murphy, B. Aksak, and M. Sitti, "Adhesion and Anisotropic Friction Enhancements of Angled Heterogeneous Micro-fiber Arrays with Spherical and Spatula Tips," *Journal of Adhesion Science and Technology*, 21(12- 13):1281– 1296, 2007.
- 12) S. Kim, B. Aksak, and M. Sitti, "Enhanced Friction of Polymer Microfiber Adhesives with Spatulate Tips," *Applied Physics Letters*, 91(22):221913, 2007.
- 13) B. Yang, B. Aksak, Q. Lin, and M. Sitti, "Compliant and Low-cost Humidity Sensors Using Nano-porous Polymer Membranes," *Sensors and Actuators B: Chemical*, 114(1):254–262, 2006.

Conference Publications

- 1) J. J. Carreras, N. Laal-Dehghani, S. Gorumlu, F. Mehdi, L. Castillo, B. Aksak, and J. Sheng. "Aerodynamics of S809 Airfoil at Low and Transitional Reynolds Numbers," *Bulletin of the American Physical Society* 58 (2013).
- 2) S. Pol, A. Taylor, D. Mckee, L. Castillo, I. Perez, R. Beibei, J. Sheng, C. Westergaard, B. Aksak, G. Araya, F. Hussain "Development of a Scaled Smart Wind Farm." *Bulletin of the American Physical Society* 58 (2013).

- 3) G.Tortora, P. Glass, N. Wood, B. Aksak, A. Menciasci, M. Sitti, C. Riviere, "Investigation of Bioinspired Gecko Fibers to Improve Adhesion of HeartLander Surgical Robot," *Engineering in Medicine and Biology Society (EMBC), 2012 Annual International Conference of the IEEE*, pp.908-911, 2012.
- 4) B. Aksak, M. Murphy, and M. Sitti, "Gecko Inspired Micro-fibrillar Adhesives for Wall Climbing Robots on Micro/Nanoscale Rough Surfaces," *International Conference on Robotics and Automation*, pp.3058-3063, 2008.
- 5) B. Kirby, B. Aksak, S. C. Goldstein, J. F. Hoburg, T. C. Mowry, and P. Pillai, A modular robotic system using magnetic force effectors," *IEEE/RSJ International Conference on Intelligent Robots and Systems* ,pp.2787-2793, 2007.
- 6) B. Aksak, P. S. Bhat, J. D. Campbell, M. De Rosa, S. Funiak, P. B. Gibbons, S. C. Goldstein, C. Guestrin, A. Gupta, C. Helfrich, J. F. Hoburg, B. Kirby, J. Kuffner, P. Lee, T. C. Mowry, P. Pillai, R. Ravichandran, B. D. Rister, S. Seshan, M. Sitti, and H. Yu, "Demo abstract: Claytronics—Highly Scalable Communications, Sensing, and Actuation Networks," *In Proceedings of the 3rd International Conference on Embedded Networked Sensor Systems*, San Diego, CA, 2005.
- 7) S. C. Goldstein, T. C. Mowry, J. D. Campbell, P. Lee, P. Pillai, J. F. Hoburg, P. B. Gibbons, C. Guestrin, J. Kuffner, B. Kirby, B. D. Rister, M. De Rosa, S. Funiak, B. Aksak, and R. Sukthankar, "The Ensemble Principle," *In 13th Foresight Conference of Advanced Nanotechnology*, San Francisco, CA, October 2005.
- 8) B. Kirby, J. D. Campbell, B. Aksak, P. Pillai, J. F. Hoburg, T. C. Mowry, and S. C. Goldstein, "Catoms: Moving Robots without Moving Parts," *In AAI (Robot Exhibition)*, pp.1730–1, Pittsburgh, PA, 2005.

ORAL PRESENTATIONS

- 1)) "Obtaining Robust Adhesion from Bio-inspired Mushroom-like Fibers: A Geometrical Investigation," *ASC Spring Exposition*, April 28-30 2014, Orlando, FL (invited).
- 2) "Obtaining Robust Adhesion from Bio-inspired Mushroom-like Fibers: A Geometrical Investigation," *37th Annual Meeting of The Adhesion Society*, Feb 23-26 2014, Bahia Resort Hotel, San Diego, California
- 3) "Design, Fabrication and Characterization of Bio-Inspired Fibrillar Surfaces," *Mechanical Engineering Spring 2011 Seminar Series*, May 3 2011, Lubbock, Texas.
- 4) "Design, Fabrication and Characterization of Bio-Inspired Fibrillar Surfaces," *Building Partnerships To Increase Female and Minority Students in STEM and Training the Integrated Scholar for the 21st Century*, Sept 20 2012 Texas Tech University, Lubbock, Texas.
- 5) "Biologically Inspired Micro/Nano-fibers as New Sportswear Closure Materials," *AFRL Technology Showcase*, August 11 2010, Wright Peterson Air Force Base, Dayton, Ohio
- 6) "Biologically Inspired Micro/Nano-Fibrillar Adhesives" *Pira International Conference: The Future of Nanomaterials*, Feb 22-24 2005, Miami, Florida.

FUNDING

- Apr' 13** **Principal Investigator**
Agency: TTU Office of Technology and Commercialization
Type: Commercial Development Grant
Performance Period: 04/01/2013-08/31/2013
Location: Texas Tech University, Lubbock, TX
Amount: \$30,000
Project Title: Drag Reduction on Wind Turbine Blades by Means of Bio-Inspired Fibrillar Surfaces
- Jan'11** **Principal Investigator**
Agency: Department of Defense
Type: Small Business Innovative Research Phase II Grant
Performance Period: 01/31/2011-12/31/2012
Amount: \$750,000

Location: nanoGripteck LLC, Pittsburgh, PA

Title: Bio-Inspired Dry Fibrillar Adhesives for Enhanced Sealing of Respiratory Protective Masks

July '10

Principal Investigator

Agency: National Science Foundation

Type: Small Business Innovative Research Phase I Grant

Performance Period: 07/01/2010-12/31/2010

Location: nanoGripteck LLC, Pittsburgh, PA

Amount: \$150,000

Title: Manufacturing of Bio-Inspired Polymer Micro/Nano-Fiber Arrays as New Gripping Materials

July '09

Principal Investigator

Agency: National Science Foundation

Type: Small Business Innovative Research Phase I Grant, \$150,000/1 year

Location: nanoGripteck LLC, Pittsburgh, PA

Performance Period: 07/01/2009-6/30/2010

Amount: \$150,000

Title: Biologically Inspired Polymer Fiber Adhesives as Enhanced Gripping Material

PATENTS

B. Aksak, M. Sitti, M. Murphy, "3 issued patents and 4 patent applications related to fabrication of bio-inspired fibrillar adhesives" *US Patent 8,524,092; US Patent 8,206,631; US Patent 8,398,909; US Patent App. 13/533,412; US Patent App. 13/429,621; US Patent App. 13/845,702; US Patent App. 13/533,38.*

B. Aksak, L. Castillo, M. Sitti, "Fibrillar Structures to Reduce Viscous Drag on Aerodynamic and Hydrodynamic Wall Surfaces" *US Provisional Patent Application, 2013.*

AWARDS

Fall '13

Faculty Teaching Award

Department of Mechanical Engineering, Texas Tech University, Lubbock, Texas

Fall '13

Pi Tau Sigma Best Professor Award

Department of Mechanical Engineering, Texas Tech University, Lubbock, Texas

Fall '04

Best Teaching Assistant Award, Feedback Control Systems

Department of Mechanical Engineering, Carnegie Mellon University, Pittsburgh, PA

RESEARCH INTERESTS

Nature Inspired Systems/Manufacturing

Micro/Nano Fibrillar Adhesives
Micro/Nano Composites for Sensing and Actuation
Design and Optimization
Energy Harvesting
Drag and Lift Management

Robotics Applications

Micro-Sensors/Actuators
Modular Robotics
Miniature Robotics
Evolutionary Robotics