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Kripa K. Varanasi

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Education

Ph. D. in Mechanical Engineering, Massachusetts Institute of Technology, Cambridge, MA, 2004.
M.S. in Mechanical Engineering, Massachusetts Institute of Technology, Cambridge, MA, 2002.
M.S. in Electrical Engineering & Computer Science, Massachusetts Institute of Technology, Cambridge, MA, 2002.
B. Tech in Mechanical Engineering, Indian Institute of Technology Madras, Chennai, India, 1998.

Research Interests

Surfaces, Interfaces, & Coatings
Nanoengineered Surfaces and their applications to Energy, Water, Oil & Gas, Agriculture, Aviation, Electronics Cooling Systems.

Fluid-Surface and Thermal-Fluid-Surface Interactions;
Superhydrophobic, Superhydrophilic, Oleophobic/Oleophilic Surfaces;
Biomimetics; Phase-Change Phenomena (Condensation, Boiling, Freezing and Ice formation) on nanoengineered surfaces; Nucleation and Growth; Micro and Nanoscale Heat Transfer; Heat Pipes and Thermal Interfaces; Harsh Environment Coatings and Surface Technologies (Ceramics and Metals); Subsea Separation (fluid-fluid and fluid-gas) and Flow Assurance; Quantum Dots, Plasmonics and Bandgap Engineering; Nanomanufacturing (Ceramics and Metals).

Experience

Massachusetts Institute of Technology, Cambridge, MA, 01/2009
– present



People

FACULTY

EMERITUS FACULTY

ADMIN STAFF

TEACHING STAFF

LECTURERS

RESEARCH STAFF

TECHNICAL STAFF

SUPPORT STAFF

POSTDOCS

VISITORS

FACULTY CLOUD

Doherty Associate Professor (2012 -- present)
d' Arbeloff Assistant Professor of Mechanical Engineering (2009 -- 2011)

General Electric Research Center, Niskayuna, NY, 04/2004-12/2008

Lead Research Scientist, Nanotechnology Program, Energy & Propulsion Technology Organization

PI for DARPA Thermal Ground Plane (01/2008-12/2008): Led the joint GE-University of Cincinnati-Air Force Research Labs team on advanced electronics cooling using planar heat pipes.

PI, GE Research: Established research programs on nanoengineered materials at GE Research for Energy, Aviation, Water, Oil and Gas, businesses of GE. Expertise in nanoengineered surfaces (over 25 patents) wetting interactions, thermal-fluids, icing, nucleation and phase change, nanoceramics, nanofabrication, and materials design.

Awards/Honors

Bergles-Rohsenow Young Investigator Award in Heat Transfer by American Society of Mechanical Engineers (2013)

Outstanding Young Manufacturing Engineer by Society of Manufacturing Engineers (2013)

Front Covers of *Nature*, *Advanced Materials*, *Applied Physics Letters*, *Soft Matter*

LiquiGlide -- Best Invention of 2012 by TIME and Forbes Magazines (2012)

First Prize, MassChallenge, Massachusetts wide Entrepreneurship Competition (2012)

Doherty Chair in Ocean Utilization (2011-2013)

DARPA Young Faculty Award (2010)

Best Paper Award, IEEE-ASME Itherm Conference (2010)

NSF CAREER Award (2010)

d' Arbeloff Career Development Chair (2009 – 2011)

Charles E. Reed Award, School of Engineering, MIT (2009)

Best Patent Award, GE Global Research (2008)

First Prize, ASME Nanotechnology Symposium (2008)

GE Leadership Award, GE Global Research (2008)

GE Inventor Award (2007)

GE Excellence Award for contributions to Nanotechnology at GE (2007)

Best Patent Award, GE Global Research (2006)

Best Technology Project of the Year (Superhydrophobic Metal), GE Global Research (2005)

GE Management Award for outstanding research in Nanotechnology (2005)

GE Inventor Award (2005)

Select Publications (see <http://varanasi.mit.edu/> for full list)

- Bird, J. C., Dhiman, R., Kwon, H. M., Varanasi, K. K., " Reducing the Contact Time of a Bouncing Drop," *Nature*, 503, 385-388, 2013
- Paxson, A. T., Yague, J. L., Gleason, K. K., Varanasi, K. K., " Stable Dropwise Condensation for Enhancing Heat Transfer via the Initiated Chemical Vapor Deposition (iCVD) of Grafted Polymers," *Advanced Materials*, 26, 418-423, 2014

- Azimi, G., Dhiman, R., Kwon, H., Paxson, A. T., Varanasi, K. K., " Hydrophobicity of Rare-Earth Oxide Ceramics," Nature Materials, 12, 315-320, 2013.
- Paxson, A. T., Varanasi, K. K., " Self-Similarity of Contact Line Depinning from Textured Surfaces," Nature Communications, 4, 1492, 2013
- Kwon, H. M., Bird, J. C., Varanasi, K. K., " Increasing the Leidenfrost Point using Micro-Nano Hierarchical Surface Structures," Applied Physics Letters, 103, 201601, 2013
- Rykaczewski, K., Anand, S., Subramanyam, S. B., Varanasi, K. K., " Mechanism of Frost Formation on Lubricant-Impregnated Surfaces," 29, 5230-5238, Langmuir, 2013
- Smith, J. D., Dhiman, R., Anand, S., Reza-Garduno, E., Cohen, R. E., McKinley, G. H., Varanasi, K. K., " Droplet Mobility on Lubricant-Impregnated Surfaces," Soft Matter 2012.
- Anand, S., Paxson, A. T., Smith, J. D., Dhiman, R., Varanasi, K. K., " Enhanced Condensation on Lubricant-Encapsulated Surfaces," 6, 10122, ACS Nano 2012.
- Rykaczewski, K., Landin, T., Walker, M., Scott, J. H., Varanasi, K. K., " Direct Imaging of Complex Nano-to-Microscale Interfaces Involving Solid, Liquid, and Gas Phases
- Smith, J. D., Meuler, A., Bralower, H., Venkatesan, R., Subramanian, S., Cohen, R. E., McKinley, G. H., Varanasi, K. K., " Hydrate-phobic Surfaces: Fundamental Studies in Clathrate Hydrate Adhesion Reduction," Physical Chemistry Chemical Physics, 14, 6013, 2012
- C. J. Love, J. D. Smith, Y. Cui, K. K. Varanasi, "Size-dependent Thermal Oxidation of Copper -- Single-Step Synthesis of Hierarchical Nanostructures," Nanoscale, accepted, 2011.
- H. Kwon, A. Paxson, K. K. Varanasi, N. Patankar, "Rapid Deceleration Driven Wetting Transition During Pendant Drop Deposition on Superhydrophobic Surfaces," Physical Review Letters, accepted, 2011.
- K. K. Varanasi, T. Deng, J. D. Smith, M. Hsu, N. Bhate, "Frost Formation and Ice Adhesion on Superhydrophobic Surfaces," Applied Physics Letters, 97, 234102, 2010.
- A. J. Meuler, J. D. Smith, K. K. Varanasi, J. Mabry, G. H. McKinley, R. E. Cohen, "Relationships between Water Wettability and Ice Adhesion," ACS Applied Materials and Interfaces, 2, 3100, 2010
- K. K. Varanasi, M. Hsu, N. Bhate, W. Yang, T. Deng, " Spatial Control in the Heterogeneous Nucleation of Water," Applied Physics Letters, 95, 094101, 2009.
- T. Deng, K. K. Varanasi, M. Hsu, N. Bhate, C. Keimel, J. Stein, M. Blohm " Nonwetting of Impinging Droplets on Textured Surfaces" Applied Physics Letters, 94, 133109, 2009.

Select Patents (see see <http://varanasi.mit.edu/> for full list)

- Porous Structures with Enhanced Transport Properties and