Department of Mechanical Engineering

Presents

"Microscale Superlubricity and Wearless in Graphite"

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*ABSTRACT *

Upon shearing a microscale lithographically-defined graphite mesa, the sheared section retracts spontaneously to minimize interface energy [1,2]. We show that such self-retraction provides a novel probe of superlubricity, where ultra-low friction occurs between incommensurate surfaces. The observed symmetry of the self-retraction and an estimate of the frictional force involved confirm that it happens due to superlubricity. The effect is remarkable because it occurs reproducibly under ambient conditions, and over a contact area of up to 10´100?m^2 , more than seven orders of magnitude larger than previous scanning-probe-based studies of superlubricity in graphite. By analyzing the sheared interface, we show how the grain structure of highly oriented pyrolitic graphite influences the probability of self-retraction. These observations open the way for practical applications of superlubricity in micromechanical systems.

[1]Zhen QS & Jiang Q. (2002): Multiwalled carbon nanotubes as gigahertz oscillators Physical Review Letters 88, 045503

[2]Zheng QS et al. (2008): Self-retracting motion of graphite microflakes, Physcal Review Letters *100, *067205

BIOGRAPHY

Dr. Quanshui Zheng is a chair professor of the Engineering Mechanics Department at Tsinghua University, had serviced for seven years as the department chair. He is the funding Director of two multidisciplinary research institutes: the Center for Nano and Micro Mechanics at Tsinghua University, and the Institute for Advanced Study at Nanchang University.

He is the Editor-in-Chief of Acta Mechanica Sinica. Dr. Zheng had visited UK, France, Germany, USA, and Australia for more than five years as a Royal Society fellow, Alexander von Humboldt fellow, visiting professor, or joint professor. The major interests of his group include: novel solutions for nano- and micro-scale devices, transportations, and flow; mechanics of heterogeneous andor anisotropic materials; and theory of tensors and tensor functions and rational mechanics.

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