

Publication

Atomic-scale control of friction by actuation of nanometer-sized contacts

JournalArticle (Originalarbeit in einer wissenschaftlichen Zeitschrift)

ID 171132

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Year 2006

Title Atomic-scale control of friction by actuation of nanometer-sized contacts

Journal Science

Volume 313

Number 5784

Pages / Article-Number 207-10

Stiction and wear are demanding problems in nanoelectromechanical devices, because of their large surface-to-volume ratios and the inapplicability of traditional liquid lubricants. An efficient way to switch friction on and off at the atomic scale is achieved by exciting the mechanical resonances of the sliding system perpendicular to the contact plane. The resulting variations of the interaction energy reduce friction below 10 piconewtons in a finite range of excitation and load, without any noticeable wear. Without actuation, atomic stick-slip motion, which leads to dissipation, is observed in the same range. Even if the normal oscillations require energy to actuate, our technique represents a valuable way to minimize energy dissipation in nanocontacts.

Publisher AMER ASSOC ADVANCEMENT SCIENCE

ISSN/ISBN 0036-8075

edoc-URL <http://edoc.unibas.ch/dok/A5262111>

Full Text on edoc No;

Digital Object Identifier DOI 10.1126/science.1125874

PubMed ID <http://www.ncbi.nlm.nih.gov/pubmed/16840695>

ISI-Number WOS:000239008000039

Document type (ISI) Article