

Nanotubes stick four times better than gecko feet...

Geckos manage to stick to almost any surface using tiny protrusions called setae on their feet. These can make close contact with more or less any surface – van der Waals forces then provide the stickiness that lets them walk on walls. Liehui Ge and colleagues at the University of Akron, Ohio, and Rensselaer Polytechnic Institute in Troy, New York, have now managed to replicate the basic structure with carbon nanotubes, making a tape that acts like an artificial gecko foot. The new material can support a shear stress of 36 N/cm² which is about four times better than a gecko can do and will stick to just about anything including Teflon. Since there is no chemical adhesion, the material can be used reversibly over



(Courtesy Rustyphil/Dreamstime.com)

and over again. It should find applications in almost any situation where things have to stick and then unstick.

Further reading

Liehui Ge *et al.* 2007 *Proc. Nat. Acad. Sci.* **104** 10792.

A new field of controllable optics?

Antennae in the radio-frequency range are often made out of numerous elements acting together to concentrate and direct electromagnetic energy in desired ways. René de Waele and colleagues at the FOM institute for atomic and molecular physics in Amsterdam now seem to have done the same with light at the nanometre scale. They not only managed to use chains of silver particles to direct light in a frequency-dependent fashion, but in ways that cannot be done at all with conventional optics.

The trick is to couple light to electrons in the silver to form quasiparticles called plasmons, which have smaller wavelengths than the free photons that go into them. A whole new field of controllable optics at the nanoscale could be just about to appear.

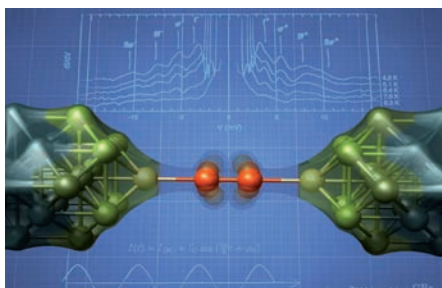
Further reading

René de Waele, A Femius Koenderink, and Albert Polman 2007 *Nano Lett.* **7** 2004.

...and AC Josephson effect makes nanowires vibrate

One of the remarkable effects that Brian Josephson predicted in his Nobel-prize winning work back in 1962 was that a constant voltage applied across an insulating tunnel gap separating two superconductors would give rise to a high-frequency current oscillation – the AC Josephson effect. Experiments have confirmed these oscillations in a variety of systems, and now, researchers at the Georgia Institute of Technology believe they have found that Josephson current oscillations also interact with mechanical motion on an atomic scale.

Alexei Marchenkov and colleagues made a niobium dimer (Nb₂) that acts as a weak link between two superconducting (bulk) niobium electrodes. They discovered features in the differential conductance through the dimer that seem to correspond to excitations of the dimer vibrational modes by Josephson oscillations. Their observations confirm the results of theoretical simulations and should have applications in studying



Peaks in the measured conductance plotted versus applied voltage, shown in the top background, correspond to vibrational modes of a dimer of niobium atoms suspended between the left and right tip-electrodes. (Courtesy Georgia Tech/Alexei Marchenkov and Uzi Landman.)

structural and mechanical properties in a variety of nanomaterials.

Further reading

Alexei Marchenkov *et al.* 2007 *Nature Nanotechnology* **2** 481.

Is this end for the game of draughts?

If you like a game of draughts, or checkers in the US, you may not want to continue reading. Jonathan Schaeffer and colleagues at the University of Alberta have used computing power to prove mathematically that if neither player makes a mistake, then the game ends in a draw every time.

A similar result is well known for noughts and crosses (or tic-tac-toe in the US), which usually kills interest in playing the game sometime in early childhood. The proof for checkers is trickier. It required dozens of computers for nearly 20 years to check a staggering number of configurations – the game involves some 5 × 10²⁰ possible positions. Schaeffer has pursued the problem since 1989, when he began the Chinook project to develop a program capable of defeating the checkers world champion.

Further reading

Jonathan Schaeffer *et al.* 2007 *Science online* DOI: 10.1126/science.1144079.