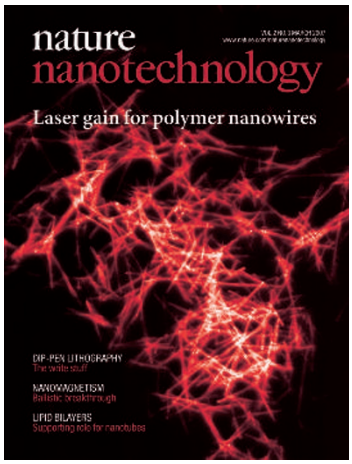


COVER STORY

Vol.2 No.3 March 2007

Conjugated polymers have a number of optical properties that make them attractive for laser applications. The fluorescence spectrum can be chemically tuned over a range of wavelengths and the probability for achieving stimulated emission — which is essential for laser operation — is high. They can also be shaped into spheres, rings and other geometries that can be used as laser cavities. The cover shows conjugated polymer devices made by Gareth Redmond and colleagues in which the lasing medium and the cavity are both combined in the same nanowire, which emits blue–violet laser radiation when pumped by another laser. Moreover, the length of the nanowire determines the laser wavelength, and with greater control over the templated growth process, it may be possible to make pre-positioned arrays of tuneable lasers. **[Letter p180; News & Views p141]**

ETCH A TRENCH

The ability of solid carbon to reduce silicon dioxide to its gaseous state at high temperatures has been exploited to pattern surfaces. Using single-walled carbon nanotubes as a source of carbon, Hye Ryung Byon and Hee Cheul Choi etched one-dimensional nanotrenches on a SiO_2 substrate by introducing small quantities of oxygen during the growth of the nanotubes. Atomic force microscopy confirmed that the shape, length and trajectory of the nanotrenches are fully guided by the nanotubes. The nanotrenches can be used as masks for making sub-10-nm metal nanowires, and when combined with alignment techniques they can generate well-ordered one-dimensional nanostructures for various electronic applications. **[Letter p162]**

COARSE OF ACTION

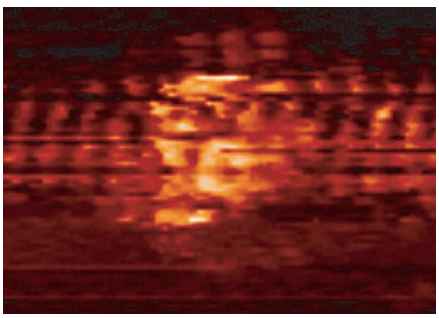
What do bubbles in foam and rocks have in common? They are examples of coarsening — a thermally-driven process that organizes small units into bigger ones in many areas of nature. Although direct manipulation of coarsening is extremely difficult, Philip Moriarty and colleagues now show that mechanical force can direct the coarsening of two-dimensional arrays of gold nanoparticles on silicon surfaces. An atomic force microscope tip is used to drive and monitor the evolution of nanoparticle arrays. Although the growth exponent that characterizes the coarsening depends on the initial structure, this mechanical approach still makes it possible to exert precise control over the micro- and nanostructures formed by the nanoparticles. **[Letter p167]**

BALLISTIC BREAKTHROUGH

When the dimensions of a metallic contact are so small that they are comparable to the de Broglie wavelengths of electrons in the metal, the lack of scattering results in ballistic electron transport and the conductance becomes quantized. In ferromagnetic metals, meanwhile, an applied magnetic field can change the resistance of the metal — a phenomenon known as magnetoresistance. Bernard Doudin and co-workers have now shown that magnetoresistance is also quantized when electrons travel ballistically through contacts that contain just a few atoms of cobalt. The results, which were observed at room temperature, could prove useful in sensing and data storage applications. **[Letter p171; News & Views p143]**

WELCOME TO THE NANOBUDS

Fullerenes and carbon nanotubes have been studied extensively over the past few decades, revealing many novel and useful properties. However, very few attempts have been made to physically merge these remarkable forms of carbon. Now Albert Nasibulin and co-workers have discovered a new hybrid material in which the fullerenes are covalently bonded to the outer surface of single-walled nanotubes. This material, which the authors have dubbed 'NanoBuds', can be made by either of two methods, which both involve just one step. **[Letter p156]**



NanoBuds make their debut.

p156

THEORISTS THINK SMALL

The ability to control the conductance of single molecules will have a major impact in nanoscale electronics, but it is a challenge for experimenters to make good electrical contacts to these molecules, and for theorists to model what is happening in these experiments. Previous theoretical work has studied electron transport through azobenzene — a molecule that changes shape when exposed to light — using relatively large gold electrodes. Now Gianaurelio Cuniberti and colleagues investigate a system in which two carbon nanotubes are attached to a single azobenzene molecule. They find that the low-energy conduction properties of the azobenzene can be significantly modified by changing the topology of the contacts between the nanotubes and the molecule, and/or the chirality of the nanotubes. They also propose experiments to demonstrate controlled electrical switching with nanotube electrodes. **[Letter p176]**

DELAYS ON THE TUBE

With their hydrophilic tails and hydrophobic heads, lipid molecules tend to form bilayer structures that are found throughout nature, notably in the walls of cells. By integrating a carbon nanotube transistor with a lipid bilayer on a silicon dioxide surface, Xinjian Zhou, Paul McEuen and co-workers have developed an electronic platform for studying molecular interactions at membranes. The individual lipid molecules can diffuse freely within the bilayer, despite the presence of the nanotubes. However, proteins bound to the membrane see the nanotube as a barrier, with larger diameter tubes presenting bigger obstacles to diffusion. The electronic sensing of a protein binding to receptors in the membrane is also demonstrated, which suggests that the lipid bilayer/nanotube hybrids could have applications in chemical and biological sensing. **[Article p185; News & Views p140]**