

## A biomaterial to shout about



A composite gel made of collagen and alginate recently tested by Mariah Hahn *et al.* (*Biomaterials* <http://dx.doi.org/10.1016/j.biomaterials.2005.07.022>) presents itself as a possible solution to the problem of damaged vocal cords. Lesions caused by excessive talking, throat clearing, coughing, inhaling irritants, smoking or yelling represent a significant medical challenge when they result in permanent voice dysfunction or even loss. Doctors say the best treatment for scars of the vocal cords is to prevent them. This is because little can be done in the way of pharmaceutical or physical therapies, surgical intervention is itself highly risky and biomaterials to mend the scarred connective tissue have not yet been optimized. The notable characteristics of the gel from Hahn *et al.* that make this biomaterial stand out over others, are that it maintains its original shape and mass, it allows

cells to synthesize new extracellular matrix, it is available in injectable form, and its mechanical properties can be tailored. As such, this hydrogel promises to be able to restore the normal shape and physiology of the vocal cords over time.

## Film producer

Thin films of single-walled carbon nanotubes (SWCNTs) can be produced using chemical vapour deposition or printing methods. Both of these techniques however, involve the use of a foreign material that remains in the film post-production. Yoshiaki Abe and colleagues (*Advanced Materials* **17**, 2192–2194; 2005) report a method that uses direct current (d.c.) electrodeposition to produce layers of up

to 1 mm in thickness, without unwanted materials contaminating the carbon structure. Purified SWCNTs were suspended in an anhydrous solution of *N,N'*-dimethylformamide. A d.c. electric field of 1.5 V was then applied to the mixture between two conducting substances, causing a thin deposit of SWCNT film to condense at the anode surface. Contrary to the case during the standard deposition of metals, no current flow

was observed. Abe *et al.* have produced SWCNT films on many different current-carrying materials at standard room temperature and pressure. Scanning electron microscope images of the film reveal that only fairly straight SWCNTs gathered at the anode, with more complicated structures remaining in the solution. The layer produced is strongly bound to the substrate and varies little in thickness across its surface.

## FIT TO BURST

There are already many reports of microcapsules that rupture in response to an external trigger, such as electric field, light or pH changes. However, capsules that rupture without the need for external influences could be advantageous where pulsed-release or non-uniform patterns are required for drug delivery. Microcapsules designed by De Geest *et al.* (*Advanced Materials* **17**, 2357–2361; 2005) burst in response to the pressure that builds up inside. The researchers made microgel particles with the drug dispersed through them. The particles were then coated with a membrane that was permeable to water, but impermeable to both the drug and the degradation products of the microgel. This outer membrane was constructed by depositing polyelectrolyte molecules on the microgel particles using a layer-by-layer technique. Thus, water can enter the capsule, hydrolyse the crosslinked microgel, and eventually break it down. As the degradation products build up inside the microcapsule, so does the internal pressure, until the membrane bursts and the drug is released. The time to rupture can be tuned from days to months simply by varying the number of crosslinks in the original microgel.

## Breaking chiral symmetry

Chiral surfaces are widely used in heterogeneous enantioselective reactions not only because they allow easier product separation and reactivation but also because their enantiospecific properties are particularly suited to organic optoelectronic and integrated photonic applications. Bo Xu and colleagues at the University of Maryland now propose in *Nano Letters* (<http://dx.doi.org/10.1021/nl051415r>) an approach for fabricating  $C_{60}$  overlayers with controlled chirality and spacing by reactive co-adsorption with an

aromatic molecule, acridine-9-carboxylic acid. Although these constituent molecules are unlikely candidates for chiral symmetry breaking, structural control is achieved through a self-assembly process that involves specific intermolecular and adsorbate–substrate interactions. The assembly mechanism suggests a general strategy for generating chiral surfaces in which both the physical and electronic properties can be tuned for different potential applications in optoelectronic devices.

## Manipulating morphology

The size and shape of most nanoparticles are determined during their synthesis and aren't changed after that. In recently reported work, however, Stoeva *et al.* (*Langmuir* <http://dx.doi.org/10.1021/la051699v>) reversibly manipulate the size and shape of gold nanoparticles by using a chemical method after the initial synthesis is complete. The reagents they use do not attack bulk gold, illustrating the fact that such nanoscale particles can have very different reactivities to bulk materials. The authors ascribe this increased reactivity to the nanoparticles' highly defective structure as compared with the bulk, which leads to greater stresses and a decrease in the lattice stabilization energy. Large (10–100 nm) polyhedral gold nanoparticles are synthesized by a chemical route. Subsequent treatment with alkanethiols breaks them down

into small (2–10 nm), monodisperse spherical particles, which tend to assemble into long-range lattices in solution. The addition of a surfactant then reforms the small particles into larger polyhedral shapes. The process is entirely reversible, so whether the nanoparticles are small and round or large and polyhedral depends simply on the relative concentrations of alkanethiol and surfactant.

