NANOBIOELECTRONICS

Plug in your brain

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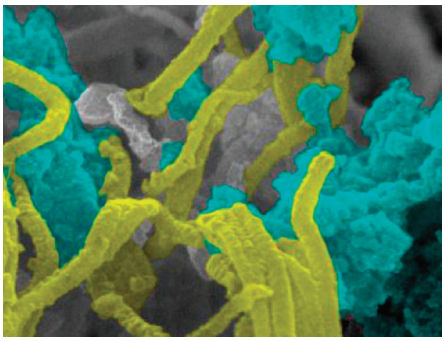
Syringe-injectable mesh electronics has been regarded as a promising minimally invasive method for *in vivo* multiplexed neural recording. Flexible electrical probes with structural features smaller than neurons are easy to integrate with brain tissue, but connecting them to measurement instrumentation is far more challenging. To overcome this issue, Schuhmann *et al.* have now reported a plug-and-play mesh electronic design featuring a rapid, scalable and user-friendly input/output interfacing scheme.

In the proposed plug-and-play mesh electronics, a flexible mesh region is connected to either a single Pt pad or two-terminal Si nanowire field-effect transistor recording devices. The obtained structure is rolled to fit a capillary tube and unrolls to its initial size once ejected from the needle. An array of such input/output pads that remains outside the targeted brain region can be manually inserted into a standard zero-insertion-force connector to interface the pads with standard recording equipment. This facile post-injection procedure is compatible with previously established syringe-injectable mesh electronics and only takes a few minutes to complete. Moreover, the recording measurements yield local field potential signals from 100% of the electron channels, as evidenced by *in vivo* mouse studies. *OB*

BIOMATERIALS

A dual-functional nanoplaster

Nat. Commun. **8,** 15807 (2017)



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Tissue-adhesive materials are convenient wound-sealing alternatives to sutures and staples. They are easy to apply and present less trauma and pain to patients. Coupled with real-time imaging possibilities, they can be traced when used to repair soft organs. This allows surgeons to follow up the repaired organ in post-surgical checks, and assess its integrity during the recovery process.

In their work published in *Nature Communications*, Shin *et al.* present an adhesive material endowed with real-time imaging capability, made of tantalum oxide/silica core/shell nanoparticles (TSNs). The authors show that the material can join two calf-liver ribbons, and close hepatic wounds in animal models. The nanoparticle gluing power is provided by the silica in the shell, which adsorbs on the liver forming a network of interactions with liver fibrils, as shown by the false-colour scanning electron microscopy image (pictured). The real-time imaging properties derive from the biologically inert tantalum oxide core, which can be followed *in vivo* using different techniques, such as ultrasound and computed tomography scans.

TSNs have adhesive properties comparable to those of materials currently used in the clinic, but features higher biocompatibility and lower cytotoxicity. Upon injection in rat muscles, the physiological movements of the animals do not affect its position, which suggests that TSNs can also be used as immobilized markers in image-guided surgical procedures. As a proof of principle, the authors present preliminary data on the feasibility of TSNs as markers to identify cancer lung lesions in rats. *CP*

NITROGEN-VACANCY CENTRES

Remote coherent control

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Nitrogen–vacancy (NV) defects in diamond are quantum mechanical systems characterized by long coherence times at room temperature — an advantageous property in view of the potential use of these colour centres as spin qubits. Several proposals have been put forward for hybrid devices allowing the remote control of the defects' quantum state mediated by phonons or magnons. However, a common drawback of coupling NV centres with the environment is the strong suppression of their characteristic coherence times. This is particularly the case for the magnetic coupling with spin waves — often dominated by incoherent mechanisms.

Now, Andrich *et al.* demonstrate the long-distance coherent control of NV centres by exploiting spin-wave modes. The researchers fabricate a magnonic device based on an yttrium iron garnet magnetic thin film where surface spin-waves propagate after injection by a microstrip microwave antenna. Nanodiamonds containing NV centres are also deposited on the yttrium iron garnet surface, and the evolution of the quantum state of the defects — resonantly coupled to spin-waves under the combined effect of an external magnetic field — is monitored by measuring their photoluminescence. At low-power conditions for the spin-wave injection, the researchers induce and detect Rabi oscillations in NV centres at distances of ~100 μm from the microstrip antenna. Further coherent control of the defects' quantum state is demonstrated by exploiting multi-pulse dynamical decoupling protocols. *GP*

SUPRAMOLECULAR CHEMISTRY

Interlocked benzenes

Angew. Chem. Int. Ed. **56,** 10602–10606 (2017)

In the vast majority of cases, supramolecular structures made of benzene rings are planar, because arranging benzene rings in three dimensions results in increased strain and therefore unstable structures. There are, however, notable examples of all-unsaturated carbon compounds, such as carbon nanotubes, helicenes and polyphenylenes, that show specific properties due to their not being flat. Adding to this set of compounds, Dumslaff *et al.* now report a novel interlocked structure made of only sp^2-hybridized carbons that can form the basic unit for larger nanostructures.

The researchers synthesized a molecule composed on two cyclohexa-*m*-phenylene macrocycles. These macrocycles are interlocked through a covalent bond between two opposite phenylene rings of each macrocycle. As a result, these four phenylene rings form a rigid backbone from which the two macrocycles extend in an orthogonal fashion — the final structure resembles a paddlewheel.

These molecules arrange in an extremely stable amorphous solid. In fact, the glass transition temperature of an analogue of these interlocked structures containing *tert*-butyl substituents is as high as 152 °C. The stability of these three-dimensional structures is likely due to tight packing of the phenylene rings. *AM*

Written by Olga Bubnova, Alberto Moscatelli, Chiara Pastore and Giacomo Prando.