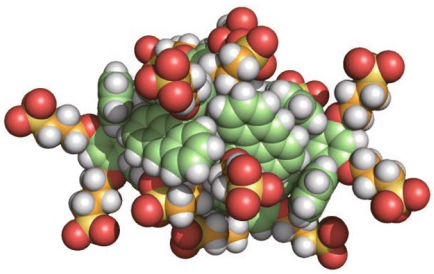
Corrected: Publisher Correction

SUPRAMOLECULAR CHEMISTRY

## Micelles from gemini

*Angew. Chem. Int. Ed.* https://doi.org/10.1002/anie.201814624 (2019)



Credit: Wiley-VCH

A gemini amphiphile is a molecule composed of two identical amphiphilic units separated by an organic spacer. At high concentration, gemini amphiphiles tend to self-assemble into nanostructured geometries which have been used for applications such as catalysis and separation. Now, Nishioka et al. have shown that aromatic gemini amphiphiles can form monodisperse micelles.

The researchers first synthesize a V-shaped amphiphile composed of polyaromatic molecules and hydrophilic side groups. They use a linear acetylene spacer to complete the gemini. Because of their bent shape, these gemini amphiphiles do not aggregate into columnar structures like previous ones; rather, driven by $\pi$–$\pi$ stacking among the aromatic components and hydrophobic interactions, they form micelles with controlled size and atomic composition. The micelles are composed of four gemini molecules and are ellipsoidal in shape, with dimensions between 2.7 nm and 1.9 nm. They form hydrophobic cavities about 2 nm in diameter. As a proof-of-principle application, Nishioka et al. show that they can efficiently incorporate organic compounds, including two $C_{60}$ molecules. *AM*

https://doi.org/10.1038/s41565-019-0431-0

DRUG DELIVERY

## In your eyes

*Nat. Commun.* **10**, 804 (2019)

Choroidal neovascularization (CNV) is a major cause of vision loss consisting in the formation of new blood vessels in the choroid, a tissue layer within the eye in contact with the retina. Neovascularization eventually leads to impaired retinal structure and function, and irreversible blindness. Currently, CNV is treated by regular intraocular injections of drugs that inhibit development of new vessels or by laser irradiation, both bearing risks of side effects such as retinal detachment or retinal tissue ablation.

Wang et al. now report a light-sensitive polymeric nanoparticle for intravenous drug delivery and specific targeting of the choroid. Their nanoparticle is functionalized with a cell-penetrating peptide covalently bound to a photocleavable caging group that prevents nanoparticle activation in the body. The caging group is only cleaved within the eye upon irradiation with a low-phototoxicity light beam. Following exposure of the cell-penetrating peptide, the nanoparticles are taken up locally by the choroidal endothelial cells. The authors show that their strategy can deliver doxorubicin, a standard drug for intraocular treatment of CNV, to the choroid of CNV mouse models, resulting in a 46.1% reduction of neovessel formation in comparison with controls. *CP*

https://doi.org/10.1038/s41565-019-0433-y

BIOELECTRONICS

## Self-healing multitasking

*Adv. Funct. Mater.* https://doi.org/10.1002/adfm.201808695 (2019)

Lightweight and soft epidermal electronics mimicking the morphology of human skin are promising candidates for applications in wearable sensing, particularly in health monitoring. Recently, self-healing electronic tattoos have been developed to tackle the mechanical damage that occurs during long-term wear. Now, Q. Wang and co-workers report a self-healable and biocompatible silk electronic tattoo designed for multiple stimuli sensing.

The device concept relies on a combination of graphene incorporated with soft and flexible silk fibroin (SF) $Ca^{2+}$ membrane that can be directly transferred to human skin. The graphene/SF/$Ca^{2+}$ composite can heal itself with 100% efficiency after damage by water, because of dynamic hydrogen and coordination bonds present in the membrane. The electronic tattoo shows multiple sensing functionalities. In particular, when used as a strain sensor, the device exhibits high gauge factors and excellent tensile strain durability. Its humidity sensing performance is reproducible and stable with fast response and recovery rate. Remarkably, the temperature sensitivity of the wearable device is comparable to or better than that of previously reported carbon-based temperature sensors. *OB*

https://doi.org/10.1038/s41565-019-0434-x

QUANTUM TECHNOLOGY

## Walk the line

*Nat. Commun.* **10**, 1063 (2019)

Qubits made from semiconductor quantum dots are a potential platform for future quantum computing. Although quantum gates with high fidelity have been demonstrated, the coupling of such qubits over distances, for example for use in quantum registers, remains a challenge. Mills et al. now show how they can controllably shuttle single electrons through a linear array of quantum dots.

The researchers define nine Si quantum dots in a Si/SiGe heterostructure by an advanced gate structure. They use three charge sensors to map out the nine-dimensional charge stability space. The adjustment of the chemical potentials of the dots and the connecting tunnelling barrier enables the controlled transfer of a single electron between neighbouring dots. Furthermore, the transition from a control scheme based on physical gate voltages to a virtual gate scheme strongly diminishes the effect of crosstalk between quantum dots and allows the researchers to control several electrons within the array independently.

Mills et al. then design a control sequence that shuttles a single electron through the array in either direction within about 50 ns. With more complex sequences, two or three electrons can move through the array at a time, well separated by at least one empty dot at all times. *BH*

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