Graphene-based implantable technology paves way for high-precision therapeutic applications

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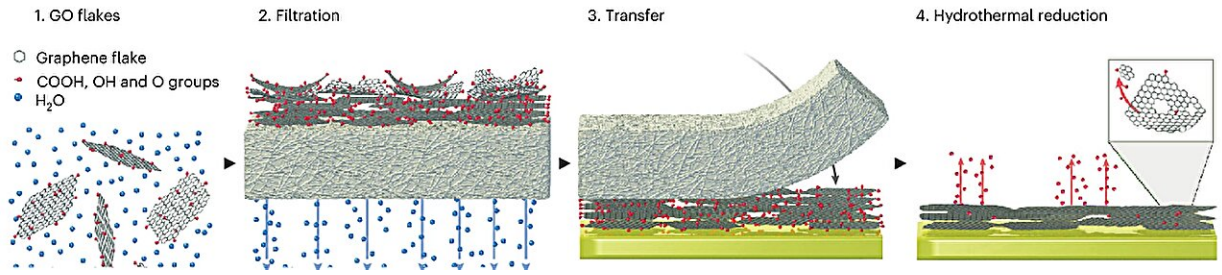

Preparation of the porous reduced GO thin-film EGNITE. This consists of filtering a GO solution through a porous membrane (1, 2), transferring the deposited film of stacked GO flakes onto a conductive substrate (3) and the hydrothermal reduction of the ensemble, which turns the film highly porous and conductive (4). Credit: *Nature Nanotechnology* (2024). DOI: 10.1038/s41565-023-01570-5

Years of research has led to the development of EGNITE (Engineered Graphene for Neural Interfaces), a novel class of flexible, high-resolution, high-precision graphene-based implantable neurotechnology.

The study published today (Jan. 11) in *Nature Nanotechnology* adds an innovative technology to the blooming landscape of neuroelectronics and brain-computer interfaces.

EGNITE builds on the vast experience of its inventors in the fabrication and medical translation of carbon nanomaterials. This innovative technology based on nanoporous graphene integrates fabrication processes standard in the semiconductor industry to assemble graphene microelectrodes of a mere 25 μm in diameter. The graphene microelectrodes exhibit low impedance and high charge injection, essential attributes for flexible and efficient neural interfaces.

Preclinical studies by various neuroscience and biomedical experts that partnered with ICN2, using different models for both the central and peripheral nervous system, demonstrated the capacity of EGNITE in recording high-fidelity neural signals with exceptional clarity and precision and, more importantly, afford highly targeted nerve modulation. The unique combination of high-fidelity signal recording and precise nerve stimulation offered by EGNITE technology represents a potentially critical advancement in neuroelectronic therapeutics.

This innovative approach addresses a critical gap in neurotechnology, which has seen little advancement in materials over the last two decades. The development of EGNITE electrodes has the capacity to place graphene at the forefront of neurotechnological materials.

More information: Damià Viana et al, Nanoporous graphene-based thin-film microelectrodes for in vivo high-resolution neural recording and stimulation, *Nature Nanotechnology* (2024). DOI: 10.1038/s41565-023-01570-5

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