CAMBRIDGE | Enterprise

Versatile Electronic Fibre

Available Technologies

Enabling fibre structure and fabrication process for high-performance electronic wearables

Wearable electronics, such as smart textiles or e-textiles, are growing fields due to their potential application in healthcare monitoring, consumer electronics, energy harvesting and storage, and sensing.

For example, integration of photodetectors into clothes would enable features such as hazardous light detection for skin cancer prevention or analysing the skins optical absorbance/reflectance for vital signal monitoring.

E-textiles must integrate multiple functionalities; depending on final application they must be a combination of electronic, energy harvesting and storage, be comfortable to wear, lightweight, mechanically flexible, and resistive to deformation such as bending, tension and compression.

Background

The integration of conventional electronics into flexible substrates including textiles faces challenges due to high fabrication cost, lack of compatibility with textile manufacturing process, difficult maintenance, mechanical rigidity, and lack of bio- or skin compatibility.

Graphene has emerged as a promising material for wearable electronics due to its high electrical conductivity, low-dimensional thickness, conformability, flexibility and chemical stability. Researchers from the Cambridge Graphene

Centre have invented a reliable and consistent method of depositing rolled layers of 2D material such as CVD grown graphene onto fibres up to 1m in length, apt for electronic fibres and flexible or curved electronics.

Technology overview

- The technology is a reliable and consistent method to deposit sheets of 2D material such as CVD graphene onto a fibre core.
- The layered materials can have a very small bending radius, for example, the fibers can have a length up to 100cm and a width of as little as 0.1mm.
- The fibers can be made from polymer, glass, carbon, or metal.
- The rolled material could be monolayers of graphene, boron nitride, transition metal dichalcogenides, dopant structures or alloys.

The method ensures that deposited layers are wrinkle and crease free.

Benefits

- Fast rate of production possible
- Fibers could be used to integrate electronics into a textile during weaving, for applications such as light-harvesting, light-generation, and photodetection.
- Fibers are washable (AAATCC standard) with Iph,wash/Iph,nowash 94% and 72% at 20 and 30 cycles
- Fibers can form photodetectors with a broad spectral responsivity between 488-870 nm.

Fibers are flexible and durable proven by mechanical bending tests (100 cycles at bending radius 4mm) with Iph,bend/Iph,nobend changes <10%

CAMBRIDGE | Enterprise

Applications

The technology is relevant to applications involving layered graphene including wearable applications, photodetectors, light emitting diodes, solar cells, and biosensors.

Opportunity

We are seeking industrial experts and partners to commercialise the technology under license.

Inventors

This technology was developed at the Cambridge Graphene Centre (CGC). The mission of the CGC is to investigate the science and technology of graphene, carbon allotropes, layered crystals and hybrid nanomaterials. The CGC promotes innovative and adventurous research with an emphasis on applications by effectively establishing joint industrial-academic activities.

Cambridge Graphene Centre | Research Centre on Graphene, Layered Crystals and Hybrid Nanomaterials

References & Patents

[PDF] Graphene-perovskite fibre photodetectors | Semantic Scholar

EP3963644A1 – Rolled hetero-structures and method of manufacturing rolled hetero-structures – pending

US20220172905A1 – Rolled hetero-structures and method of manufacturing rolled hetero-structures – pending