Soybean and graphene: Unlikely hi-tech bedfellows

AT A GLANCE

- A breakthrough by CSIRO-led scientists has made the world's strongest material – graphene – more commercially viable, and all thanks to the humble soybean.

GRAPHENE is a carbon material that is one atom thick – so what's this got to do with soybean? Until now, the high cost of graphene production has been the major roadblock in its commercialisation.

Graphene's thin composition and high conductivity means it is used in applications ranging from miniaturised electronics to biomedical devices.

These properties also enable thinner wire connections; providing extensive benefits for computers, solar panels, batteries, sensors and other devices.

Previously, graphene was grown in a highly-controlled environment with explosive compressed gases, requiring long hours of operation at high temperatures and extensive vacuum processing.

But CSIRO scientists have developed a novel 'GraphAir' technology which eliminates the need for such a highly-controlled environment.

CSIRO Scientist Dr Dong Han Seo, co-author of the study, holds a piece of graphene film 'grown' from soybean oil.

The technology grows graphene film in ambient air with a natural precursor, making its production faster and simpler.

"This ambient-air process for graphene fabrication is fast, simple, safe, potentially scalable, and integration-friendly," CSIRO scientist Dr Zhao Jun Han said.

Zhao is the co-author of a paper detailing this CSIRO graphene research published recently in *Nature Communications*.

"Our unique technology is expected to reduce the cost of graphene production and improve the uptake in new applications."

Enter soybean into this hi-tech world

GraphAir transforms soybean oil – a renewable, natural material – into graphene films in a single step.

"Our GraphAir technology results in good and transformable graphene properties, comparable to graphene made by conventional methods," CSIRO scientist and co-author of the study, Dr Dong Han Seo said.

With heat, soybean oil breaks down into a range of carbon building units that are essential for the synthesis of graphene.

The team also transformed other types of renewables – even waste oil such as those leftover from barbecues or cooking – into graphene films.

"We can now recycle waste oils that would have otherwise been discarded and transform them into something useful," Dong said.

The potential applications of graphene include water filtration and purification, renewable energy, sensors, personalised healthcare and medicine, just to name a few.

Graphene has excellent electronic, mechanical, thermal and optical properties as well.

Its uses range from improving battery performance in energy devices, to cheaper solar panels.

CSIRO are looking to partner with industry to find new uses for graphene.

Researchers from The University of Sydney, University of Technology Sydney and The Queensland University of Technology also contributed to this work. ■