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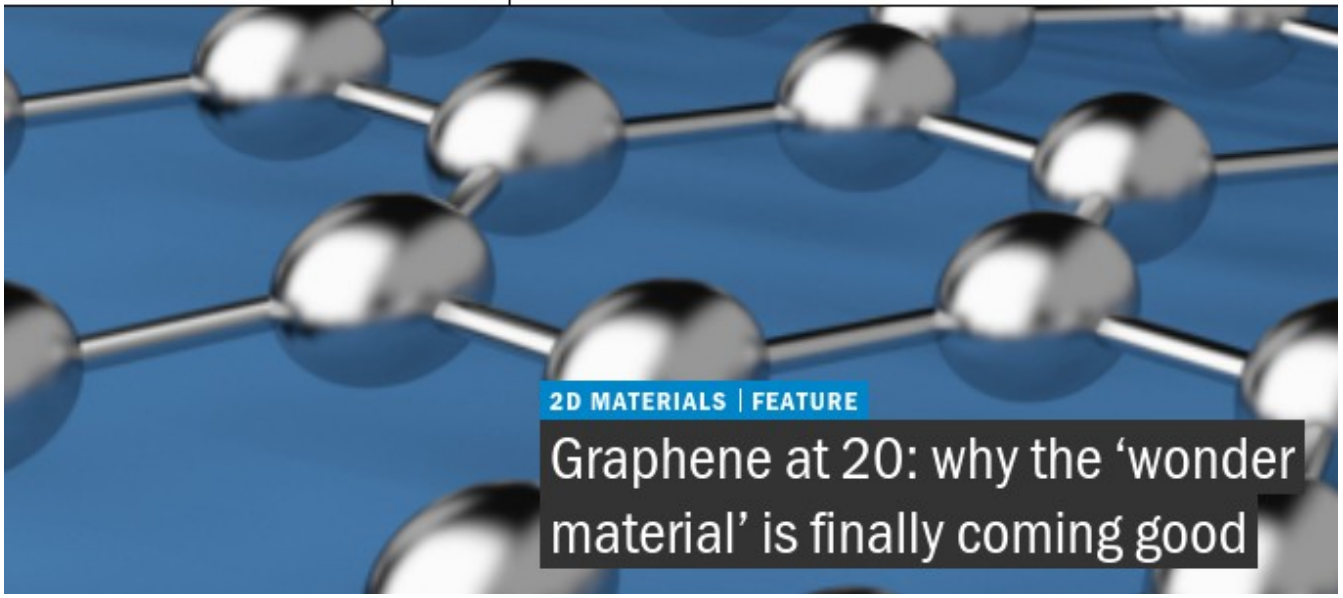

Graphene

Single layer of carbon atoms 0.345nm thick in a hexagonal lattice

Discovered in 2004 at Manchester University by Geim and Novoselov

Nobel Prize 2010

National research institute at Manchester

Research centres also at Cambridge, Exeter, NPL, ….

EU billion euro research project

Many production methods, after the original sticky tape

Numerous applications under study, only just beginning to find a market

Properties

High electrical conductivity

Also a semiconductor

Almost completely transparent

High tensile strength – 200 times stronger than steel

Some applications under investigation

Touchscreens, liquid crystal displays, light-emitting diodes

Transistors one atom thick

Body armour

Batteries with greatly-improved charging speeds, safety and capacity

Mix with other materials to add strength and reduce weight – for construction, transport, aerospace, …

Desalination, drinking water purification

Biomedical

Example:

Graphene brain implants allow miniaturisation to nanoscale, with the potential to reach single-neuron resolution. They are safer than metal to implant and can be programmed and recharged wirelessly, allowing signals to be sent to stimulate the brain, or differentiate between healthy and cancerous brain tissue with micrometer-scale precision..

Aims include better treatment for Parkinsons and strokes.

“We are now reaching where real applications and products are starting to emerge”

But they still need to be better and more cost-effective

Cost depends on quality: at present $100 to $400 per gram