Graphene could replace rare metal used in mobile phone screens

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Researchers from Paragraf and Queen Mary University of London demonstrated the successful fabrication of an Organic Light-Emitting Diode (OLED) with a monolayer graphene anode, replacing ITO in

organic light-emitting diodes. The new study is published in the journal *Advanced Optical Materials*.

Indium is one of the nine rarest elements in the Earth's crust and is on the EU's list of critical materials. However, it is widely used, mostly in the form of indium tin oxide (ITO), and a key part of the touch screens on our mobile phones and computers. Most homes will have many items containing indium, it's used in flatscreen TVs, solar panels, as well as LED lights in our homes.

This Innovate UK-funded research opens the door to a radical change in the potential of high-tech devices of the future by removing a limiting ingredient, Indium.

Professor Colin Humphreys of Queen Mary and Paragraf, says: "Because of its importance and scarcity there have been many attempts to replace ITO, but no material has been found to have a comparable performance in an electronic or optical device until now."

"Our paper is the first paper in the world to demonstrate that graphene can replace ITO in an electronic/optical device. We have shown that a graphene-OLED has identical performance to an ITO-OLED. ITO-OLEDs are widely used as the touch screens on our mobile phones."

Graphene is a single layer of carbon atoms. Carbon is very abundant in the Earth and unlike indium is a sustainable material.

When it was discovered, in the form of small flakes, graphene was called the wonder material because of its amazing properties. However, organizations such as IBM, Intel and Samsung have been unable to scale up the growth of graphene, so that it can be used in electronic devices. Paragraf has developed a new way to produce large-area graphene suitable for such devices.

More information: Zhichao Weng et al, Wafer-Scale Graphene Anodes Replace Indium Tin Oxide in Organic Light-Emitting Diodes, *Advanced Optical Materials* (2021). DOI: 10.1002/adom.202101675

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