Research brings unbreakable phones one step closer

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Breakthrough research at RMIT University is advancing transparent bendable electronics, bringing science fiction gadgets – such as unbreakable rubber-like phones, rollable tablets and even functional clothing – closer to real life.

Researchers from RMIT's Functional Materials and Microsystems research group have developed a new method to transfer electronics with versatile functionality, which are usually made on rigid silicon, onto a flexible surface.

The result of their work was published last week in Nature Publishing Group's *Asia Materials*, the leading materials science journal for the Asia-Pacific.

The ability of micro and nano-electronic devices to sense, insulate or generate energy is controlled by thin, transparent nanolayers of oxide materials, often much thinner than 1/100th of a human hair.

These oxide materials are brittle and their high processing temperatures – often in excess of 300 °C – have until now prevented their incorporation in flexible electronic devices.

Lead author, PhD researcher Philipp Gutruf, said the new process developed at RMIT could unleash the potential of fully functional flexible electronics, while providing a new way for the materials to mesh together.

"We have discovered a micro-tectonic effect, where microscale plates of oxide materials slide over each other, like geological plates, to relieve stress and retain electrical conductivity," he said.

"The novel method we have developed overcomes the challenges of incorporating oxide materials in bendable electronic devices, paving the way for bendable consumer electronics and other exciting applications."

Supervisor and co-leader of the research group, Dr Madhu Bhaskaran, said the new approach used two popular materials – transparent conductive indium tin oxide and rubber-like silicone which is also biocompatible.

"The ability to combine any functional oxide with this biocompatible material creates the potential for biomedical devices to monitor or stimulate nerve cells and organs. This is in addition to the immediate potential for consumer electronics applications in flexible displays, solar cells, and energy harvesters."

Provided by RMIT University