Scientists create tiny bendy power supply for even smaller portable electronics

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Scientists have created a powerful micro-supercapacitor, just nanometres thick, that could help electronics companies develop mobile phones and cameras that are smaller, lighter and thinner than ever before. The tiny power supply measures less than half a centimetre across and is made from a flexible material, opening up the possibility for wearable electronics.

The research is published in the Royal Society of Chemistry journal *Energy & Environmental Science*.

A bottleneck in making portable electronic devices like mobile phones even smaller is reducing the size and increasing the flexibility of the power supplies in electronic circuits. Supercapacitors are attractive power supplies because they can store almost as much energy as a battery, with the advantage of high-speed energy discharge. Supercapacitor electrodes are normally made from carbon or conducting polymers, but these can be relatively costly.

A team led by Professor Oliver G Schmidt at the Leibniz Institute for Solid State and Materials Research in Dresden (IFW-Dresden) examined the use of manganese dioxide as an alternative electrode material, which is more environmentally friendly and less expensive than the standard materials. Manganese dioxide is not a natural choice for an electrode material because it isn't very electrically conductive, nor is it naturally flexible or strong. However, the scientists overcame this by vaporising the manganese dioxide using an electron beam and then allowing the

gaseous atoms to precipitate into thin, bendy films. They incorporated very thin layers of gold into the films to improve the electrical conductivity of the material.

Tests on the new micro-supercapacitor showed that the tiny, bendy power supply can store more energy and provide more power per unit volume than state-of-the-art supercapacitors.

Dr Chenglin Yan, leader of the research group at IFW-Dresden, said: "Supercapacitors, as a new class of energy device, can store high energy and provide high power, bridging the gap between rechargeable batteries and conventional capacitors. So we thought a micro-supercapacitor would be an important development in the rapid advance of portable consumer electronics, which need small lightweight, flexible micro-scale power sources.

"The device could be applied to many miniaturised technologies, including implantable medical devices and active radio frequency identification (RFID) tags for self-powered miniaturised devices."

The next step in the team's research is finding a cheaper alternative to gold to improve the conductivity of the micro-supercapacitor.

Dr Yan said: "The major challenge we had to overcome in developing this technology was to obtain really high energy density on the micro-scale, at a low cost. The inclusion of gold in our micro-supercapacitor makes it more expensive, so we are now looking at replacing gold with cheaper metals, such as manganese, to make the device more practical for the market."

More information: The article 'On chip, all sold-state and flexible microsupercapacitors with high performance based on MnOx/Au multilayers' can be downloaded here: pubs.rsc.org/en/content/articl …

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