

## **Flexible battery power**

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A paper-like, polymer based rechargeable battery has been made by Japanese scientists. The news is reported in the latest edition of The Royal Society of Chemistry journal *Chemical Communications*.

With recent advances in the technology of portable electronic devices, there is a demand for flexible batteries to power them.

Drs Hiroyuki Nishide, Hiroaki Konishi and Takeo Suga at Waseda University have designed the battery – which consists of a redox-active organic polymer film around 200 nanometres thick. Nitroxide radical groups are attached, which act as charge carriers.

The battery has a high charge/discharge capacity because of its high radical density.

Dr Nishide said: "This is just one of many advantages the 'organic radical' battery has over other organic based materials which are limited by the amount of doping.

"The power rate performance is strikingly high – it only takes one minute to fully charge the battery. And it has a long cycle life, often exceeding 1,000 cycles."

The team made the thin polymer film by a solution-processable method – a soluble polymer with the radical groups attached is "spin-coated" onto a surface. After UV irradiation, the polymer then becomes crosslinked with the help of a bisazide crosslinking agent.



A drawback of some organic radical polymers is the fact they are soluble in the electrolyte solution which results in self-discharging of the battery – but the polymer must be soluble so it can be spin-coated.

However, the photocrosslinking method used by the Japanese team overcomes the problem and makes the polymer mechanically tough.

Dr Nishide said: "This has been a challenging step, since most crosslinking reactions are sensitive to the nitroxide radical."

Professor Peter Skabara, an expert in electroactive materials at the University of Strathclyde, praised the high stability and fabrication strategy of the polymer-based battery.

He said: "The plastic battery plays a part in ensuring that organic device technologies can function in thin film and flexible form as a complete package."

Dr Nishide envisages that the organic radical battery could be used in pocket-sized integrated circuit cards, used for memory storage and microprocessing, within three years.

He said: "In the future, these batteries may be used in applications that require high-power capability rather than high energy density, such as a battery in electronic devices and motor drive assistance in electric vehicles."

Source: Royal Society of Chemistry

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