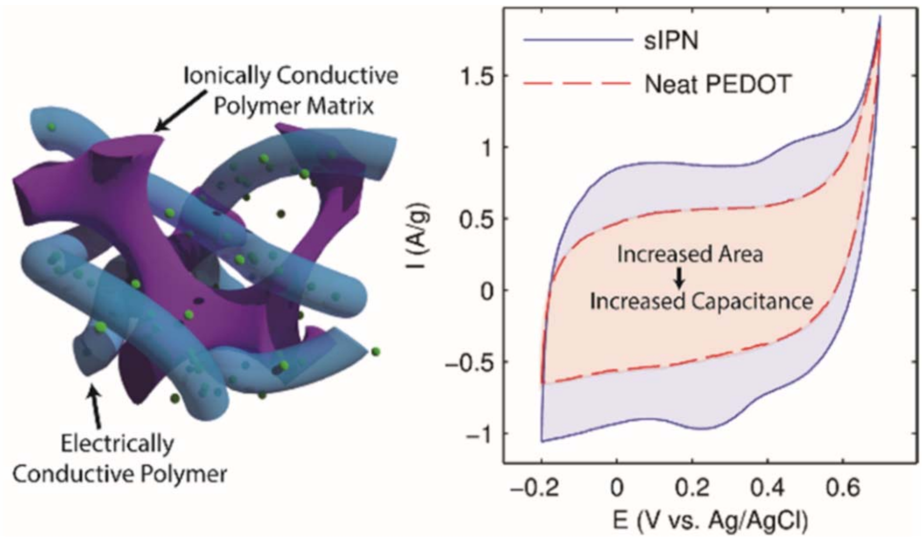
High capacitance, low cost, mechanically robust and flexible supercapacitor active material



Researchers at the Department of Materials Engineering and Metallurgy, University of Cambridge have developed a new polymeric network material that enables the production of a flexible supercapacitor with high specific capacitance and cycling stability. Possible applications include supercapacitors for wearable and biomedical applications, and soft robotics. The team is now keen to collaborate with suitable partners for the development of the technology.

Key Benefits:

- **High specific capacitance** – 182 F/g achieved using PEDOT/PEO polymer network combination
- **High cycling stability** - capacitance retained over 3,000 charging cycles at high charge rates, due to the intrinsic mechanical stability of the material.
- **Highly flexible and biocompatible** - material suitable for wearable and biomedical applications, performance retained over 1,000 bending cycles
- **Wide potential window** – working voltage 0 - 2.7 V has been experimentally confirmed for the supercapacitor device based on our active materials
- **Low-cost -** uses mature, scalable manufacturing methods (compatible with printing technologies), with cheaply and readily available raw input materials

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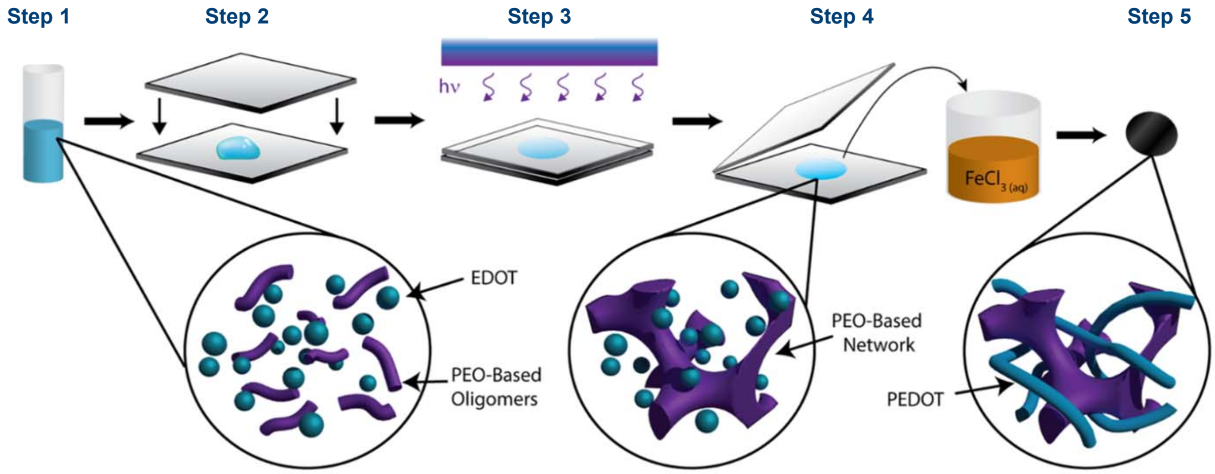

Fig. 1: Production process: (1) Blending to make a liquid mixture, (2) Casting into a mould, (3) Polymerisation and crosslinking under UV, (4) Further polymerisation by oxidizing agents (5) Resulting sIPN

Background

Existing rigid supercapacitor technology is not ideally suited for applications such as wearable electronics, roll-up displays and bio-implantable devices.

Similarly, existing flexible supercapacitors lack the electrochemical performance and robustness of their rigid counterparts, required for basic applications.

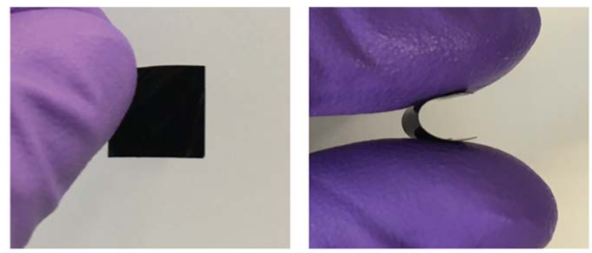

Fig. 2: Demonstration of material flexibility

Approach

Our semi-Interpenetrating Polymer Network (sIPN) of Electronically and Ionically Conducting Polymers enables the production of a flexible supercapacitor with 'rigid-supercapacitor-like' electrochemical performance.

Key capabilities of our active material:

- **Low-cost using known production processes** (see Fig. 1), also compatible with printing technologies
- **High flexibility** – Up to 200 μm radius of curvature without breaking/cracking (see Fig. 2)
- **High cycling stability** – 97.5% capacitance retention after 3000 cycles, demonstrating mechanical robustness of material
- **High specific capacitance** – 182 F/g achieved using PEDOT/PEO sIPN combination
- **Wide potential window** – Working voltage has been extended to 0 - 2.7 V

Commercialisation

This technology is protected by a GB patent application and we are now looking for partners to evaluate our material and/or develop application concepts.

If you are interested in discussing how your company can work with us, please contact us using the details on the front of this sheet.

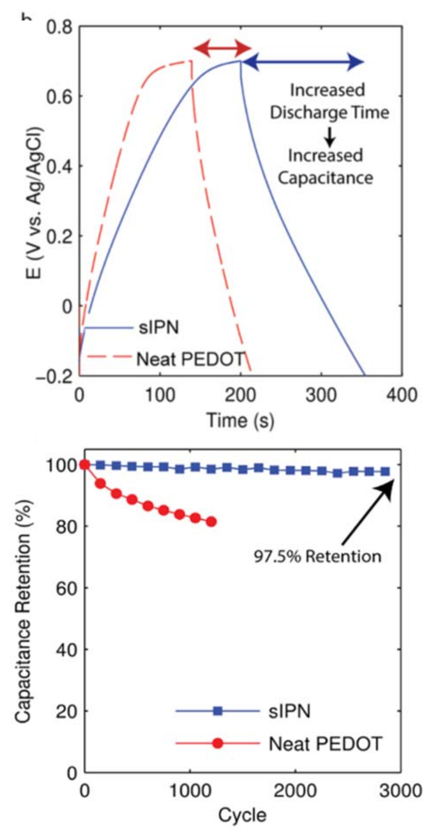

Fig. 3: Charge/Discharge plot at 1 A/g and capacitance retention cycling at 10 A/g