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enterprise

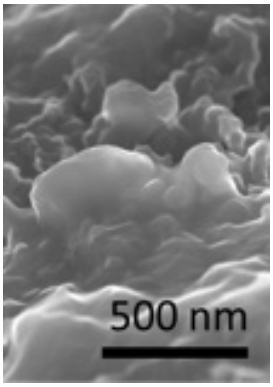
Reduced graphene oxide as a conductive binder for energy storage devices

Powerful innovation in energy storage

Researchers in the Department of Engineering, University of Cambridge, have developed a new material for energy storage device electrodes using activated carbon and reduced graphene oxide. This is expected to improve energy storage device performance. The team is now keen to license the technology to a suitable partner for development. Possible applications for improved energy storage devices include the automotive industry and hybrid vehicles, smartphones, and energy harvesting.

Key Benefits

- 25-30% improvement in specific capacitance including high scanning rate
- Low cost, standard production processes and solvents
- Up to 400% improvement in power density and discharge rate
- Test cells achieve 80% capacitance retention over 20000 cycles



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What problem does this material solve?

Lightweight energy storage devices with high energy density are vital in a world moving away from reliance on petrochemicals in almost all technology areas. The binding material in conventional energy storage limits the conductivity of the electrode and therefore the performance of the energy storage device. Current materials show decreased capacitance at high scanning rates (Fig. 1). The new composite material of activated carbon and reduced graphene oxide has an improved maximum capacitance of 25-30% over state-of-the-art supercapacitors with little extra cost. The test cells show 80% capacitance retention after 20000 cycles. Additionally, the discharge rate is improved by up to 400% compared to current technology (max 3 seconds, depending on current density).

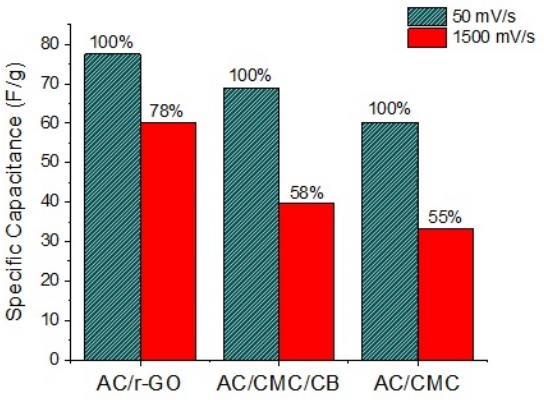

Figure 1: Our material (AC/r-GO, on the left) has better retention of capacitance (78%) when changing from low to high scanning rate (hatched to solid)

Applications

The improved performance from this composite material means that enhanced energy storage devices may be developed for a range of commercial applications. The increase in renewable energy production using sources such as solar and wind means there is more variability in the level of energy production. Therefore, there is growing demand for grid energy storage devices that can deliver stored power when production drops as a grid stabilisation mechanism. Improved energy storage devices are also of interest to the developing electric vehicle market, as increasing the distance they can be driven between charges is highly desirable.

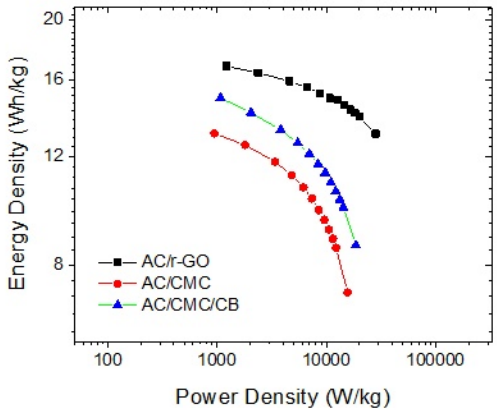

Figure 2: Our material (AC/r-GO, black squares) shows increased power density compared to existing materials

Production of the new composite material

In addition to exceptional performance, our composite material is easily produced:

- Starting material is readily available high quality graphite
- AC/r-GO mixture is made using simple in situ thermal processing
- Easy to exfoliate with standard solvents

Next steps

This technology is protected by patent applications in the USA and China, PCT publication number WO2017021705. We are now looking for partners to help us develop the material for applications in energy storage devices. Please contact us to explore this opportunity further.