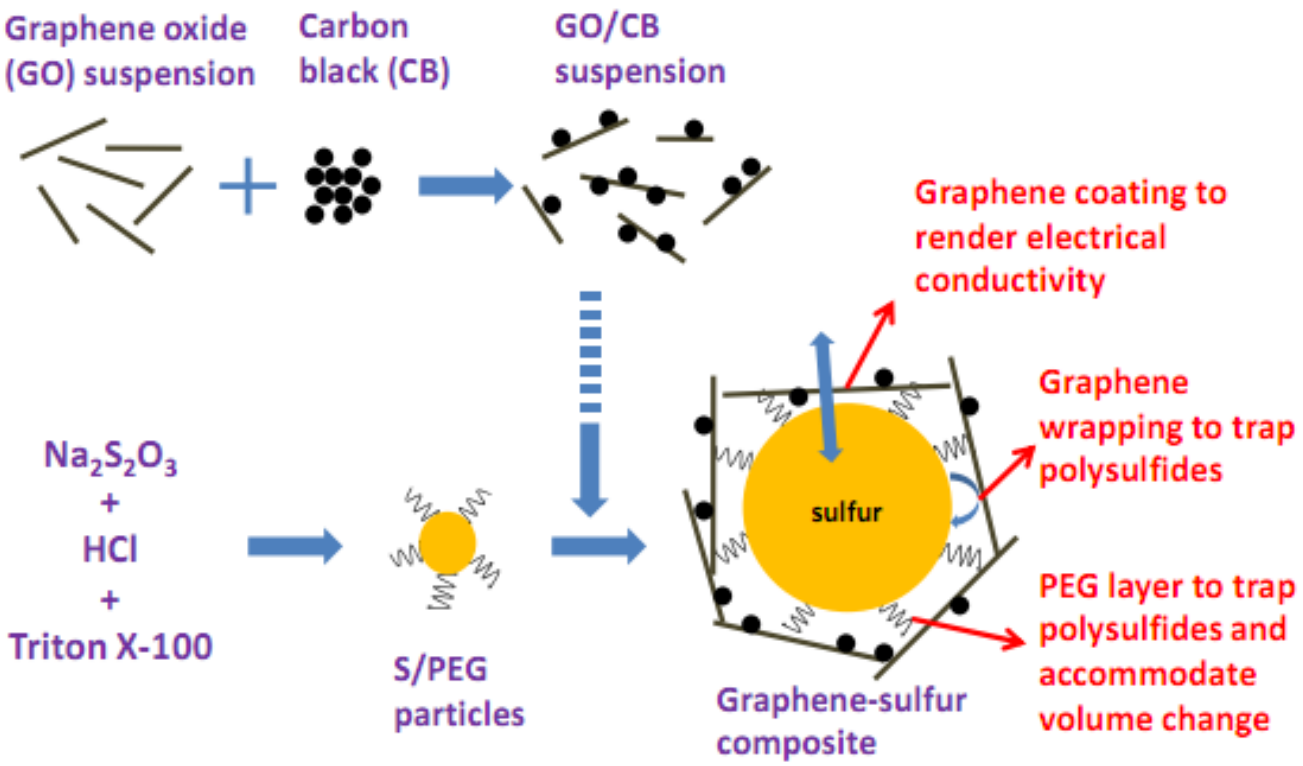
Sulphur Breakthrough Significantly Boosts Lithium Battery Capacity

(Technology Review [1]) - Lithium batteries have become the portable powerhouses of modern society. If you own a phone, mp3 player or laptop, you will already own a lithium battery. More than likely, you will have several.



But good as they are, lithium batteries are not up to the demanding task of powering the next generation of electric vehicles. They just don't have enough juice or the ability to release it quickly over and over again.

The problem lies with the cathodes in these batteries. The specific capacities of the anode materials in lithium batteries are 370 mAh/g for graphite and 4200 mAh/g for silicon. By contrast, the cathode specific capacities are 170 mAh/g for LiFePO4 and only 150mAh/g for layered oxides.

So the way forward is clear: find a way to improve the cathode's specific capacity while maintaining all the other characteristics that batteries require, such as a decent energy efficiency and a good cycle life.

Today, Hailiang Wang and buddies at Stanford University say they've achieved a significant step towards this goal using sulphur as the cathode material of choice.

Chemists have known for many years that sulphur has potential: it has a theoretical specific capacity of 1672 mAh/g. But it also has a number of disadvantages, not least of these is the fact that sulphur is a poor conductor. On top of this, polysulphides tend to dissolve and wash away in many electrolytes while sulphur tends to swell during the discharge cycle causing it to crumble.

But Wang and co say they've largely overcome these problems using a few clever nanoengineering techniques to improve the performance. Their trick is to create submicron sulphur particles and coat them in a kind of plastic called polyethyleneglycol or PEG. This traps polysulphides and prevents them from washing away.

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