UNIVERSITY OF CAMBRIDGE enterprise

High energy density lithium-sulfur batteries

BACKGROUND

Lithium-sulfur batteries have the capability to significantly outperform the state-of-the-art lithium ion batteries currently found on the market. Generating power via redox reactions allows Li-S batteries to overcome the limitations of insertion-oxide cathodes and graphite anodes in conventional Li-ion cells. However, commercialisation has not yet been realised as multiple components usually have to be added to the sulfur cathode to promote conductivity, to catalyse chemical reactions at the electrode and to prevent the loss of sulfide ions e.g., as polysufides.

In this innovative approach developed within the laboratories of Prof. Manish Chhowalla, a single additive comprising molybdenum disulfide fulfils all three of these roles, thereby reducing the amount of ‘dead weight’ which in turn increase the energy density of the battery.

BENEFITS

- Utilises earth-abundant and inexpensive molybdenum (IV) sulfide as a cathode material
- Avoids the need for three different cathode additives, thereby increasing active material at the cathode, and hence the energy density of the battery
- Results in commercially viable Li-S batteries with potentially ground-breaking energy densities
- Opens up weight-critical applications such as flight which have traditionally been beyond the capabilities of commercial, state-of-the-art lithium batteries

APPLICATIONS

This technology should be of interest to anyone working in the development of next generation lithium-ion batteries, specifically with lithium-sulfur batteries.

It is also anticipated that this technology will open up a host of new weight-critical applications for lithium batteries which have previously been limited by performance.

OPPORTUNITY

The technology has been successfully scaled up under laboratory conditions and pouch cells

- Exhibiting high levels of capacity retention even after hundreds of charge-discharge cycles
- Have been successfully fabricated and demonstrated.

PATENTS

PCT Application EP2022/076077 (priority date 20 September 2021)