Knowledge Transfer Office
香港城市大學
City University of Hong Kong

Material for Use in a Battery, a Battery and a Method of Manufacturing a Material for Use in a Battery

Energy & Environment

Manufacturing

Consumer Electronics

Energy Conservation/Generation/Management/Storage (Battery)

Nanotechnology and New Materials

Opportunity

Batteries are used as sources of power in various electronic and electrical devices and apparatus, such as watches, mobile phones, power tools and vehicles. The performance of batteries varies according to the materials they are made from, with rechargeable batteries' electrodes made from materials that can repeatedly store and release energy by means of reversible chemical reactions. However, electrode materials ultimately lose their ability to be charged and/or discharged, at which point rechargeable batteries cease to function. This can occur when the active materials comprising electrodes crack due to repeated volume changes during charging and discharging of the battery. Thus, there is need for active materials with enhanced stability to improve the lifetime of electrodes in rechargeable batteries.

Technology

The inventors have discovered that certain materials can accommodate large amounts of metal ions, such as lithium or sodium ions, which makes these materials suitable for serving as anode materials in batteries. However, these materials undergo large volume expansions during metal-ion insertion, followed by large volume contractions during metal-ion detachment. This can result in damage such as material cracking, and thus poor battery performance. Nanomaterials can be used to accommodate the above-described volume changes but are challenging and expensive to mass produce and have decreased energy density. The inventors have solved this problem by developing active materials and corresponding stretchable polymer coatings. The former can serve as anodes, and the latter function as stabilising 'balloons' around anodes, such that they expand and contract during charging and discharging without suffering damage. This enhances battery lifetime and performance. In addition, such polymer coatings can be applied to other active materials in rechargeable batteries.

Advantages

- Polymer coatings are easily introduced onto commercially available materials via processes that are suitable for use in mass production of various anode–coating systems.

IP Status
Patent filed

Technology Readiness Level (TRL) ?
4

Inventor(s)
Dr. YU Yau Wai Denis
Dr. LI Yingshun
Enquiry: kto@cityu.edu.hk

- Proportions of polymer coatings have been identified that result in a good balance between charge capacity and capacity retention, with the latter ranging from ~90 to 100%.
- The polymer coatings can be applied to other (i.e., non-anode) active materials in rechargeable batteries.

Applications

- Mass production of rechargeable batteries with enhanced stability and thus longer lifetimes than currently available rechargeable batteries.
- High-efficiency rechargeable batteries for use in electrical and electronic devices.