UNIVERSITY OF CAMBRIDGE enterprise

Cathode coatings for NMC batteries

BACKGROUND

It is well established that the capacity of lithium ion cells can be improved by increasing the proportion of nickel relative to manganese and cobalt in the so-termed NMC cathodes. The lower reliance on cobalt also has significant social benefits. Unfortunately, high nickel contents result in reduced thermal stability and poor discharge-recharge cycling performance.

Among the technical solutions proposed to mitigate the cathode degradation, one of the most promising appears to be the use of coatings, especially mixed metal oxides such as $LiAlO_2$. However, until this work, bimetallic oxide coatings required two precursors which would generally result in uneven distributions of the metal species over the electrode.

In this innovation, bimetallic alkoxides – where one metal is either magnesium or lithium, and where the second is zirconium, titanium or aluminium – are coated onto the electrode and heated (“calcined”) to conveniently produce homogeneously distributed mixed oxides.

TECHNOLOGY OVERVIEW

- Convenient, scalable process for coating NMC electrodes and for stabilising high-nickel, high capacity Li ion batteries.
- Allows easy access to a wide range of mixed metal oxides, allowing ion transport and electrode barrier properties to be adjusted and controlled.
- Excellent cycling stability without loss of capacity compared to uncoated particles has been demonstrated for NMC-811 coated with Mg/Zr mixed oxide.

BENEFITS

- Improved lifetime of NMC cathodes without compromising capacity of Li-ion batteries.
- Convenient and gentle chemistry.
- Widely applicable to a range of different mixed metal oxides.

APPLICATIONS

- The method is being expanded to a broad range of metals to realise its true potential.
- It is an exciting opportunity for those wishing to stabilise high Ni content cathode materials at scale.

OPPORTUNITY

This technology is protected by a priority patent application (GB 2112283.3). We are now seeking to work with an industrial partner to optimise and scale the synthetic route and exploit its potential in high capacity, long lifetime Li-ion batteries.