Basseterre battery performance

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Non-destructive techniques capable of tracking commercial battery properties under realistic conditions have unlocked chemical, thermal and mechanical data with the potential to accelerate and optimize the development and utilization strategies of lithium-ion devices, both new and used.

Before use, battery assembly wetting and formation cycles should be carefully monitored using imaging or advanced electrochemical techniques to reduce the scrap rate. This could be achieved using tomography, acoustic imaging or spectroscopic characterization.

During use, thermal and mechanical phenomena at the cell level could contribute to enhance the battery management system (BMS). In this context, electrical and optical sensors offer large versatility of shape, sensitivity and accuracy.

After use, accurate evaluation of battery degradation at the cell level and determination of their true end-of-life status is crucial for second-life applications. To preserve battery integrity, acoustic and thermographic imaging appear promising techniques.

One technique being pursued by automakers and battery developers to extend lifetime is ‘derating’, where a battery is operated more conservatively in certain situations to reduce degradation. An example of derating is to slow the rate of charging when the battery nears its maximum storage capacity, which limits the potential damage to the cells.

Everything has a trade-off in battery engineering, says Dr Billy Wu, a senior lecturer in electrochemical engineering at Imperial College London, but with a deeper understanding of physics we can get closer to the optimum.

“So, the question is where do you sit on that trade-off curve? How much do you compromise performance for longevity? We’ve looked at how you can achieve maximum performance without

pushing a battery too far, preventing degradation.”

A Faraday Institution Industry Fellowship between Imperial College London and WAE (formerly Williams Advanced Engineering), an Oxfordshire-based technology and engineering services business, has investigated the effectiveness of various derating approaches.

The collaboration completed a critical review of derating methods and produced a valuable go-to resource for a wide range of organisations – automakers, battery developers, grid energy storage system operators, and developers of consumer electronics – seeking to exploit the considerable potential of the technique.

Derating is appealing because it can be implemented at minimal cost, applied via software updates to existing EV fleets, and does not influence system reliability or generate additional safety issues.

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