Quick Evaluation of the State-of-Health of Spent Lithium-Ion Battery Modules

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A decommissioned battery module with 15 in parallel and 4 series from an electric vehicle was aged at 2 C-rate in the SOC range of 30–80% in the laboratory until its state of health (SOH) value reached about 60%. The module capacity was calibrated at 1/5 C-rate after every 100 or 200 cycles of aging. The probability density function (PDF) method and incremental capacity analysis (ICA) were introduced to establish an SOH model of battery modules against experimental charge and discharge voltage data in the process of capacity calibration. As a new SOH evaluation algorithm, the discrete Fréchet distance was also proposed for the battery module, and the concept of mean Fréchet distance (MFD) was given as a quick evaluation index of the module's SOH. The results showed that there was a fine negative linear dependence of module SOH on MFD. The discrete Fréchet distance method has better accuracy than ICA and PDF in terms of module SOH evaluation.

FULL TEXT