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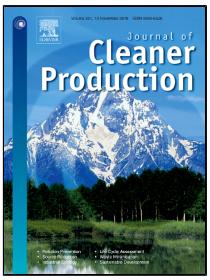

State of health estimation of second-life $LiFePO_4$ batteries for energy storage applications

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State of health estimation of second-life $LiFePO_4$ batteries for energy storage applications[1]

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Abstract: This paper focuses on the identification of the aging mechanism and estimation of the state of health of second-life batteries. Six retired $LiFePO_4$ batteries are selected to conduct cycle life tests under three typical load profiles for energy storage applications. By adopting incremental capacity analysis (ICA) and IC peak area analysis, aging mechanisms in the batteries are studied. All the batteries have shown the same aging pattern with a combination of loss of lithium inventory (LLI) and loss of active materials on negative electrodes (LAM_{NE}). The LLI and LAM_{NE} are analyzed in a quantitative manner to detect the similarities and differences among the batteries operated under different load profiles. To estimate the battery remaining capacity, three types of regression methods are proposed and compared. The features of IC curves are used as inputs to the regression models. The results show that the estimation errors with ordinary least squares (OLS) regression and ridge regression methods are within 2%, and that ridge regression has lower root mean square error than OLS regression. Using correlation-based feature selection

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