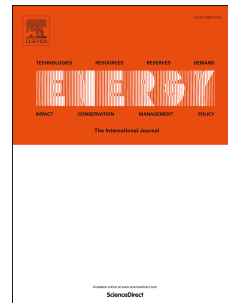


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## Practical failure recognition model of lithium-ion batteries based on partially charging process

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### Abstract

The recognition of failed batteries in a battery pack has long been a time-consuming task. Thus there is an urgent need for an on-board method implementation to identify failed batteries for the safe operation of electric vehicles. In this paper, a novel method to identify failed batteries with insufficient capacities is proposed. The properties of the incremental capacity curve are studied. Six features are extracted from the partial incremental capacity curve of each battery and a shrinkage method called the elastic net is used to select two variables that are most relevant to the capacity fade. A classification model based on linear discriminant analysis is established which can assign a given battery into two classes, namely “good” and “bad”. The effect of prior probability for each class of battery and the configuration to minimize true loss are discussed. This proposed method is relatively easy to implement with high accuracy, thus having high practicability.

*Keywords:* Lithium-ion battery, Failure recognition, Incremental capacity, Variable selection, Linear discriminant analysis.

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