Lithium battery packs cannot be connected in series

Does a series-connected lithium-ion battery pack have a fault?
In this study, small-scale fault experiments that consider the inconsistency among cells, virtual connection fault, and external short circuits of the series-connected lithium-ion battery pack are carried out under laboratory conditions to verify the proposed method.

What are the characteristics of lithium ion battery packs?
One of the critical aspects of the use and management of lithium-ion battery packs is the statistical variations of the electro-chemical-thermal characteristics of the single cells. A battery pack consists of series and parallel connected cells. The effect of the mismatch among the cells causes degradation of the performances of the battery pack.

What happens if a battery pack is connected in parallel?
The maximum value of mismatch among the cell parameters that will be connected in parallel must be properly defined and the allowed voltage range of the battery pack must be reduced to avoid overcharge and over-discharge of some of the cells. This causes a reduction of the effective usable capacity of the battery pack.

What is a multi-fault diagnostic strategy for series-connected lithium-ion battery pack?
A multi-fault diagnostic strategy for the series-connected lithium-ion battery pack is proposed. The contribution-based PCAis adopted to detect the fault of the battery. The reconstruction-based parallel PCA-KPCA is used to estimate the fault waveform. Inconsistency,connection fault,and external short circuit are comprehensively diagnosed.

What happens if a battery pack is mismatched?
This causes a reduction of the effective usable capacityof the battery pack. If usually the charge of a single cell is maintained between 10% to 90% of the nominal capacity,the charge of the battery pack in case of mismatch must be between 15% to 85% of the nominal capacity,that is an additional 10% of battery capacity cannot be used.

What happens if a fault is detected in a battery pack?
If the contributions exceed the preset threshold,it is preliminarily detected that a fault has occurred in the battery pack. After a fault is detected,the characteristic parameters,Ut,R0,and OCV,of the fault cell are reconstructedbased on parallel PCA-KPCA. The fault waveforms of the parameters are estimated.

The results show that battery configurations with modules directly connected in parallel and then assembled in series are more robust against variation of the cell capacity through the battery. Moreover, given the cells and the battery configuration, we show that changing the position of the cells has a significant impact on the

usable capacity ...

This paper proposes a connection fault diagnosis method for series-connected battery packs based on the combination of edit distance on real-sequence (EDR) and charging capacity-voltage (QV) curve conversion. The method can determine the location of the faulty cell and the preliminary quantification of fault degree by calculating the similarity ...

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Abstract: In this paper, the multi-fault diagnosis problem is investigated for series-connected lithium-ion battery packs based on an improved correlation coefficient ...

Multi-fault diagnosis for series-connected lithium-ion battery pack with reconstruction-based contribution based on parallel PCA-KPCA Appl. Energy, 324 (2022), Article 119678, ...

challenge of battery pack modeling is that pack-level per-formance cannot be accurately extrapolated from single-cell models. This is due not only to manufacturing variations between cells and non-uniform degradation rates, but to the very fact of the cells being connected in series or parallel within the pack. As shown in [1], battery pack ...

Whatever your reasons, it"s time to put some cells into series. The common notation for battery packs in parallel or series is XsYp - as in, the battery consists of X cell "stages" in...

The lithium-ion battery has become the prevalent technology to store and serve electric power. The state of health (SOH) for a battery cell directly influences the working safety and reliability of the host system. Moreover, since the battery cells are series connected for higher terminal voltage, the cell inconsistency will also impact the performance of the whole battery pack. In ...

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Internal short circuits (ISCs) may occur in lithium-ion battery packs during their use and lead to the depletion of battery power at an early stage or to thermal runaways and safety risks at a later stage. In this study, a state-of-charge (SOC) correlation-based early stage ISC detection method for the online detection of ISCs under dynamic conditions is proposed to ...

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As shown in Figure 1, taking the series-connected lithium battery pack equalization unit composed of Bat1, Bat2, Bat3, and Bat4 as an example, each single battery is connected to four switching MOS tubes to form a bidirectional energy transfer circuit, and each MOS tube is connected in parallel with a current-continuing diode, which turns on the ...

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In order to meet the vehicle driving ranges and power requirements, the power battery pack is generally assembled by multiple batteries in series or parallel [5]. These lithium-ion battery (LIB) packs could result in a series of the potential risk of fire or explosion because of cell fault [6, 7]. Hence, it"s necessary to study the fault ...

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