

Can material characteristics improve lithium-ion battery performance?

As research in lithium-ion batteries covers multiple scales from materials development to system design, implications of improvements in material characteristics on battery cell performance are often hard to quantify.

How can lithium-ion batteries improve the safety of electric vehicles?

To enhance the resilience and safety of electric vehicles (EVs), it is imperative to consider the properties of lithium-ion batteries. Accurately identifying the model parameters of these batteries can significantly improve the effectiveness of battery management systems by facilitating condition monitoring and fault diagnosis.

Why do we need a model for lithium-ion batteries?

The increasing adoption of batteries in a variety of applications has highlighted the necessity of accurate parameter identification and effective modeling, especially for lithium-ion batteries, which are preferred due to their high power and energy densities.

How to design a virtual battery cell?

To design a virtual cell the user needs to provide many different parameters. Others can be calculated according to constraints, which need to be fulfilled. The first constraint of every battery cell is the equality of anode- and cathode surface capacity.

Which algorithm is used for parameter identification in a battery model?

Considering the fractional-order characteristics, only algorithms such as GA, PSO [80,82], or nonlinear least squares method [83,84] can be used for parameter identification. Besides, some battery models are proposed to utilize the advantages of different modeling techniques.

Is battery parameter identification important for state estimation and EV applications?

In addition, no comparison methods and discussions have existed in the above studies. The publications in Scopus are investigated between 2012 and 2022 with the item "battery parameter identification". It is generally acknowledged that battery parameter identification is critical to state estimation and EV applications.

Here, we present a novel approach for estimating parameters that combine the two RC equivalent models with the variational and logistic map cuckoo search (VLCS) algorithm. To accurately estimate the parameters of a ...

Lithium ion battery model for virtual battery is generally required to be able to describe both the external electrical characteristics of the battery and the internal physical and chemical processes of the battery. ... (OCV) curve is shown in Fig. 2, and the battery parameters are shown in Table 1, where C-rate means the current amplitude with ...

Prediction of thermal runaway for a lithium-ion battery through multiphysics-informed DeepONet with virtual data. ... these results demonstrate the response of LFP cells by adjusting relevant parameters in the multiphysics FEM to reflect actual experimental data, specifically considering the physical properties of the four key chemical ...

Online parameter identification is essential for the accuracy of the battery equivalent circuit model (ECM). The traditional recursive least squares (RLS) method is easily ...

The physical and electrochemical model parameters are representative of an instance of a prismatic lithium-ion battery cell that comprises lithium cobalt oxide (LCO) chemistry. In terms of the structure of this article, the subsequent Section 2 overviews the various LIB battery solver and model equations, the architecture of the applied codebase, and the specifications of ...

Effective health management and accurate state of charge (SOC) estimation are crucial for the safety and longevity of lithium-ion batteries (LIBs), particularly in electric vehicles. This paper presents a health management system (HMS) that continuously monitors a 4s2p LIB pack's parameters--current, voltage, and temperature--to mitigate risks such as ...

Multi-time scale variable-order equivalent circuit model for virtual battery considering initial polarization condition of lithium-ion battery. / He, Xitian; Sun, Bingxiang; Zhang, Weige et al. ... the time range for short-time scale model parameter identification is determined based on the electrochemical impedance spectroscopy acquired by the ...

In [37] an electrochemical model was used as the virtual battery to replicate the degradation mechanism and this simulation has been used to estimate the ECM parameters by varying the associated ...

Lithium ion battery model for virtual battery is generally required to be able to describe both the external electrical characteristics of the battery and the internal physical and chemical processes of the battery. At the same time, it needs to meet the requirements of low model calculation and low time-consuming. ... the parameter ...

By analyzing the available datasets, in this paper, we have selected a straightforward and accessible parameter--the average voltage value from the constant ...

For lithium-ion battery ESSs, the state of charge (SOC) characterizes how much electricity is left in the battery, and it is an essential parameter for the safe operation of battery ESSs . Typical SOC estimation methods include the open circuit voltage (OCV) and current integration methods.

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