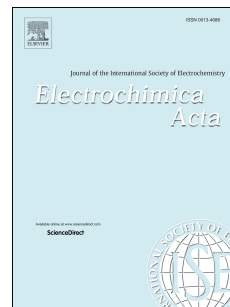


Accepted Manuscript

A comparative study of different equivalent circuit models for estimating state-of-charge of lithium-ion batteries

Xin Lai, Yuejiu Zheng, Tao Sun



PII: S0013-4686(17)32288-0

DOI: [10.1016/j.electacta.2017.10.153](https://doi.org/10.1016/j.electacta.2017.10.153)

Reference: EA 30539

To appear in: *Electrochimica Acta*

Received Date: 29 July 2017

Revised Date: 24 October 2017

Accepted Date: 24 October 2017

Please cite this article as: X. Lai, Y. Zheng, T. Sun, A comparative study of different equivalent circuit models for estimating state-of-charge of lithium-ion batteries, *Electrochimica Acta* (2017), doi: 10.1016/j.electacta.2017.10.153.

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

A comparative study of different equivalent circuit models for estimating state-of-charge of lithium-ion batteries

Xin Lai, Yuejiu Zheng*, Tao Sun

College of Mechanical Engineering, University of Shanghai for Science and Technology, Shanghai 200093

*Correspondence to: yuejiu_zheng@163.com (Yuejiu Zheng)

Highlights:

- Eleven equivalent circuit models compared for model/SOC accuracy, stability, robustness.
- First- and second-order RC models have best balance of accuracy and reliability.
- A higher-order RC model increased robustness.
- Accurate SOC-OCV curve and high precision sensors are essential for SOC estimation.

Abstract: An appropriate model is a prerequisite for accurate state-of-charge (SOC) estimation. The widely used equivalent circuit models (ECMs) employ a variety of forms; thus, to find the optimum ECM is a primary task for SOC estimation. In this work, we examined eleven ECMs to fulfill the following goals: (1) to compare the typical ECMs for accuracy, stability, and robustness of model and SOC estimation; (2) to compare and evaluate the robustness of the ECMs considering model and sensor errors. The results indicate that the model accuracy does not always improve by increasing the order of the RC network. Conversely, over-fitting problems appear with a certain probability. The first- and second-order RC models are the best choice owing to their balance of accuracy and reliability for LiNMC batteries. The higher-order RC model has better robustness considering the variation in model parameters and sensor errors. Independently of the ECM adopted, an accurate OCV-SOC curve and high precision sensors are essential.

Keywords: Lithium-ion battery; SOC estimation; Equivalent circuit model; Extended Kalman Filter; Comparative study.

1. Introduction

Over the past decade, energy shortage and global climate warming have provided a good opportunity for the rapid development of electric vehicles (EVs) [1-3]. Battery, motor and electric control are the three key technologies applied in EVs, and the battery represents the main factor restricting the expansion of EVs in the marketplace [4, 5]. Among all types of power batteries for

Download English Version:

<https://daneshyari.com/en/article/6604908>

Download Persian Version:

<https://daneshyari.com/article/6604908>

[Daneshyari.com](https://daneshyari.com)