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Titel des Beitrags: Guide for the Focused Utilization of Aging Models for Lithium-Ion Batteries - An Automotive Perspective

Abstract: Battery aging in electric and hybrid vehicles is a major issue, and one which has to be taken into consideration during all stages of the vehicle lifecycle. It depends on many factors, such as the cell chemistry, the cell design and stress factors as well as the current rate, ΔDOD and temperature. The stress factors have been identified as being crucial due to their influence on two important battery parameters: capacity and inner resistance. Battery aging models are essential to describing the interacting influences that stress factors have on battery parameters. They provide insights about battery aging without the need for extensive measurements. Various battery aging models with widely varying capabilities are described in the literature. The aim of this paper is to provide a decision guide for utilizing the most appropriate aging model for the major stages of the vehicle lifecycle: vehicle development, operation (onboard and offboard) and post-operation. First, this paper summarizes the correlation of many known stress factors on battery parameters, considering all factors separately. Second, evaluation criteria for aging models and vehicle lifecycle stages are established. Third, the importance of the obtained evaluation with
regard to the vehicle lifecycle stages is analyzed. Using the same criteria, the different kinds of battery aging models are evaluated in the fourth step. In the final section, a guide for the focused utilization is established. In conclusion, the information obtained about requirements for aging models in major stages of the vehicle lifecycle and the evaluated aging models reduce the need for further research and development work for selecting the most beneficial cluster of aging models.

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