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A Novel Electrochemical Battery Model For State Of Charge And State Of Health Estimation

By Alexander Patrick Schmidt

Shaker Verlag Nov 2010, 2010. Buch. Condition: Neu. Neuware - Currently, there is a strong demand in the automobile industry for replacing internal combustion engines by electrical drivetrains. This requires the development of powerful battery systems on the basis of rechargeable lithium-ion cells. In order to operate them in an optimal way, it is essential to accurately detect the state of charge (SOC) and the state of health (SOH) of the energy storage system. For this purpose, the thesis at hand presents a novel electrochemical model of a lithium-ion cell. By the abdication of parameter maps the model can be parameterized for a particular cell by using some few characteristic measurements. The compact model structure only consists of 6 states and also includes the thermal behaviour of the cell. Thus, it is well suited for the implementation in battery control units. Based on classical single-particle approaches, a lumped-parameter nonlinear model is developed. It is able to predict accurately the terminal voltages for arbitrary loads, and even for potentiostatic operation. The key points are: (1) an incorporation of the electrolyte potential, (2) a modal decomposition of the partial differential equation of the liquid phase lithium-ion concentration, (3) a correct handling of...



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