

Supplementary Materials: Rapid Prediction of the Open-Circuit-Voltage of Lithium Ion Batteries Based on an Effective Voltage Relaxation Model

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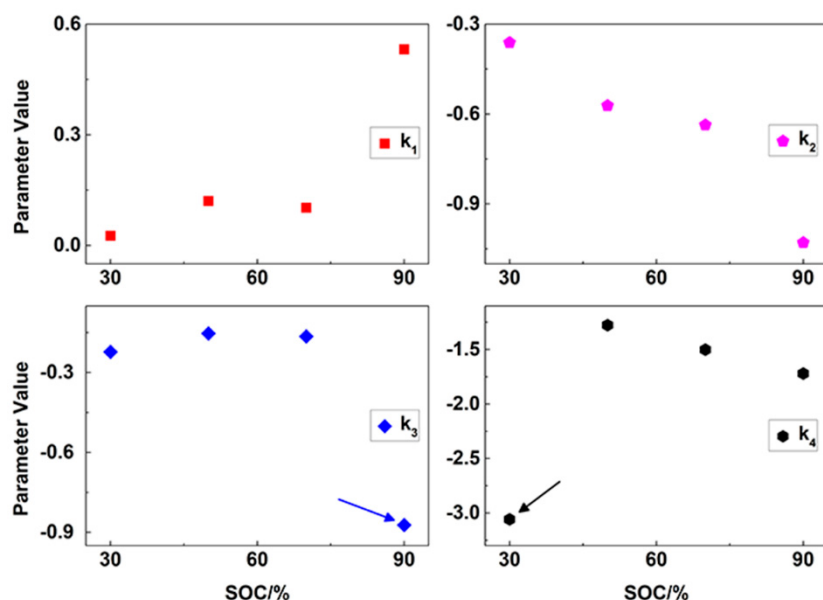


Figure S1 Results of the model parameters for LCO/MCMB battery at different SOC points.

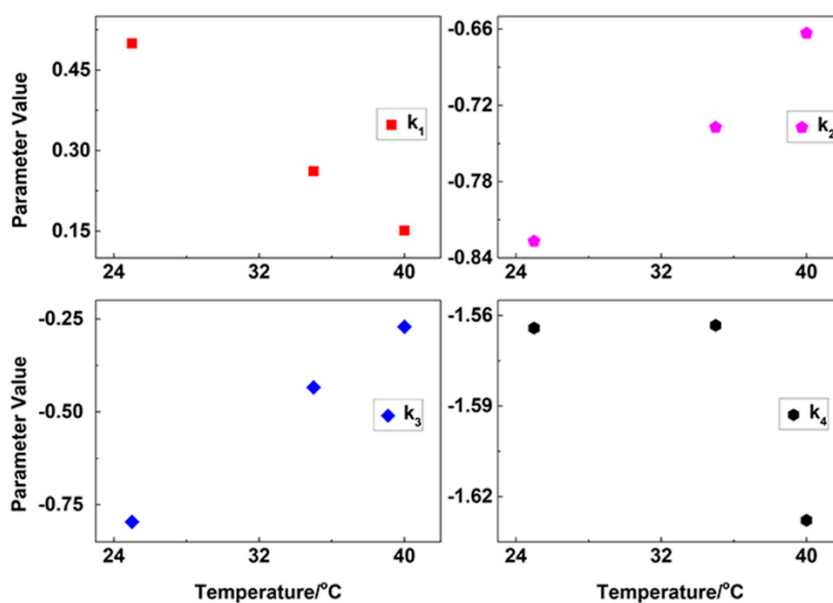


Figure S2 Results of the model parameters for LCO/MCMB battery at different temperatures.

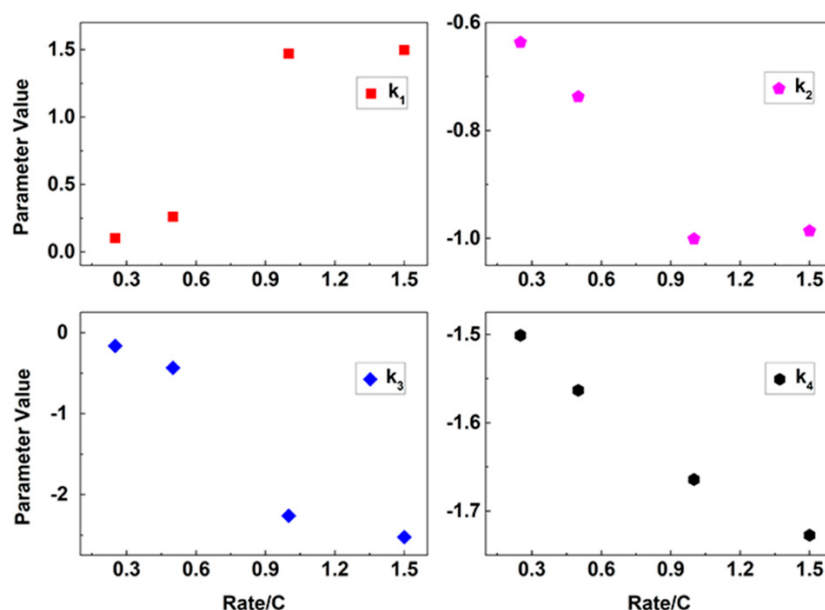


Figure S3 Results of the model parameters for LCO/MCMB battery at different discharge rates.

Additionally, **Figure S4** shows the validation result for a commercial and aged 18650 cell with NCA and graphite as the electrode material. The nominal capacity of this cell is 2800 mAh. The cell was aged by cycling with constant current – constant voltage charging and constant current discharging regime. The aging current was 1C and the temperature is 25 °C. The operating voltage range is 4.2 V to 2.5 V. For the validation, the aged cell was fully charged with 0.5 C to 4.2 V and held on 4.2 V until the current was below 0.05 C. Then it was discharged with 0.5 C to 73% SOC followed by a 3 h rest to measure the voltage relaxation data and the e-OCV. And we can find in **Figure S4** that the model fits the experimental data very well. The predicted and measured results are 3.9252 V and 3.9245 V, respectively, with an error of 0.7 mV. This validation result suggests that our model is suitable for cells at aged state.

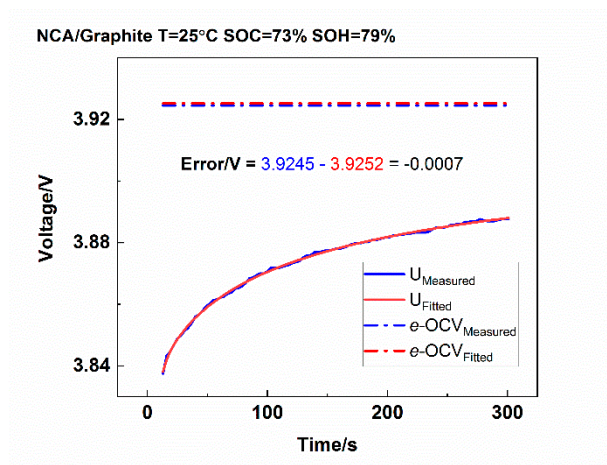


Figure S4 Validation result for an aged NCA/Graphite battery with SOH being 79% at 73% SOC.