

Experimental design for an enhanced parametric modeling of supercapacitor equivalent circuit model

ABSTRACT

The modelling of the supercapacitor (SC) plays an important role for the industrial application with many model representations such as electrical, chemical, and electrochemical models. Among one of those models are the equivalent circuit model which has been used to describe the real-time (charging/discharging) operation characteristics of the SC. Apart of its mathematical complexity, the time-consuming experimentally is also a real challenge for obtaining the internal parameters values for the SC. Choices of test equipment with a structure design of experiment also play important criteria affect the accuracy of the model. This research emphasis on a structured of experimental design for SC modelling by using Neware battery tester. The experimental exercise to attain internal parameters of the SC are described and discussed in the paper. The findings were benchmarked with an empirical model of previous researchers. The terminal voltage of SC was validated via experiment with maximum relative error of 0.045%. The model successfully reproduce the SC dynamic behavior during the charge/discharge phase which indicates the proposed method and model accuracy.

Keyword: Charge/discharge behaviour; Internal resistance; Neware BTS4000; Parametric modeling; Supercapacitor; Terminal voltage