Preliminary Study of Lithium-Ion Battery Pulsed Power
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Abstract
Electrochemical energy storage devices have been developed and used widely to power portable applications. Lithium-ion batteries are extremely popular for use in portable devices as a result of their high energy density. Lithium-ion batteries are being investigated for pulsed power applications.

Introduction
Pulsed power technology is used to accumulate energy over a relatively long period of time and release it very quickly, thus increasing the instantaneous power. Pulsed power technologies in general, are characterized by the concentration of energy, both in time and space, to pulses of high intensity. However, this presentation will focus on pulsed power applications, pulse charging and discharging of lithium-ion battery, and using LabVIEW software tools to monitor and record data.

Pulsed Power Applications
- Compact Marx Generators
- Electromagnetic Launchers
- It is an electric circuit that generates a high-voltage pulse by charging a number of capacitors in parallel, then suddenly connecting them in series.
- Marx generators are often used to simulate the effects of lightning on power line gear and aviation equipment.
- It is useful to consider the relationship between the charging time to transfer energy from the power supply to the launcher and the launch time.
- EML batteries must be able to source pulsed currents at rates much higher than their continuous C rating.

Pulsed Charging
- Pulsed charging of an electrochemical cell is performed by supplying a high current in a PWM (pulsed width modulated) fashion with 15-s-long and 325-A pulsed currents were fed into the cell with a 30-s delay between pulses.
- Pulsed charging is performed to recharge the battery quickly.
- The effect of the age on the electrochemical cell due to pulsed charging is being studied.
- Commercial cycler from MACCOR is used to perform a pulsed charging.

Pulsed Discharging
- Current extracted during pulsed discharge of an 18-Ah GAIA LIB [1]
- It is useful to consider the relationship between the charging time to transfer energy from the power supply to the launcher and the launch time.
- EML batteries must be able to source pulsed currents at rates much higher than their continuous C rating.

Experimental Setup
- Study the feasibility of using lithium ion battery for powering the pulsed load.
- Custom stand is built to match the load profile of pulsed load which can handle the current up to 10kA and a switching frequency up to 10kHz.
- LabVIEW is extensively used to record the data.

Experimental Stand and Data Acquisition System
- LabVIEW is a graphical programming platform that helps engineers scale from design to test and from small to large systems.
- It is used to generate different types of pulsed load profile by controlling the switches of the custom built stand.
- It is used for recording a data like voltage, current, and temperature during pulsed discharge and pulsed charging.
- Sample interface is shown in which the pulse width, sampling rate, duty cycle, and discharge time.

Summary
- Study the feasibility of using lithium ion battery for powering the pulsed load.
- Custom stand is built to match the load profile of pulsed load which can handle the current up to 10kA and a switching frequency up to 10kHz.
- LabVIEW is extensively used to record the data.

References

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For Further Information
Please contact lat.taiwo@gmail.com. More information on this and related projects can be obtained at: https://wiki.uta.edu/display/PPELab/Home