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# The Effect of Pulse Charging on Commercial Lithium Cobalt Oxide (LCO) Battery Characteristics

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Lithium-ion batteries can be charged by different methods. CC-CV (constant current - constant voltage) charging is the conventional method that is predominantly employed for charging the batteries. Pulse charging is considered as an alternative charging method to reduce the charging time and increase energy efficiencies. However, the impact of pulse charging frequencies on the cycle life and battery behavior are seldom investigated. This paper presents the impact of pulse-CV charging at different frequencies (50 Hz, 100 Hz, 1 kHz) on commercial lithium cobalt oxide (LCO) cathode batteries in comparison to CC-CV charging. The results show that, on average, pulse-CV charging is considerably faster than CC-CV charging. It is also observed that pulse-CV charging at lower frequencies show comparable discharge capacities to CC-CV charging throughout cycling. Impedance characteristics of the battery were examined using electrochemical impedance spectroscopy (EIS) measurements and the impact of the charging methods has been analyzed based on the performance and electrochemical behavior of the batteries.

**Keywords:** Lithium cobalt oxide batteries; constant current – constant voltage; pulse-CV charging; charging time; cycle life; electrochemical impedance spectroscopy; equivalent circuit model

FULL TEXT