Safe, Long-Life Batteries for Behind-the-Meter Grid Storage

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Behind-the-meter storage (BTMS) describes energy systems that bypass the electric grid. The BTMS consortium designs stationary batteries to fast charge electric vehicles at commercial entities without imparting demand charges. $Li_4Ti_5O_{12}$/$LiMn_2O_4$ (LTO/LMO) batteries are attractive for BTMS applications due to their favorable cost, safety, and cycle life attributes. Due to energy density limitations associated with the LTO/LMO system, we have explored increasing energy density with alternative cathode materials, which could decrease cost per kWh in addition to enabling smaller and lighter systems. We hypothesized that pairing LTO with $LiNi_{0.90}Mn_{0.05}Co_{0.05}O_2$ (NMC90-5-5) may maintain the safety and cycle stability associated with LTO, while still enabling higher energy density. We investigated how cell design and voltage limits affect performance and safety of the LTO/NMC90-5-5 system. We find that reducing the termination charge voltage by 100 mV drastically enhances the safety and cycling stability of LTO/NMC90-5-5 cells, which are the two primary metrics that are important for BTMS applications.

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