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In-situ interface film forming on the high-voltage LiCoO₂ cathode by a tiny amount of nanoporous polymer additives

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LiCoO₂ (LCO) has been proven for extensive commercial applications owing to its high specific capacity and stability. Therefore, there has been considerable interest in further enhancing its specific capacity by increasing the charging voltage. However, single-crystal LCO suffers from a significant capacity degradation when charged to 4.5 V due to the irreversible phase transition and unstable structure. Herein, an ultra-small amount (0.5%wt in the electrode) of multi-functional PIM-1 (a polymer with intrinsic microporosity) additive is utilized to prepare a kind of binder-free electrode. PIM-1 can modulate the solvation structure of LiPF₆ due to its unique structure, which helps to form a stable, robust and inorganic-rich CEI film on the surface of LCO at a high voltage of 4.5 V. This reduces the irreversible phase transition of LCO, thereby enhancing cyclic stability and improving rate performance, providing new perspectives for electrodes fabrication and improving high-energy-density cathodes.

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