

TiO₂-Modified Spinel Lithium Manganate for Suppressing Mn Ion Dissolution in Lithium Ion Batteries

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Capacity fading of spinel lithium manganate-based batteries is mainly caused by the dissolution of manganese, which limits their large-scale application. Suppressing the dissolution of manganese is crucial to reduce the capacity decline of lithium manganate-based batteries. Using a sol-gel method, Titanium dioxide (TiO₂) was doped into the surface layer of a spinel LiMn₂O₄ core, X-ray diffraction data showed that the crystal structure after modification was similar to the bulk spinel LiMn₂O₄, indicating cationic shell LiMn_{2-x}Ti_xO₄ was formed. The phase similarity between the pristine and doped layers fully maintained the ionic and electronic transport channels. Meanwhile, the doped surface layer blocked direct contact between LiMn₂O₄ and the electrolyte, preventing corrosion of LiMn₂O₄ in the electrolyte. Cycle performance experiments at elevated temperature and high rate fully demonstrated the excellent cyclability of the doped structure as a cathode material, and manganese dissolution test gave direct evidence for the superior effect of the modified cathode in suppressing Mn dissolution.

Keywords: lithium-ion batteries; capacity fading; lithium manganate; manganese dissolution.

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