Unveiling the role of Ni doping in the electrochemical performance improvement of the LiMn2O4 cathodes

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Data:

Sample	Initial Discharge Capacity (mAh/g)	Capacity Retention after 1000 cycles (%)	Rate Capability at 15 C (mAh/g)	Li Diffusion Coefficient (cm^2/s)	Reference
LiMn2O4	43.65	48.11	N/A	4.89×10^{-15}	Xu et al., 2023
LiNi0.02Mn1.98O4	73.27	74.44	N/A	N/A	Xu et al., 2023
LiNi0.05Mn1.95O4	82.07	88.92	58.27	2.26×10^{-14}	Xu et al., 2023
LiNi0.1Mn1.9O4	68.91	88.59	N/A	N/A	Xu et al., 2023
LiMn2O4 (cited)	50-80	60-70	N/A	N/A	Zhang et al., 2023

Insight:

Enhanced Stability: Ni doping significantly enhances the cycling stability of LiMn2O4 cathodes, with the LiNi0.05Mn1.95O4 sample showing an 88.92% capacity retention after 1000 cycles compared to 48.11% for undoped LiMn2O4.

Improved Rate Capability: The LiNi0.05Mn1.95O4 sample exhibits superior rate capability, delivering 58.27 mAh/g at 15 C, indicating better performance under high-rate conditions.

Increased Li Diffusion: The Li diffusion coefficient of LiNi0.05Mn1.95O4 is significantly higher (2.26×10^{-14} cm^2/s) compared to undoped LiMn2O4 (4.89×10^{-15} cm^2/s), suggesting that Ni doping facilitates faster Li ion transport.

Best sample:

LiNi0.05Mn1.95O4

Reason:

The LiNi0.05Mn1.95O4 sample is selected as the best due to its highest capacity retention (88.92%) after 1000 cycles, superior rate capability (58.27 mAh/g at 15 C), and enhanced Li diffusion coefficient (2.26×10^{-14} cm^2/s), which collectively indicate excellent long-term stability, high performance under high-rate conditions, and efficient Li ion transport.