Ni/Mn ratio and morphology-dependent crystallographic facet structure and electrochemical properties of high-voltage spinel LiNi$_{0.5}$Mn$_{1.5}$O$_4$ cathode material

Lina Wan$^a$, Yuanfu Deng$^{a,b,*}$, Chunxiang Yang$^a$, Hui Xu$^b$, Xusong Qin$^b$ and Guohua Chen$^{a,b,c,*}$

$^a$ The Key Laboratory of Fuel Cell Technology of Guangdong province, School of Chemistry and Chemical Engineering, South China University of Technology, Guangzhou, China

$^b$ Center for Green Products and Processing Technologies, Guangzhou HKUST Fok Ying Tung Research Institute, Guangzhou 511458, China;

$^c$ Department of Chemical and Biomolecular Engineering, The Hong Kong University of Science and Technology, Hong Kong, China.

*Corresponding authors. Tel.: + 86 20 34685680, Fax: + 86 20 34685679

E-mail address: chyfdeng@scut.edu.cn; kechengh@ust.hk.

Figure captions
**Figure S1.** SEM image for spherical (a) and cubic (b) MnCO$_3$.

**Figure S2.** SEM image for spherical LNMO samples: (a) S-1.45, (b) S-1.50 and (c) S-1.55.

**Figure S3.** SEM image for cubic LNMO samples: (a) C-1.20, (b) C-1.55 and (c) C-Cr.

**Figure S4.** XPS of the Mn 2p3/2 peak of the as-synthesized LNMO samples.

**Figure S5.** Voltage profiles of LNMO/Li half cells under various current densities at room temperature.

**Figure S6.** Voltage profiles of LNMO/Li half cells for C-Cr and C-1.55 samples under 5-C rate at room temperature.

**Figure S7.** Cyclic voltammetry (CV) curves of the C-1.55 electrode at scan rates from 0.1 to 0.5 mV s$^{-1}$. The oxidation (charging) peaks are labelled (a) and (b) while the reduction (discharging) peaks are labelled (c) and (d).

**Figure S8.** HTEM and SAED images for cubic C-Cr sample.

**Figure S9.** The 1$^{st}$ and 5$^{th}$ cycle of the CV curves for the C-Cr sample.

**Table S1.** Summary of the CV results obtained at different scanning rates and the Li$^+$ diffusion coefficients determined for the C-1.55 electrode.$^{[a]}$
Figure S7

Graph a: Current (A) vs Voltage (V vs Li/Li\(^+\))

Graph b: \(i^2\) vs \(n^2(V/S)^2\)

Legend:
- peak \(O_1\)
- peak \(O_2\)
- peak \(R_1\)
- peak \(R_2\)
Figure S9
<table>
<thead>
<tr>
<th>Scanning rate (mv/s)</th>
<th>Potential (V)</th>
<th></th>
<th></th>
<th></th>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(E_{O1})</td>
<td>(E_{O2})</td>
<td>(E_{R1})</td>
<td>(E_{R2})</td>
<td>(\Delta E_1)</td>
<td>(\Delta E_2)</td>
</tr>
<tr>
<td>0.1</td>
<td>4.745</td>
<td>4.799</td>
<td>4.640</td>
<td>4.686</td>
<td>0.105</td>
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<tr>
<td>0.2</td>
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<td>4.620</td>
<td>4.671</td>
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<tr>
<td>0.3</td>
<td>4.780</td>
<td>4.853</td>
<td>4.594</td>
<td>4.663</td>
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<tr>
<td>0.4</td>
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<td>4.588</td>
<td>4.659</td>
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<tr>
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<td>4.879</td>
<td>4.577</td>
<td>4.650</td>
<td>0.219</td>
<td>0.229</td>
</tr>
</tbody>
</table>

\[D_{Li}^{\prime} (\times 10^{-11} \text{ cm}^2/\text{s})\] 3.305 6.653 4.834 2.477

\(^{[a]} \text{E}_O: \text{anodic peak potential, E}_R: \text{cathodic peak potential, } \Delta E: \text{the separation between E}_O \text{ and } E_R. \text{ The subscript numbers 1 and 2 denote the redox couple at lower and higher potential, respectively.}\]