Supporting Information

Synthesis of Mn$_3$O$_4$ nanowires and its transformation to LiMn$_2$O$_4$ polyhedrons, application of LiMn$_2$O$_4$ as cathode in lithium-ion battery

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Fig. S1 XRD patterns of products obtained at 200 °C for different reaction times: (a) 0.5 h, (b) 1.0 h, (c) 6 h and (d) 12 h.

Fig. S2 (a) and (b) are the XRD pattern and the TEM image of the brown precipitate, respectively.

Table 1 Experimental pH parameter for the synthesis of Mn$_3$O$_4$ materials

Fig. S3 The SEM images of obtained: (a) sample (4); (b) sample (5).

Fig. S4 The SEM images (a) N$_2$ protecting, (b) excess O$_2$.

Fig. S5 (a) SEM of the LiMn$_2$O$_4$ using Mn$_3$O$_4$ nanocubes as raw material at 750 °C for 6h. (b) Discharge curves at 0.1 C, 0.2 C and 0.5 C, the capacity are 79.8, 79.2 and 72.9 mAh/g, respectively.

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Table 1

<table>
<thead>
<tr>
<th>Sample</th>
<th>MnSO₄</th>
<th>H₂O/Na₂B₄O₇</th>
<th>NaOH</th>
<th>pH value</th>
<th>morphology</th>
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<tr>
<td>(1)</td>
<td>-</td>
<td>15 mL (1 mmol)</td>
<td>-</td>
<td>10.07</td>
<td>-</td>
</tr>
<tr>
<td>(2)</td>
<td>15 mL (1 mmol)</td>
<td>15 mL (1 mmol)</td>
<td>-</td>
<td>8.98</td>
<td>-</td>
</tr>
<tr>
<td>(3)</td>
<td>15 mL (1 mmol)</td>
<td>15 mL (1 mmol)</td>
<td>15 mL (1 mmol)</td>
<td>9.69</td>
<td>nanowires</td>
</tr>
<tr>
<td>(4)</td>
<td>15 mL (1 mmol)</td>
<td>15 mL (0 mmol)</td>
<td>0.267 M (some)</td>
<td>9.69</td>
<td>particles</td>
</tr>
<tr>
<td>(5)</td>
<td>15 mL (1 mmol)</td>
<td>15 mL (0 mmol)</td>
<td>15 mL (1 mmol)</td>
<td>9.45</td>
<td>particles and nanorods</td>
</tr>
</tbody>
</table>

Fig. S3 The SEM images of obtained: (a) sample (4); (b) sample (5).
**Fig. S4** The SEM images (a) N$_2$ protecting, (b) excess O$_2$.

**Fig. S5** (a) SEM of the LiMn$_2$O$_4$ using Mn$_3$O$_4$ nanocubes as raw material at 750 °C for 6h. (b) Discharge curves at 0.1 C, 0.2 C and 0.5 C, the capacity are 79.8, 79.2 and 72.9 mAh/g, respectively.