Supporting Information

One-step hydrothermal synthesis of Nb doped brookite TiO$_2$ nanosheets with enhanced lithium-ion intercalation properties †

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Fig. S1 Raman spectra of (a) TO and (b) NTO.

Fig. S2 EDX spectra of NTO.
Fig. S3 XPS survey spectra of TO and NTO.

Fig. S4 SEM image of NTO-24.

Fig. S5 XRD patterns of (a) TO-3, (b) TO-6, (c) TO and (d) TO-24.
**Fig. S6** SEM images of (a) TO-3, (b) TO-6, (c) TO and (d) TO-24.

**Fig. S7** Cycling performance of TO and NTO at 0.5 C.

<table>
<thead>
<tr>
<th>sample</th>
<th>Rs/Ω</th>
<th>Rct/Ω</th>
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<tbody>
<tr>
<td>TO</td>
<td>9.5</td>
<td>161.9</td>
</tr>
<tr>
<td>NTO</td>
<td>9.6</td>
<td>52.4</td>
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**Table S1** Impedance parameters calculated form equivalent circuit model
Samples with different Nb contents (0, 0.05, 0.1, 0.15 g of niobium oxalate hydrate, respectively) were prepared as shown in Experimental, and the samples were denoted as TO, NTO-0.05, NTO-0.1 and NTO-0.15, respectively. The corresponding results and discussion are listed as follows.

As shown in Fig. S8, all the diffraction peaks of TO, NTO-0.05 and NTO-0.1 can be indexed to a pure brookite TiO$_2$ (JCPDS 29-1360). In addition, it can be clearly found that the diffraction peaks intensity decreased and the diffraction peaks of samples shifted to lower 2θ values with increasing Nb content. However, XRD pattern of NTO-0.15 shows some additional diffraction peaks (shown by quadrangle), which can be indexed to niobium compounds. Furubayashi et al.\(^1\) reported that it is difficult to achieve doping content of Nb above 20% in anatase TiO$_2$.

![XRD patterns](image)

Fig. S8 XRD patterns of (a) TO, (b) NTO-0.05, (c) NTO-0.1 and (d) NTO-0.15.

Fig. S9 shows SEM images of TO, NTO-0.05, NTO-0.1 and NTO-0.15. Undoped TO exhibited nanorod-like morphology. Both NTO-0.05 and NTO-0.1 exhibited nanosheet-like morphology. However, it can be found that some nanobelts in impure NTO-0.15 (shown in Fig. S9d), which might be attributed to niobium compounds.

According to above results, we believe that Nb doped brookite TiO$_2$ with different Nb contents can be prepared in the present work. With further increasing Nb source, impure phase in Nb doped brookite TiO$_2$ was found.