Electronic Supplementary Data

Synthesis of β-MnO₂ nanowires and their electrochemical capacitive behavior

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<table>
<thead>
<tr>
<th>No.</th>
<th>Contents</th>
<th>Pg. No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Derivation of capacitance</td>
<td>2</td>
</tr>
<tr>
<td>2</td>
<td>Fig. S1 – Linear fitting of I vs scan rates obtained after carrying cyclic voltammetric analysis of (a) 3 h and (b) 6 h calcined β-MnO2 in 1 N Na2SO4 solution.</td>
<td>2</td>
</tr>
</tbody>
</table>

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Derivation of capacitance

As per relation $Q = CVA$ where $Q$ is charge, $V$ is the capacitive potential and $A$ is the area of the loaded electroactive materials containing certain masses. If sweep the voltage with time, $Q$ and $V$ can be written as $dQ/dt$ and $dV/dt$ respectively where $dQ/dt$ as capacitive current and $dV/dt$ as scan rate. Thus, mass of the electroactive material that present at electrode surfaces, responsible for the generation of the capacitive current. The capacitive current was estimated from the width $[I(A)]$ of the rectangular cyclic voltammograms obtained at 2, 5, 10, 20 mV/s scan rate (see Fig. 7(a&b) of the main article. In the present case the slope values derived as 0.234 and 0.14 from the fitting curves (Fig 8a and b) obtained after calcinations of 3h and 6 h $\beta$-MnO$_2$ nanowires respectively. The fitting curves were obtained after plotting capacitive current versus scan rates (Fig. S1(a&b)). Finally, specific capacitance was determined after dividing slope value by mass of the electroactive material. Since the masses of the loaded active materials were as 0.585 mg and 0.588 mg at the electrode surfaces (area 0.31 cm$^2$), the specific capacitance to be 404 F/g and 233 F/g for 3 h and 6 h calcined $\beta$-MnO$_2$ nanowires, respectively.

![Fig. S1](image-url) – Linear fitting of $I$ vs scan rates obtained after carrying cyclic voltammetric analysis of (a) 3 h and (b) 6 h calcined $\beta$-MnO$_2$ in 1 N Na$_2$SO$_4$ solution.