Synthesis of Manganese Oxide Nanostructures

In the acidic media, manganate ion (MnO$_4^{2-}$) is stable and works as the growth unit for synthesis of MnO$_2$:

\[ 3\text{MnO}_4^{2-}(\text{aq}) + 4\text{H}^+(\text{aq}) \rightarrow 2\text{MnO}_4^{-}(\text{aq}) + \text{MnO}_2(\text{s}) + 2\text{H}_2\text{O}(\text{l}) \]

Manganese oxide phases can transform with thermal treatment. For example, MnO$_2$ phase transforms to Mn$_2$O$_3$ when annealed at 650 °C in air.
**Figure S1.** (a) XRD of manganese oxide structures after annealing at 650 °C. (b) Hybrid CNT/MnO$_2$ mesoporous structure. (c) Mn$_2$O$_3$ aligned structure after annealing and removal of CNTs.
CNT/Co$_3$O$_4$ hybrid electrode

Figure S2. CNT/Co$_3$O$_4$ aligned strips laid down on the Si/SiO$_2$ substrate. The top part has been coated with gold to make a connection for the test.