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Electrochemically grown MnO_2 nanowires for dual *viz.*, supercapacitor and electrocatalysis applications

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Formulae used

The specific capacitance of the prepared MnO_2 electrode has been calculated using the formula,

$$C = \frac{I \times \Delta t}{m \times \Delta V} \tag{1}$$

The energy and power densities have been calculated using the formulae,

$$E = \frac{C \times (\Delta V)^2}{7.2} \tag{2}$$

$$P = \frac{3600 \times E}{\Delta t} \tag{3}$$

Where,

I-Applied current (A),

Δt-Discharge time (s),

m- Active mass of the electrode material (g),

ΔV- Operating voltage window (V).

C- Specific capacitance,

E- Energy density ($Whkg^{-1}$), and

P- Power density (Wkg^{-1}).

The potential towards reversible hydrogen electrode (RHE) has been determined using the Nernst equation,

$$E_{RHE} = E_{Hg/HgO} + 0.059 \times pH + E^{0}_{Hg/HgO} \quad (4)$$

Where, E_{RHE} is the converted potential versus an RHE, $E^{0}_{Hg/HgO}$= 0.098 at room temperature (27 °C) and $E_{Hg/HgO}$ is the experimental measured potential versus Hg/HgO reference electrode. The over potential (η) has been calculated using the following equation:

$$\eta = E_{RHE} - 1.23 \quad (5)$$

where, η and E_{RHE} are the over and converted potentials, respectively.

The Tafel slope has been determined using the equation,

$$\eta = b \log j + a \quad (6)$$

where, b is the Tafel slope and a is the fitting parameter.

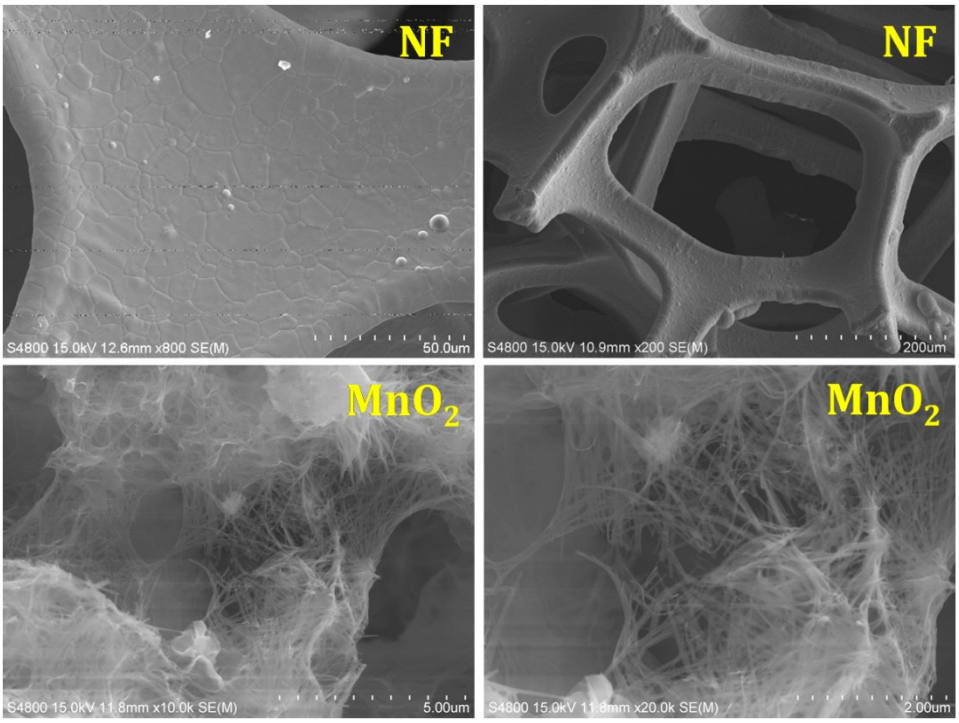

Figure S1: FE-SEM images of 3-D NF and MnO_2 nanowires with various magnifications.

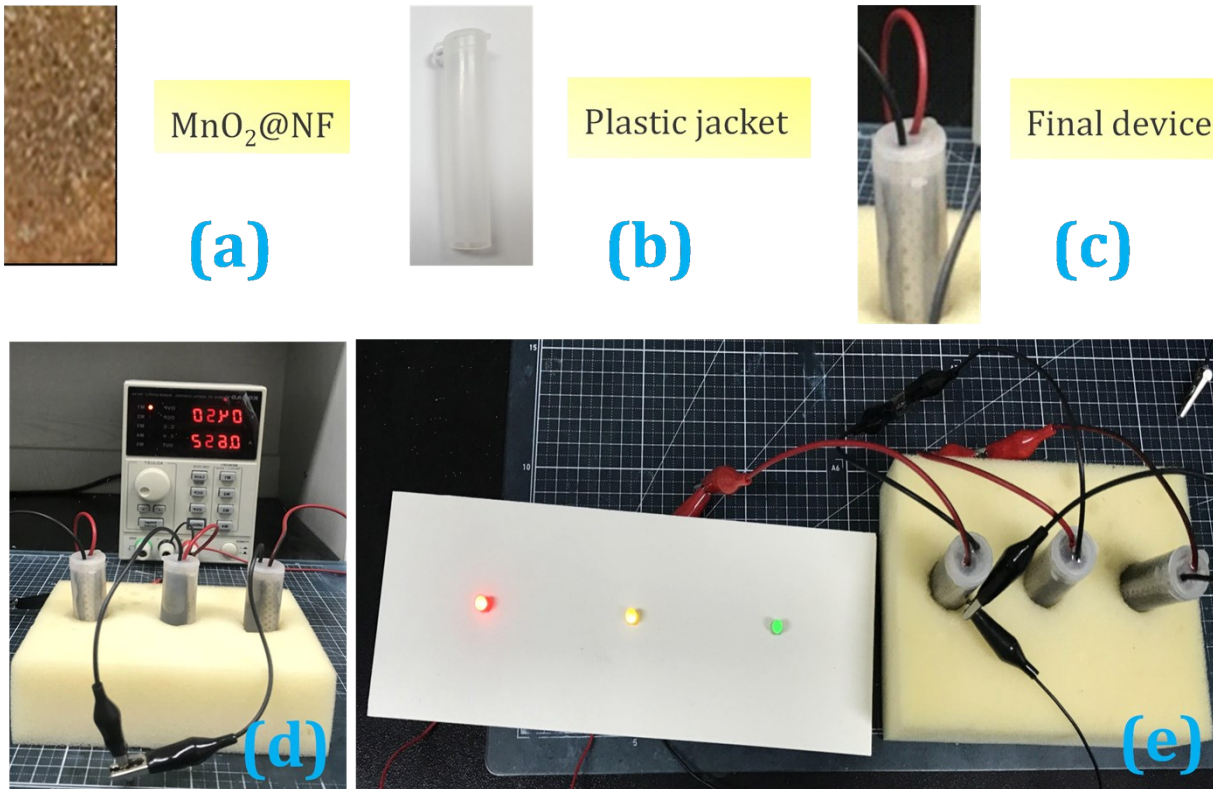

Figure S2: Images of steps implicated while formulating MnO_2//MnO_2 SSC device; (a) MnO_2 film deposited on 3D-NF, (b) Plastic cylindrical tube, (c) device, (d) Charging panel, and (e) Actual demonstration lighting the LED using SSC device.