Supporting Information

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Multicolor, Fluorescent Supercapacitor Fiber

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Supporting Information

Experimental Section

*Preparation of multi-walled carbon nanotube array.* Multi-walled carbon nanotube (MWCNT) array was synthesized by chemical vapor deposition. In a typical synthesis, Fe (1.2 nm)/Al$_2$O$_3$ (5 nm) on a silicon wafer was used as the catalyst, ethylene was used as carbon source with a flowing rate of 90 sccm, and a mixture of Ar (480 sccm) and H$_2$ (30 sccm) was used as the carrier gas. The growth was made at 750°C, and the thickness of spinnable MWCNT array was appropriately 200 μm. The CNT sheets were directly drawn from the same spinnable MWCNT array with a width of 10 mm.

*Characterization.* The morphologies of the fluorescent fiber electrodes and fluorescent supercapacitor fibers were characterized by scanning electron microscopy (SEM, Hitachi, FE-SEM S-4800 operated at 1 kV). Electrochemical tests including galvanostatic charge–discharge curves and cyclic voltammograms of the supercapacitor fibers were conducted on a CHI 660D electrochemical workstation. The cyclic stability was traced on an Arbin electrochemical station (MSTAT-5 V/10 mA/16Ch). The spectrum was measured on a miniature fiber optic spectrometer (Idealoptics PG2000-pro, China) installed on an optical microscopy (Olympus BX51, Japan). The optical photographs were captured by a digital camera (SONY A6000, Japan).
Table S1. Comparison of the spectrum peak values from the unpackaged fiber electrodes of different colors with correlated standard visible light wavelength ranges.\cite{S1}

<table>
<thead>
<tr>
<th>Color</th>
<th>Standard Wavelength (nm)</th>
<th>Spectrum Peak (nm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Violet</td>
<td>380 – 450</td>
<td>448</td>
</tr>
<tr>
<td>Blue</td>
<td>450 – 495</td>
<td>462</td>
</tr>
<tr>
<td>Green</td>
<td>495 – 570</td>
<td>520</td>
</tr>
<tr>
<td>Yellow</td>
<td>570 – 590</td>
<td>543</td>
</tr>
<tr>
<td>Orange</td>
<td>590 – 620</td>
<td>603</td>
</tr>
<tr>
<td>Red</td>
<td>620 – 750</td>
<td>646</td>
</tr>
</tbody>
</table>

\[380\ V \quad 450 \quad B \quad 495 \quad G \quad 570 \quad Y \quad 590 \quad O \quad 620 \quad R \quad 750\]
Figure S1. Schematic illustration to the components of the fluorescent supercapacitor fiber.
Figure S2. a) Cross-sectional SEM image of the fluorescent fiber. b) Higher magnification of the region marked with a red rectangle in a.
Figure S3. a) Spectrum of the orange fiber electrode over 5000 bending cycles with a bending angle of 180°. b) Correlated spectrum variation of intensity peak value in a.
Figure S4. Spectrum obtained with increasing dye dispersion concentrations from 0 to 60 mg mL$^{-1}$. 
Figure S5. a) Galvanostatic charge-discharge curves of fluorescent supercapacitor fibers incorporated with increasing dye dispersion concentration from 0 to 60 mg mL$^{-1}$. Current density, 10 mA cm$^{-2}$. b) Dependence of specific capacitance on the incorporated dye dispersion concentration.
Figure S6. Galvanostatic charge-discharge curve of a fluorescent supercapacitor fiber based on MWCNT/PEDOT composite at increasing current densities from 10 to 100 mA cm$^{-3}$. 
Figure S7. Spectrum variation with and without the incorporation of PEDOT:PSS.
Figure S8. Schematic illustrations of the integrated configurations and corresponding galvanostatic charge-discharge curves of the fluorescent supercapacitor fibers. a, b) Increased power capacities by connection in parallel. c, d) Increased voltage by connection in series.
Figure S9. Spectrum peak value variation of an unpackaged green fluorescent supercapacitor fiber under bending with increasing bending angles from 0 to 180°.
Figure S10. Capacitance variation of a fluorescent supercapacitor fiber under bending with increasing bending angle from 0 to 180°. Current density, 10 mA cm$^{-3}$.

References for the Supporting Information