NANO MICRO small

Supporting Information

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Multicolor, Fluorescent Supercapacitor Fiber

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Supporting Information

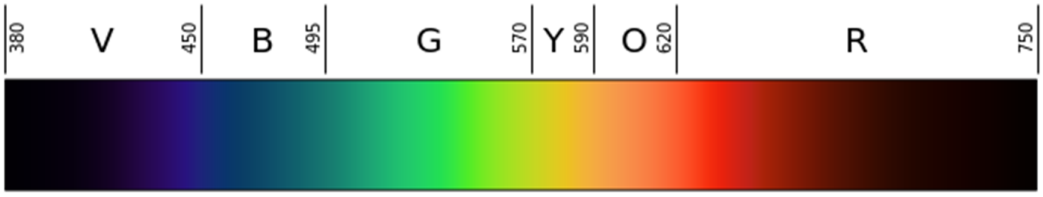
Experimental Section

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_2O_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.[S1]

Color	Standard Wavelength (nm)	Spectrum Peak (nm)
Violet	380 – 450	448
Blue	450 – 495	462
Green	495 – 570	520
Yellow	570 – 590	543
Orange	590 – 620	603
Red	620 – 750	646



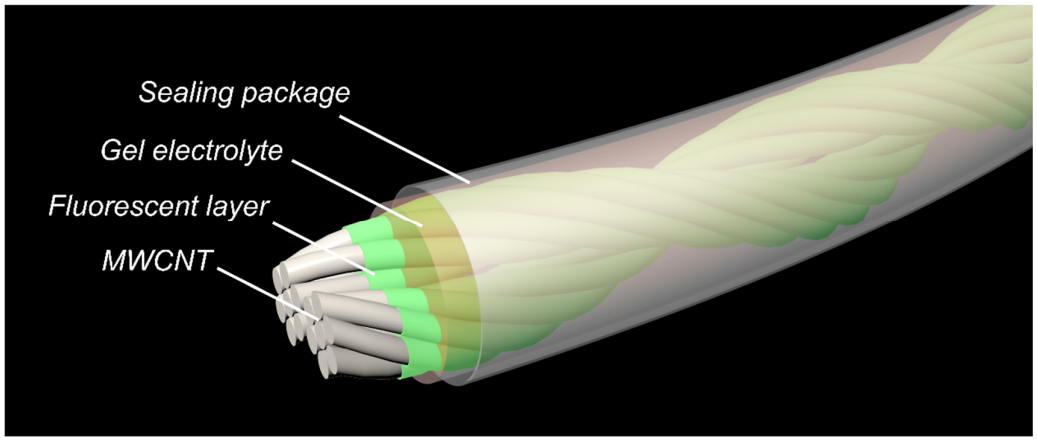


Figure S1. Schematic illustration to the components of the fluorescent supercapacitor fiber.

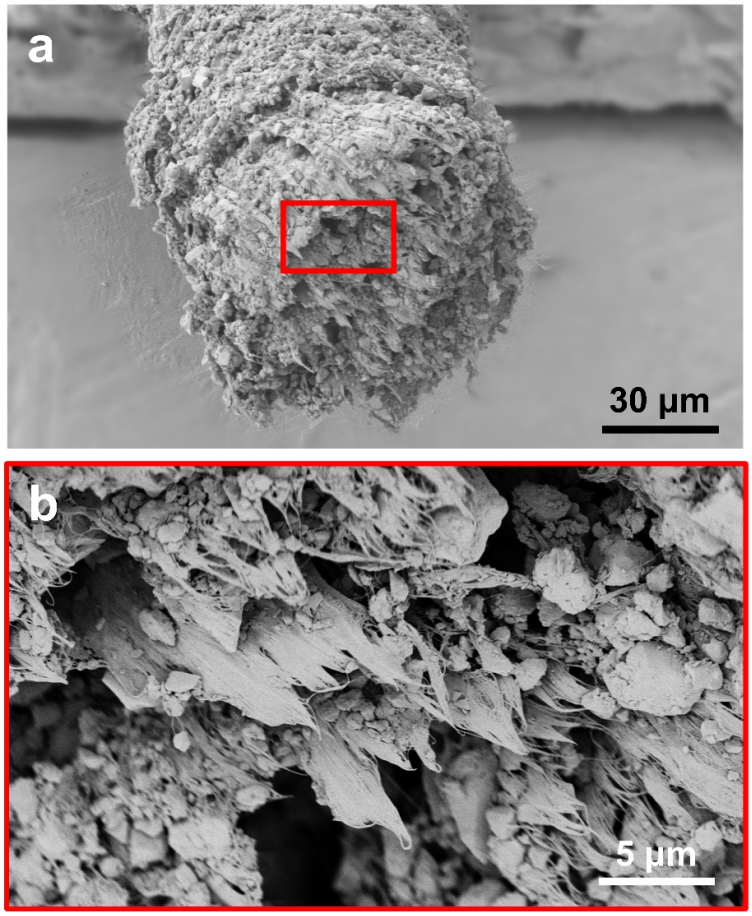


Figure S2. a) Cross-sectional SEM image of the fluorescent fiber. **b)** Higher magnification of the region marked with a red rectangle in **a**.

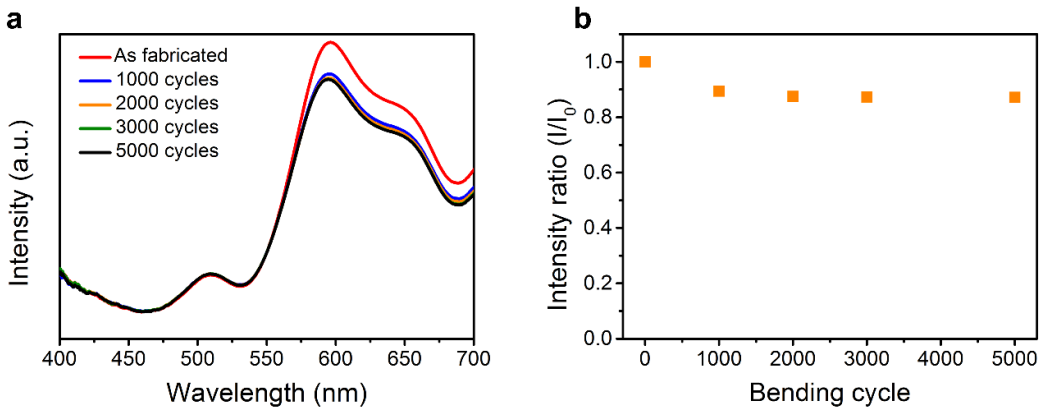


Figure S3. a) Spectrum of the orange fiber electrode over 5000 bending cycles with a bending angle of 180°. **b)** Correlated spectrum variation of intensity peak value in **a**.

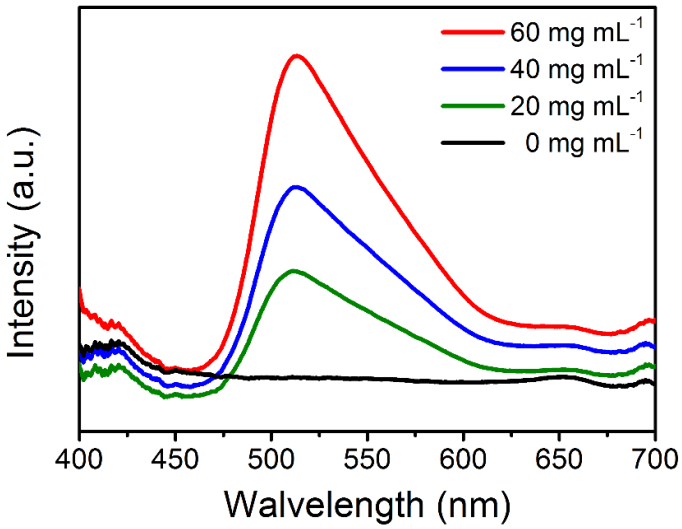


Figure S4. Spectrum obtained with increasing dye dispersion concentrations from 0 to 60 mg mL^{-1}.

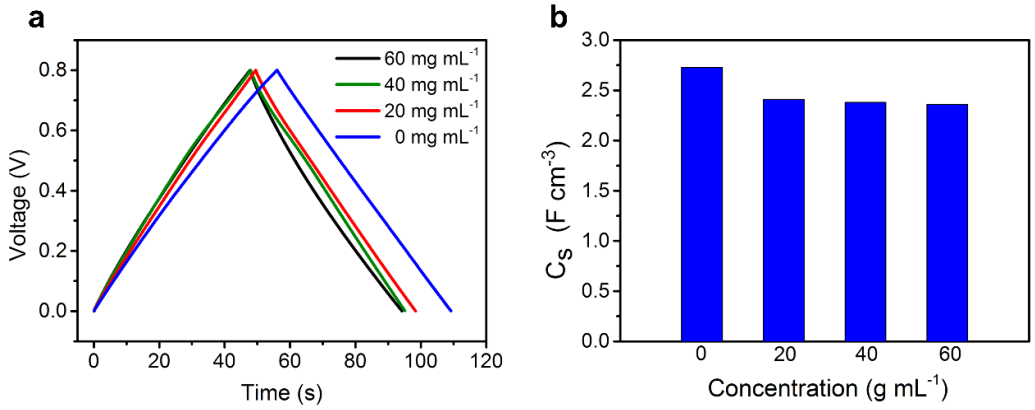


Figure S5. a) Galvanostatic charge-discharge curves of fluorescent supercapacitor fibers incorporated with increasing dye dispersion concentration from 0 to 60 mg mL^{-1}. Current density, 10 mA cm^{-3}. **b)** Dependence of specific capacitance on the incorporated dye dispersion concentration.

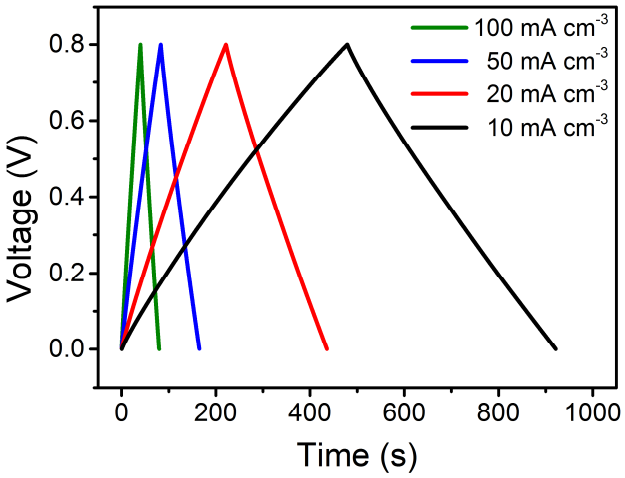


Figure S6. Galvanostatic charge-discharge curve of a fluorescent supercapacitor fiber based on MWCNT/PEDOT composite at increasing current densities from 10 to 100 mA cm^{-3}.

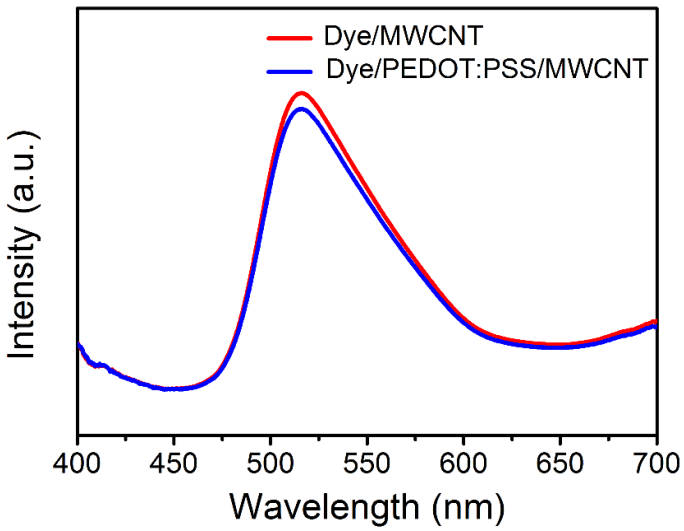


Figure S7. Spectrum variation with and without the incorporation of PEDOT:PSS.

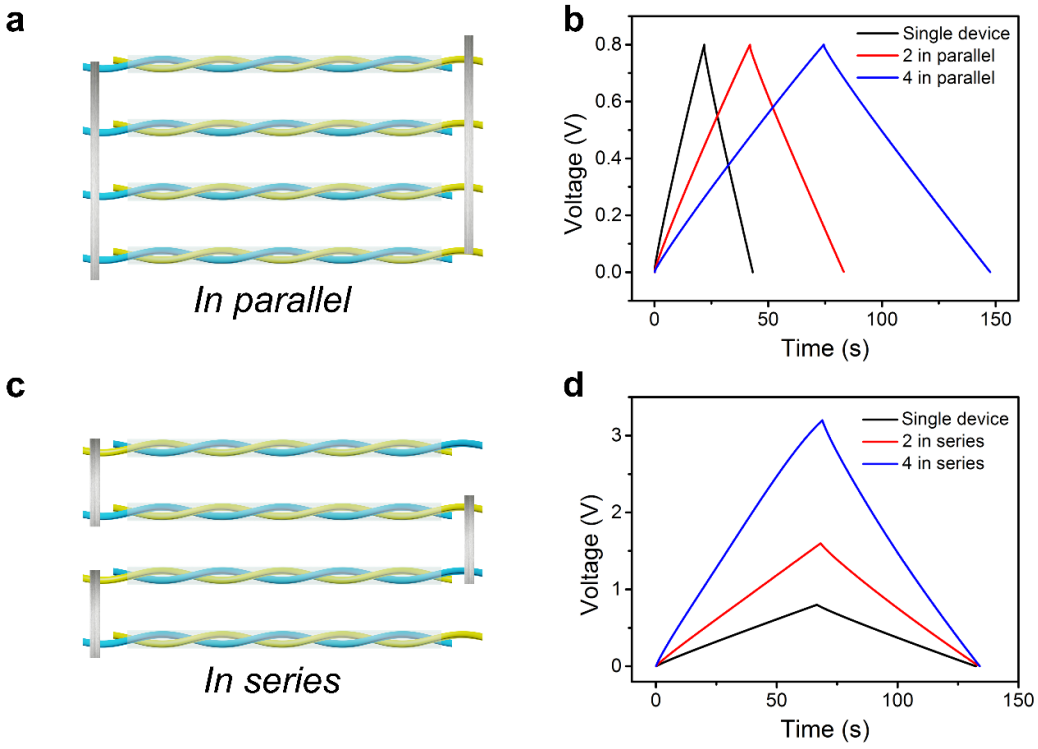


Figure S8. Schematic illustrations of the integrated configurations and corresponding galvanostatic charge-discharge curves of the fluorescent supercapacitor fibers. **a, b)** Increased power capacities by connection in parallel. **c, d)** Increased voltage by connection in series.

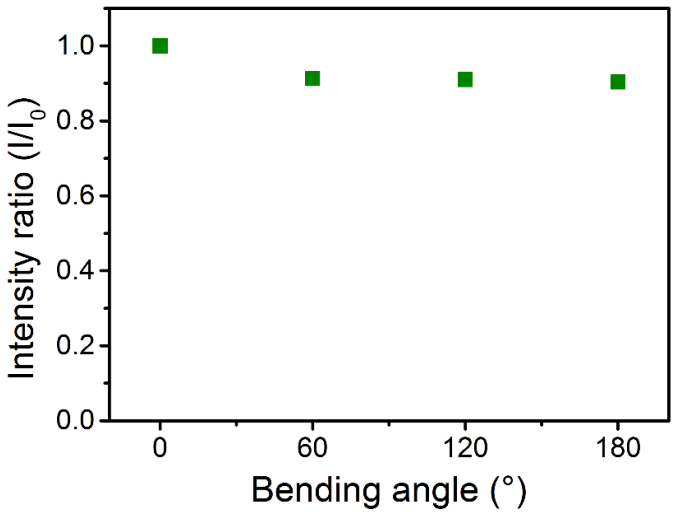


Figure S9. Spectrum peak value variation of an unpackaged green fluorescent supercapacitor fiber under bending with increasing bending angles from 0 to 180°.

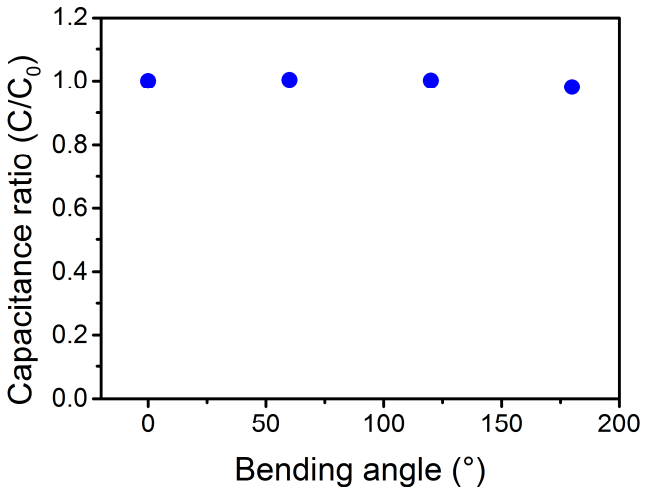


Figure S10. Capacitance variation of a fluorescent supercapacitor fiber under bending with increasing bending angle from 0 to 180°. Current density, 10 mA cm^{-3}.

References for the Supporting Information

[S1] J. F. Kennedy, A. Kaczmarek, *Carbohyd. Polym.* **2007**, *67*, 648.