Supporting Information

Aligned Coaxial Tungsten Oxide/Carbon Nanotube Sheet: A Flexible and Gradient Electrochromic Film

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Experimental details:

WO_3 layers coating: A tungsten hexaaryloxide compound ($W(OC_6H_5)_6$) was simply prepared by refluxing WCl_6 with phenol, which was found to be a prominent precursor for WO_3 since it is easily prepared from commercially available WCl_6, stable to handle and store in air. During the oxide deposition, $W(OC_6H_5)_6$ powders were placed in a ceramic boat, with a CNT sheet hung over the boat. The precursor was then heated to 300-400 °C for 10 mins. When the deposition was finished, the furnace was cooled to room temperature.

Characterization: The samples were characterized by scanning electron microscopy (FEI Quanta 400 FEG), high-resolution transmission electron microscopy (HRTEM, FEI Tecnai G2 F20 S-Twin, 200kV), and Raman spectroscopy (Horiba JY Labram HR800 Raman spectrometer, 633 nm excitation). The X-ray diffraction (XRD) patterns were obtained on a D8-Advance Bruker-AXS diffractometer using Cu Kα irradiation. The transmission spectra of the samples were obtained using the Perkin-Elmer Lambda 20 spectrophotometer.

Electrochemical measurement: Electrochemical measurements were carried out on an electrochemical workstation (CHI660C, Shanghai Chenhua Instruments, Inc.) using a conventional three-electrode test cell.The working electrode was the CNT/WO_3 film. An SCE electrode and Pt foil were used as reference and counter electrode, respectively. Cyclic voltammetry (CV) and chronoamperometry (CA) tests were performed in 1M $HClO_4$. CV measurements were carried out at a scanning rate of 20 mV s^{-1} between -0.2-1.0 V at room temperature. CA tests were conducted under -1 V.

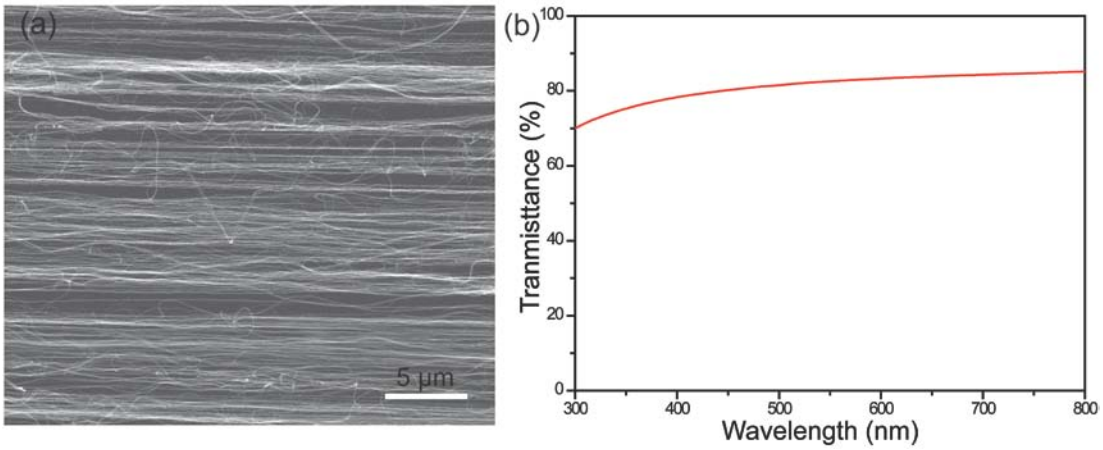

Fig. S1. (a) SEM image of CNT sheet drawn from aligned CNT array. (b) UV-Vis spectra of CNT sheets.

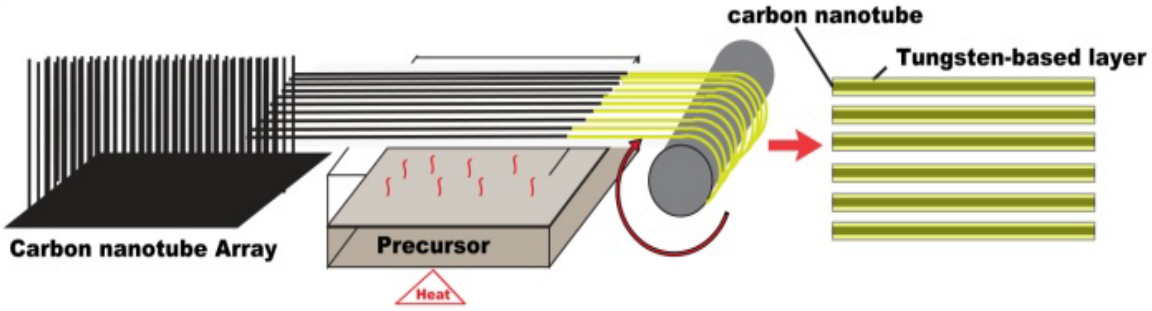

Fig. S2. Schematic diagram showing full wrapping of WO_3 layers on aligned CNT surface to form aligned coaxial WO_3/CNT nanohybrid sheets.

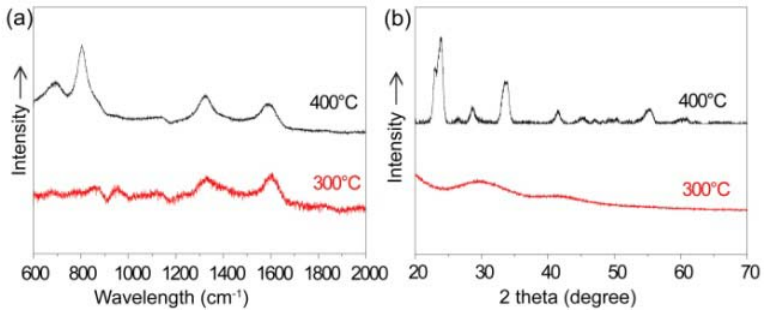

Fig. S3. (a) Raman spectra and (b) X-ray diffraction patterns of the films obtained at 300 and 400 °C, respectively.