



RSC Advances

ARTICLE

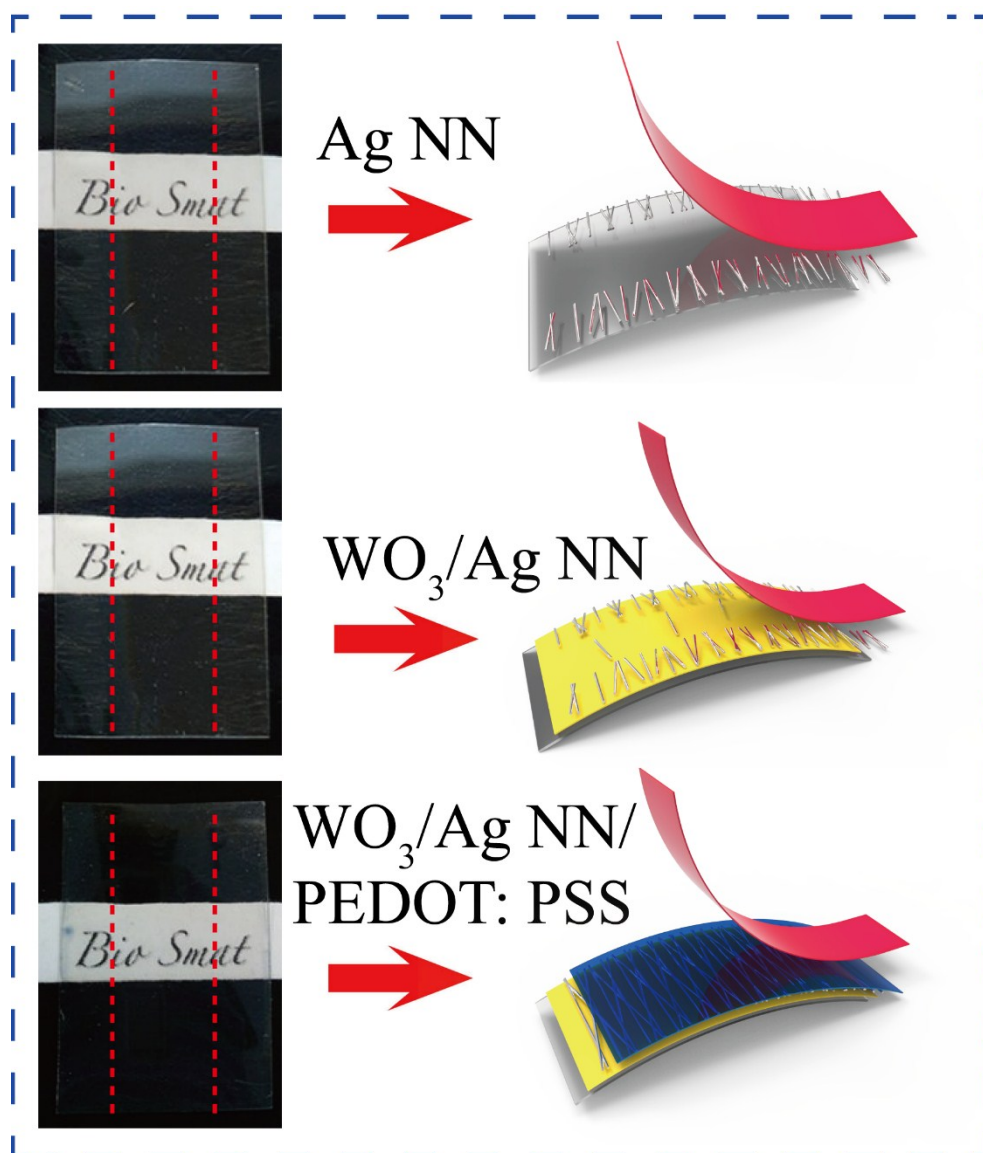
## Ultraflexible, Stretchable and Fast-switching Electrochromic Devices with Enhanced Cycling Stability

Qian Liu,<sup>†a</sup> Zijie Xu,<sup>†a</sup> Wu Qiu,<sup>a</sup> Chen Hou,<sup>a</sup> Yanan Wang,<sup>a</sup> Peijian Yao,<sup>a</sup> Rui Yu,<sup>a</sup> Wenxi Guo,<sup>\*a</sup> Xiang Yang Liu<sup>\*ab</sup>

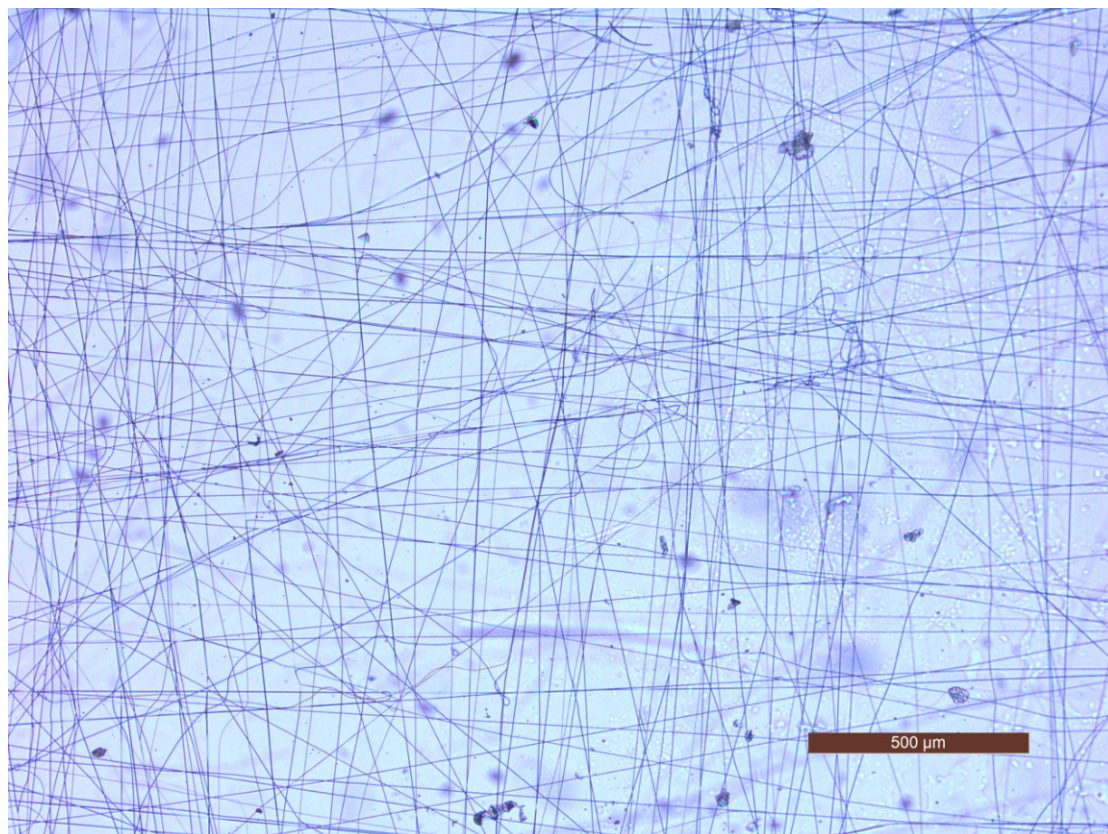
<sup>a</sup>Research Institute for Soft Matter and Biomimetics, Fujian Provincial Key Laboratory for Soft Functional Materials Research, Department of Physics, Xiamen University, Xiamen, 361005, China.

<sup>b</sup>Department of Physics, Faculty of Science, National University of Singapore, Singapore, 117542, Singapore.

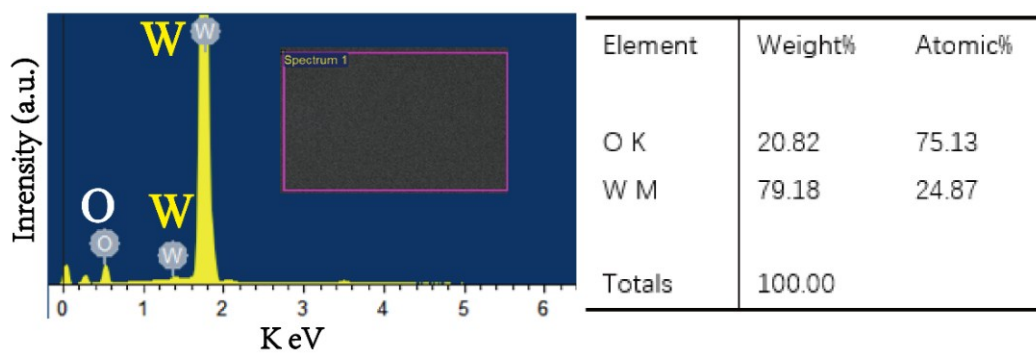
Email: wxguo@xmu.edu.cn; phyluxy@nus.edu.sg



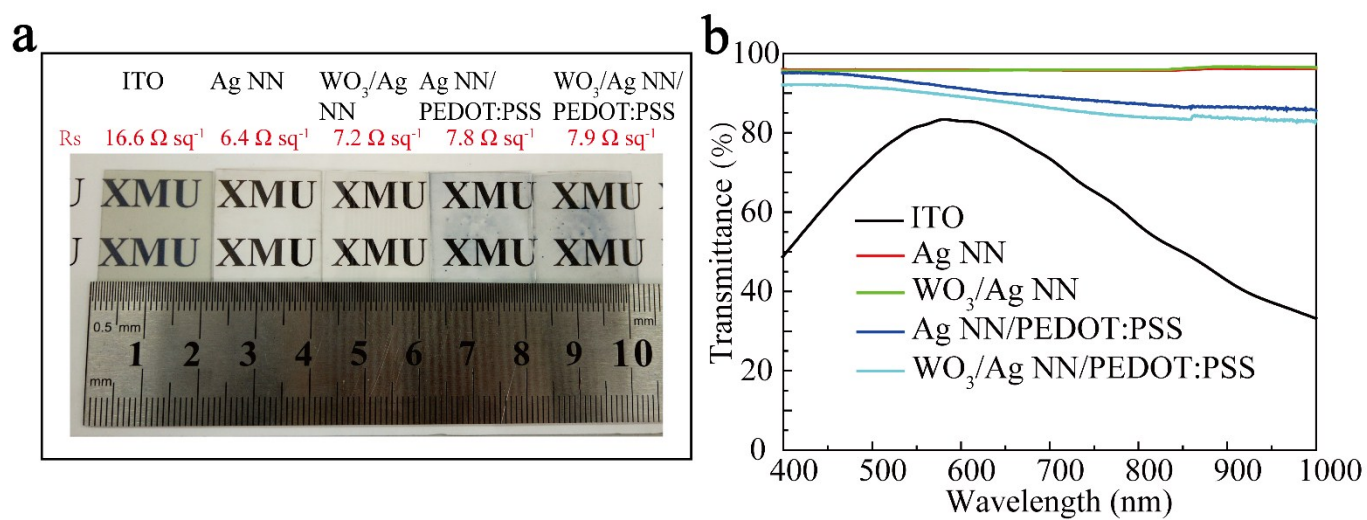
**Figure S1.** Photographs (left) and the schematic illustration (right) of the electrode films after the adhesion test with a scotch tape, respectively.



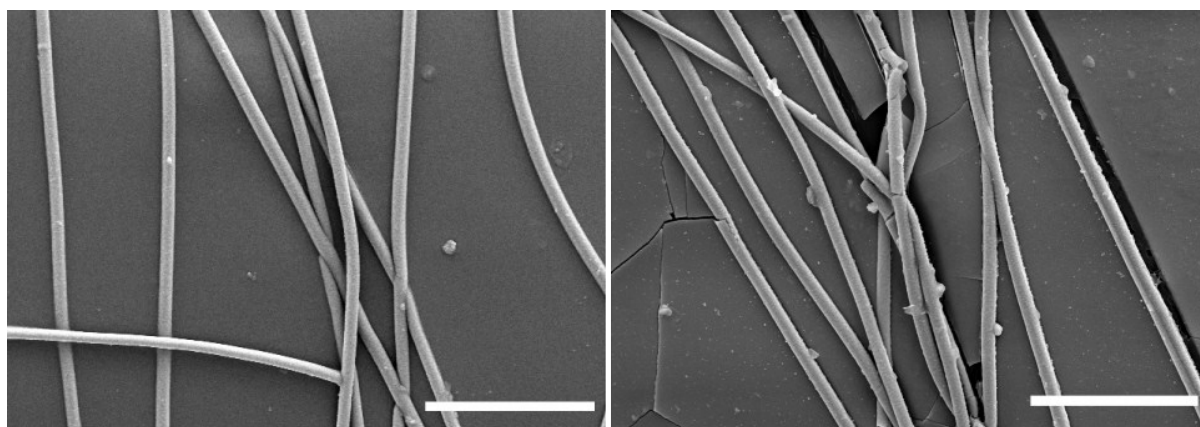
**Figure S2.** Optical image of Ag NN on the PET substrate.



**Figure S3.** EDX elemental spectra analysis of magnetron sputtered WO<sub>3</sub>.

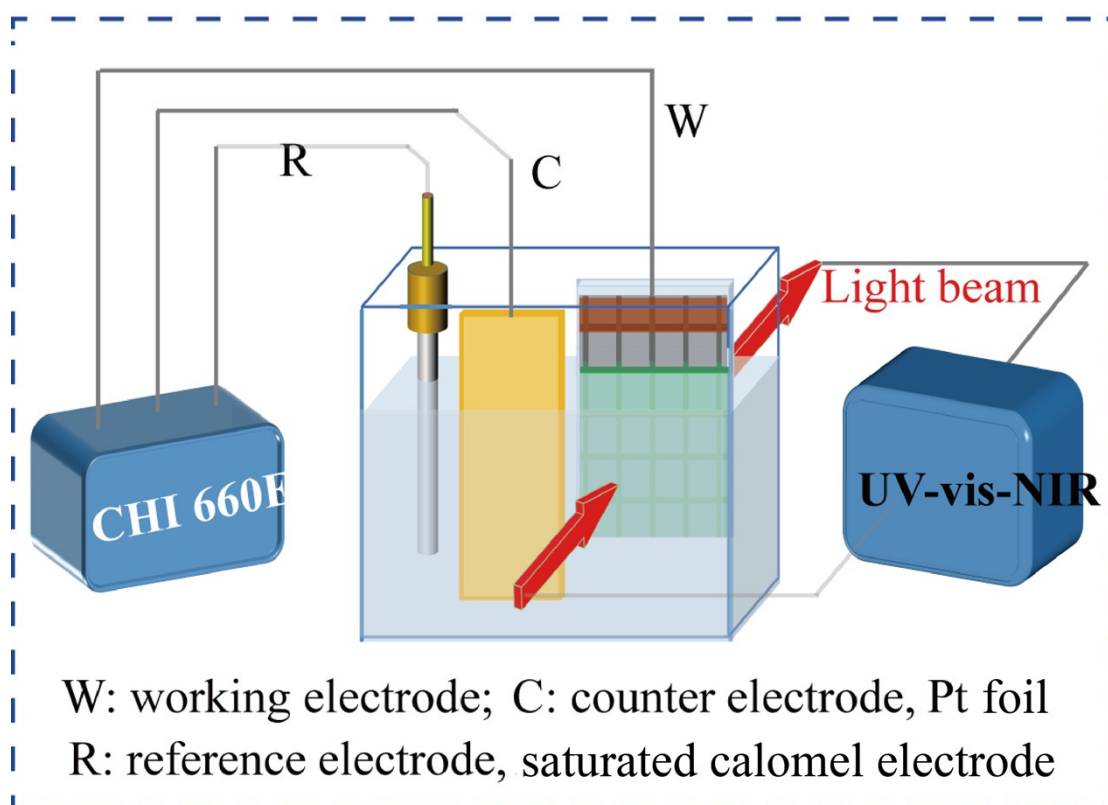


**Figure S4.** Photographs and light transmission spectra of commercial ITO, Ag NN, WO<sub>3</sub>/Ag NN, Ag NN/PEDOT:PSS and the WO<sub>3</sub>/Ag NN/PEDOT:PSS hybrid film.

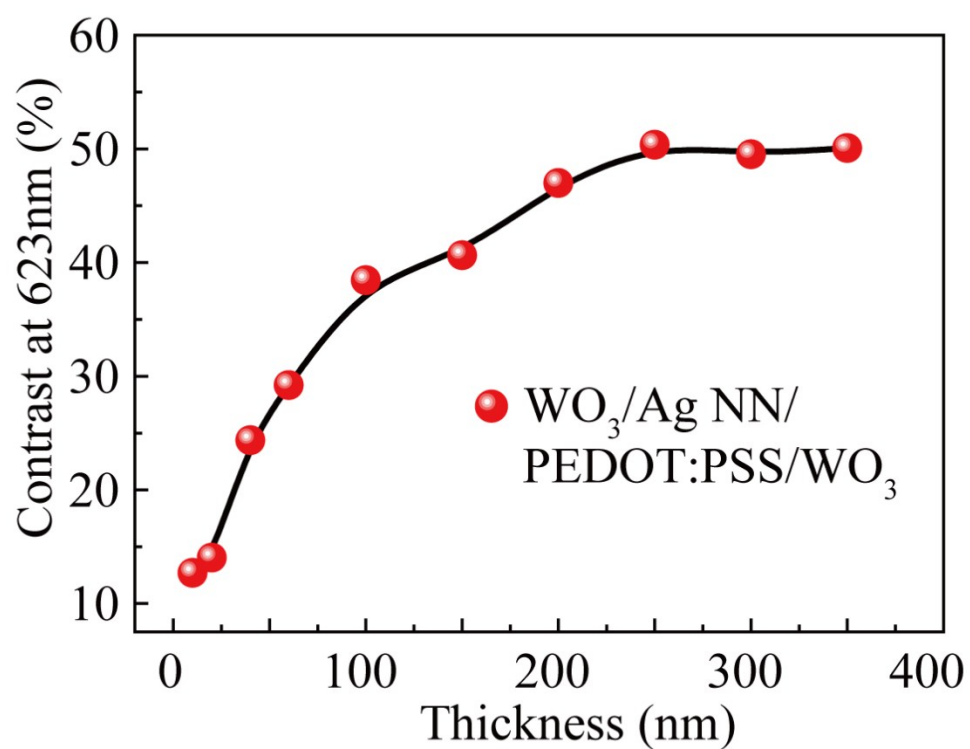


**Figure S5.** SEM images of the hybrid film before and after stretching measurement (50% tensile strain). The scale bar is 10  $\mu\text{m}$ .



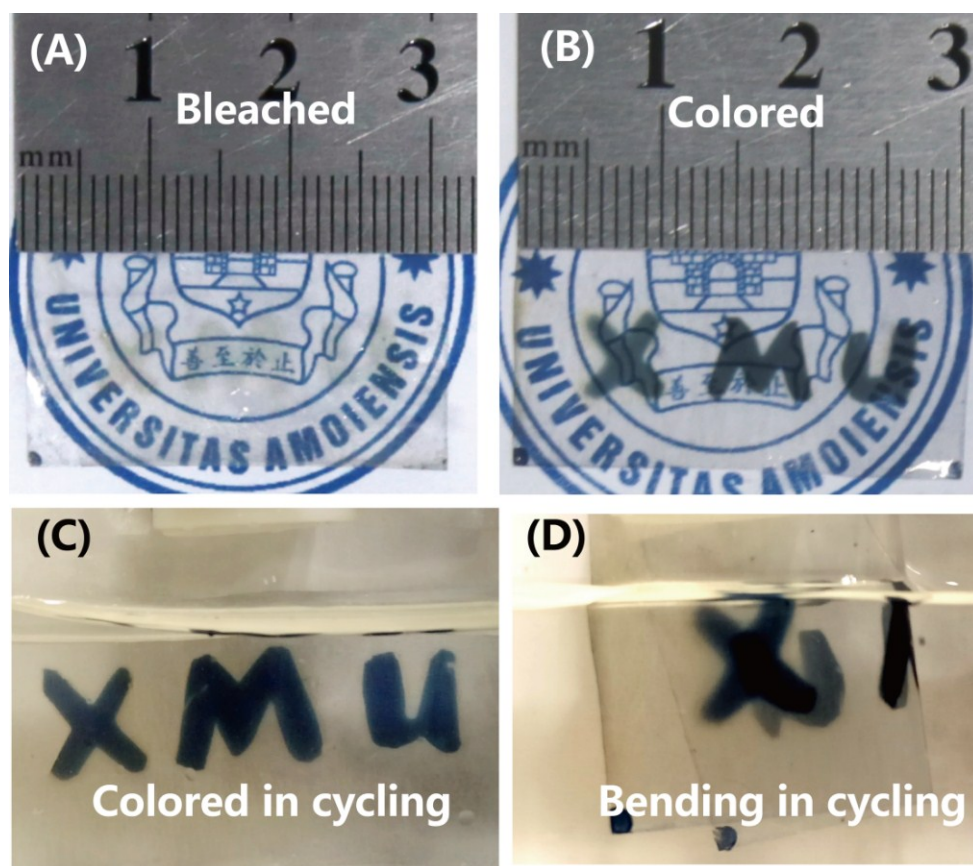


**Figure S6.** Schematic representation of the electrochromic measurement installation integrated by an electrochemical workstation and a UV-vis-NIR spectrometer. A  $\text{WO}_3/\text{Ag NN}/\text{PEDOT: PSS}/\text{WO}_3$  hybrid film, a Pt foil, and a saturated calomel electrode (SCE) serve as working electrode, counter electrode, reference electrode, and the electrolyte, respectively. All the electrodes are placed in a quartz cuvette containing 1 M  $\text{LiClO}_4/\text{PC}$  solution at a wavelength of 623 nm. Chronoamperometry mode of the electrochemical workstation for electrochemical test.



**Figure S7.** The optical contrast as a function of the thickness of the external WO<sub>3</sub> film.





**Figure S8.** Optical images of bleached, colored and bending state in cycling.