Supporting information for

Ti-doped WO_3 synthesized by a facile wet bath method for improved electrochromism

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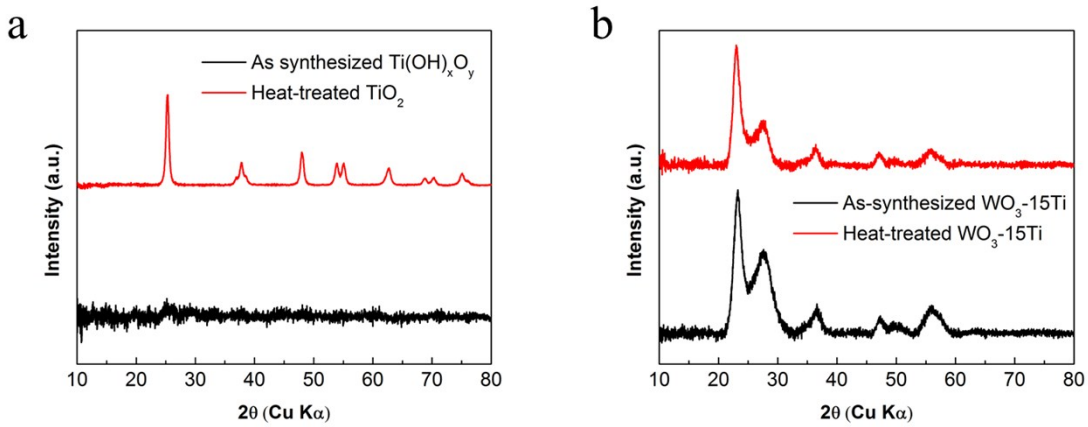

Figure S1. XRD diffractogram comparisons of $Ti(OH)_xO_y$ (a) and WO_3-15Ti (b) before and after the same heat-treatment.

Amorphous $Ti(OH)_xO_y$ was obtained with the similar synthesis, it was difficult to determine whether there was $Ti(OH)_xO_y$ impurity in the Ti-doped WO_3 sample. WO_3 was doped with the highest Ti(IV) content in the WO_3-15Ti which was calcined at 400 °C for 2 h in the air. No impurity peak was detected in its XRD pattern after the calcination, suggesting that there was no impure titanium compounds formed during synthesis.

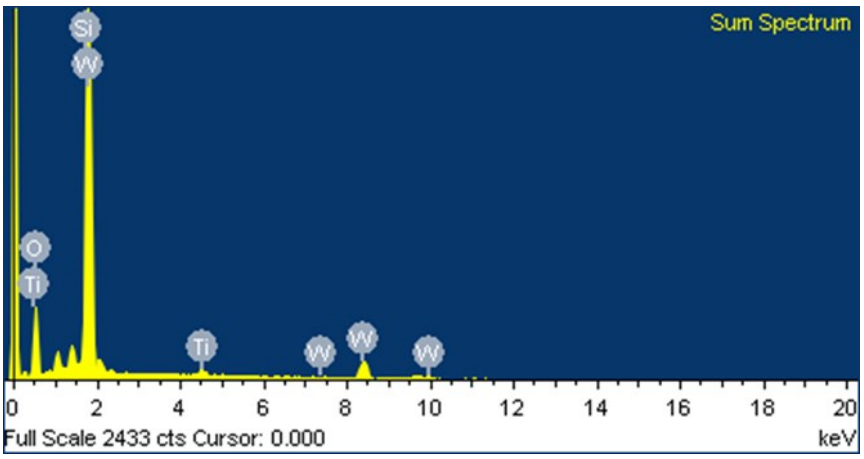

Figure S2. EDS mapping analysis of WO_3-10Ti film

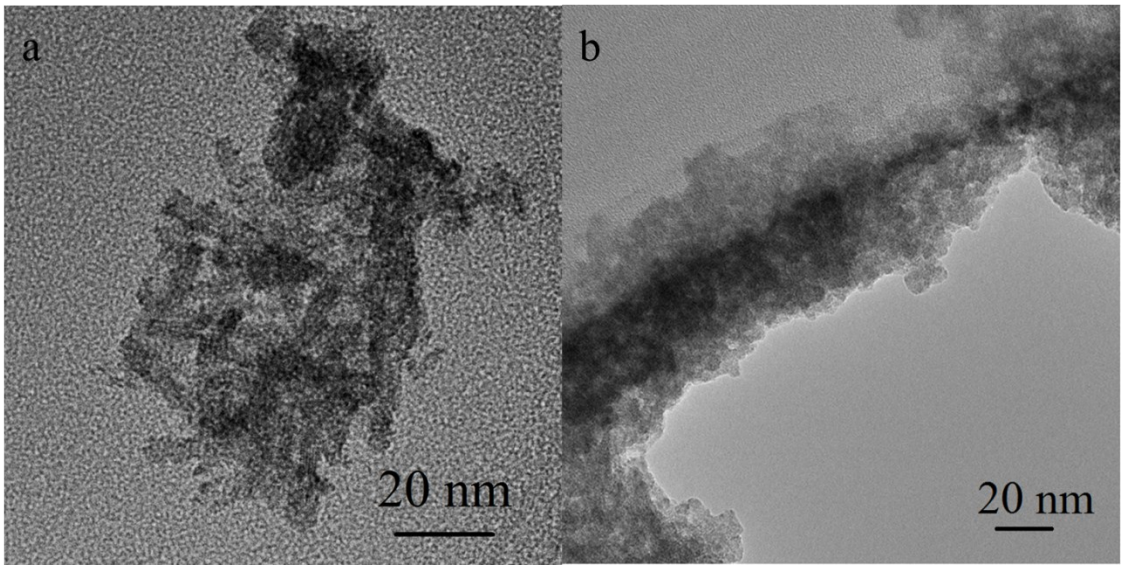

Figure S3. TEM images of WO_3-5Ti (a) and -15Ti (b)

Table S1. Parameters of WO_3 samples, including crystallite size, BET surface area, atomic ratio and the diffusion coefficient

Material	**Crystallite size (nm)**	**BET surface area (m^2 g^{-1})**	**Ti/(Ti+W) (at. %)**	**The diffusion coefficient *D* (cm^2 s^{-1})**
WO_3	32.9	34.9378	0	6.76011E-9
WO_3 -1Ti	28.2	54.5812	0.8	5.5733E-9
WO_3-5Ti	15.6	86.8863	5.2	4.70695E-9
WO_3-10Ti	10.8	85.8344	8.4	4.41936E-9
WO_3-15Ti	8.9	84.1097	12.9	2.47947E-9

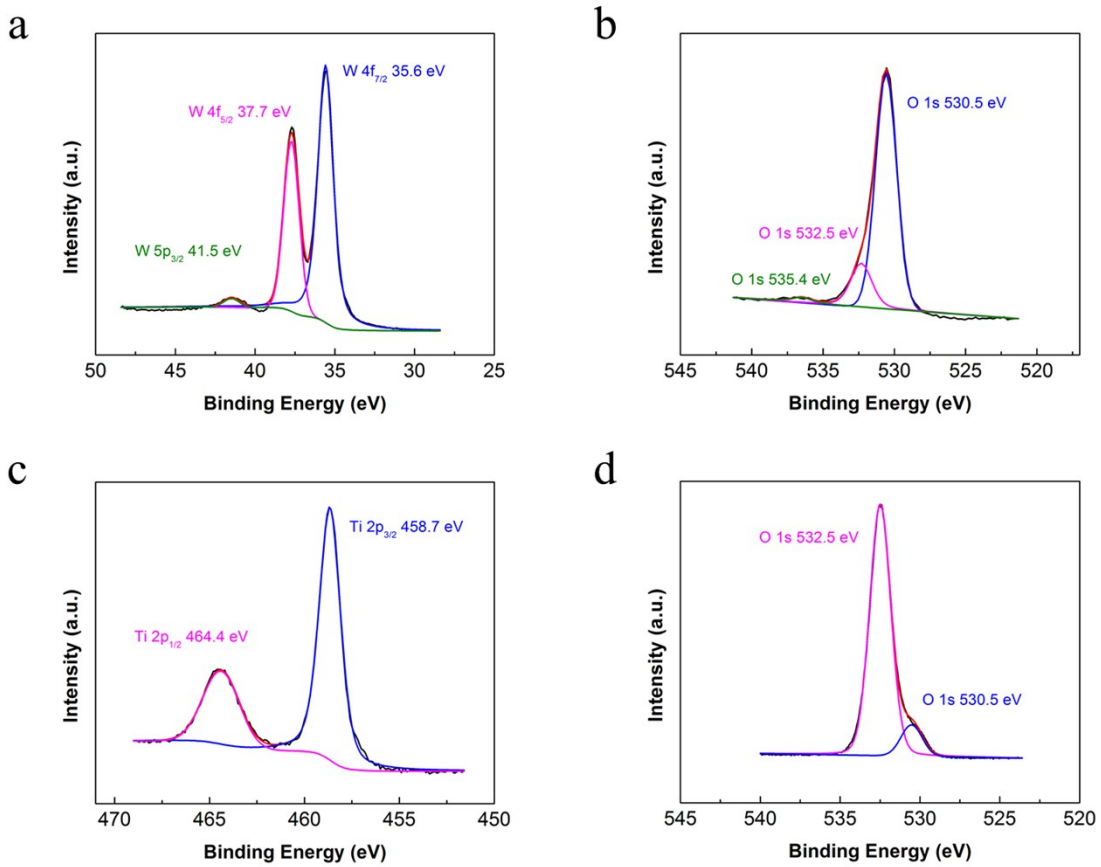

Figure S4. The XPS spectra of the main elements for WO_3 (a and b) and $Ti(OH)_xO_y$ (c and d)

Table S2. Literature survey of WO_3 with the best CE for electrochromism at the wavelength of 633 nm

Material	ΔT(%)	CE (cm^2 C^{-1})	Reference
Ti-doped WO_3 nanocrystals	67.6	106.6	This work
WO_3 nanoparticles on the silver grid/PEDOT:PSS hybrid film	81.9	124.5	Adv. Energy Mater., 2016, 6, 1501882
$WO_3 \cdot 2H_2O$ thin film	53.8	107.8	J. Mater. Chem., 2012, 22, 19904
WO_3 nanowire array film	58	102.8	J. Mater. Chem., 2011, 21, 5492

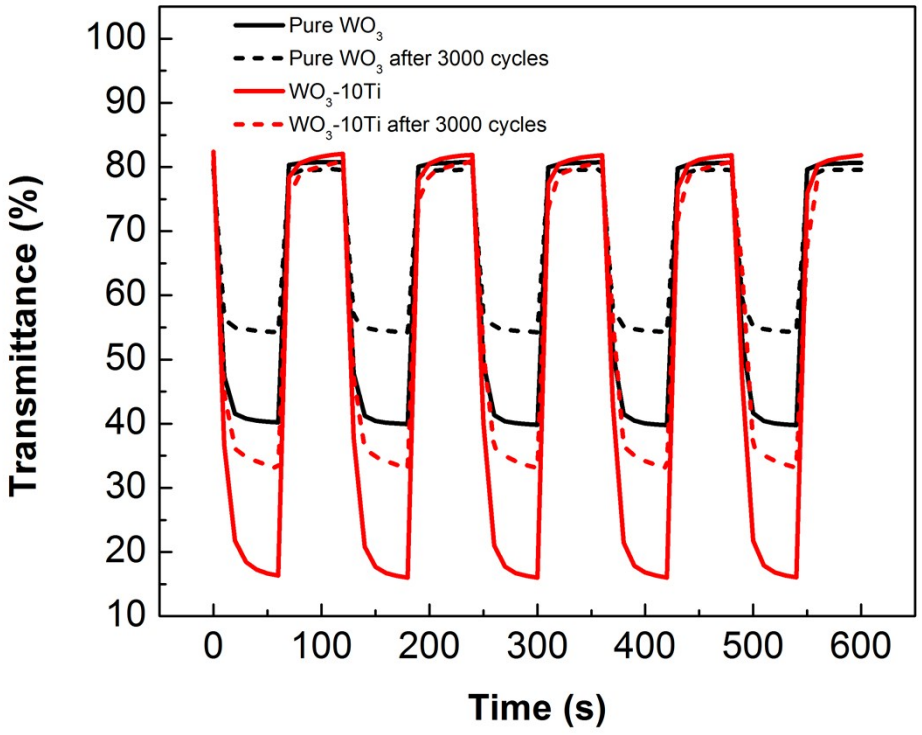

Figure S5. The optical response of pure WO_3 and WO_3-10Ti before and after 3000 cycles operation