Electronic Supplementary Information(ESI)

High performing smart electrochromic device based on honeycomb nanostructured*h*-WO_3 thin films: Hydrothermal assisted synthesis

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S1. Device fabrication

A schematic representation of EC device fabrication is shown in fig S1. For fabrication of electrochromic device based on the WO_3thinfilm, the injection filling technique was used. The acrylic adhesive tape was applied along to four edges of nanostructured WO_3 thin film leaving one open ports of about 1mm.The ITO coated glass substrate facing inwards was placed on acrylic tape and allowed to tight with WO_3 film. The 0.5 M $LiClO_4$ in propylene carbonate electrolyte was theninjected through one port using a syringe and then whole device was sealed with epoxy. The final configuration of device is Glass/FTO/WO_3/0.5M $LiClO_4$ in PC/ITO/Glass.Now device is ready for the use.

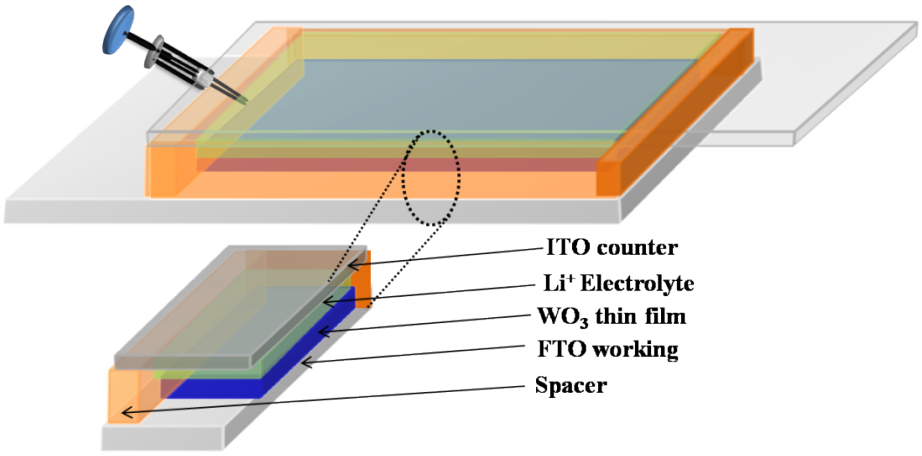


Fig. S1A schematic representation of EC device fabrication of honeycomb nanostructured WO_3 thin film.

S2. Raman Spectra

Raman spectroscopy was used to investigate the vibrational modes of WO_3 thin films deposited at different hydrothermal reaction time. In the spectrum three vibration modes were observed at 972, 798 and 277 cm^{-1} which corresponds to modes of hexagonal WO_3 thin film.[1,2]Raman band at 972 cm^{-1} correspond to W=O symmetric stretching mode of terminal oxygen atom. The peak centered at 798 cm^{-1} which could be attributed to O-W-O stretching. The band at 277 cm^{-1} is related to bending mode of O-W-O bridging oxygen.[3] No any other characteristic peak observed at 660 and 685 cm^{-1} corresponding to hydrated WO_3 thin film.[4]

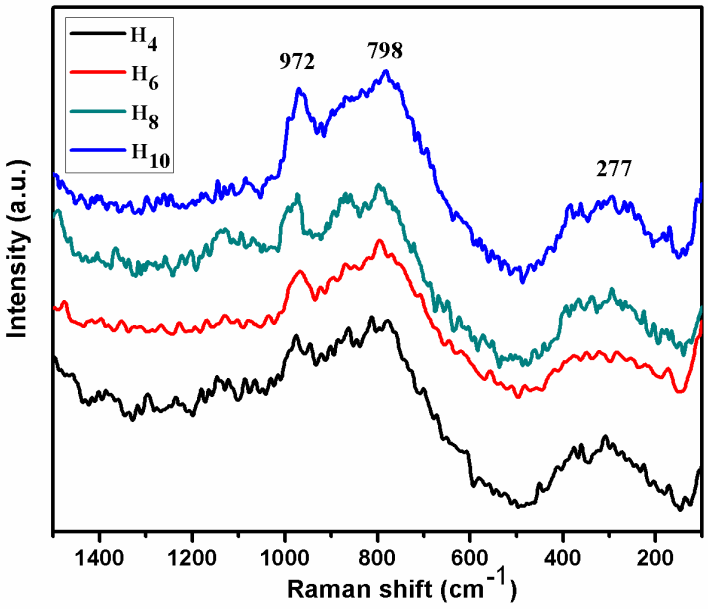


Fig. S2 Raman spectra of WO_3 thin film deposited at different hydrothermal time.

S3. Cross section SEM image

The thickness values of deposited films were determined from the cross sectional SEM images. The average thickness for sample H_4, H_6, H_8 and H_{10} is 1.1, 1.18, 1.45 and 2.4 μm respectively.

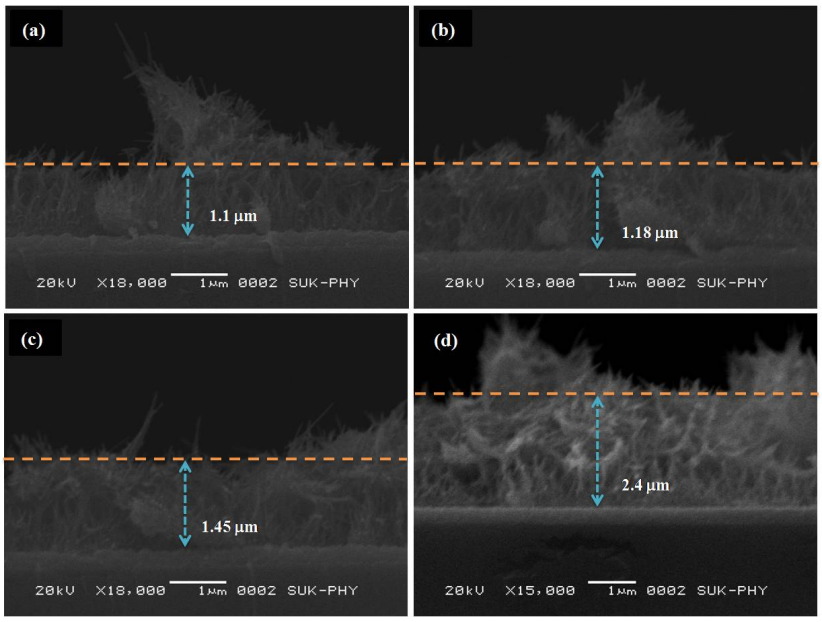
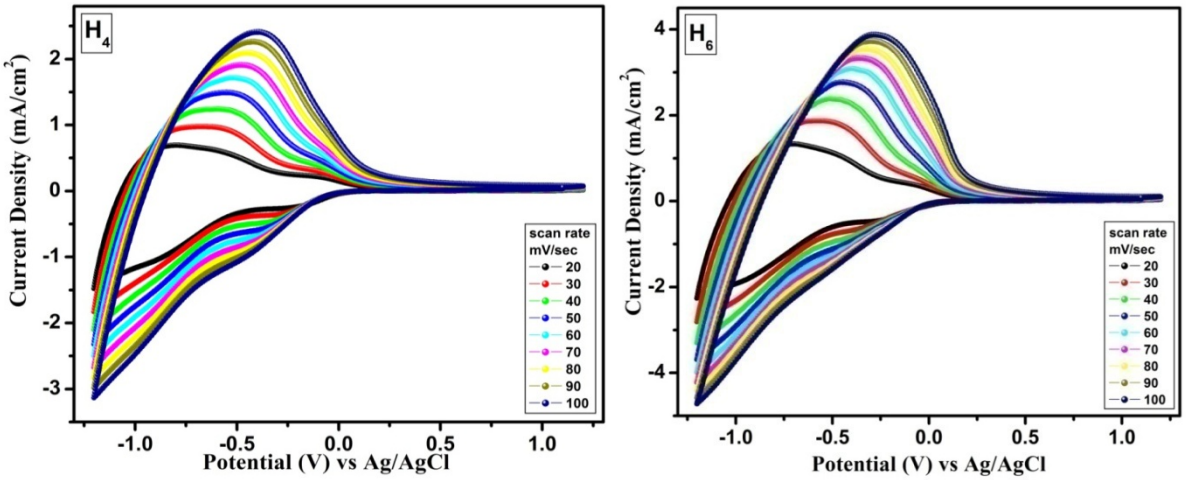


Fig. S3 The cross section SEM images of WO_3 thin film (a) sample H_4, (b) H_6, (c) H_8 and (d) H_{10}.



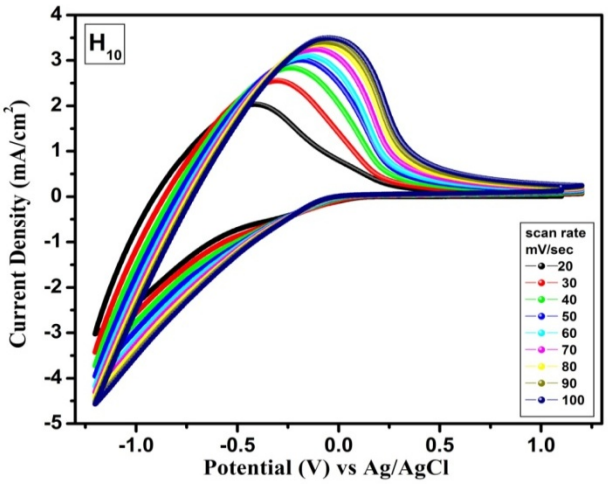


Fig. S4 Cyclic voltammograms of nanostructured WO_3 thin film recorded at different scan rate.

Table.S1EIS parameters of WO_3 thin film obtained by fitting the data to Randlescircuit**.**

Sample code	Rs (Ω)	R_{CT} (Ω)	Zw ($S\ s^{1/2}\ cm^{-2}$)
H_4	17	38.6	1.57×10^{-4}
H_6	15.3	23.6	1.23×10^{-4}
H_8	**13.2**	**11.3**	**2.59×10^{-5}**
H_{10}	13.8	12.6	2.71×10^{-5}

References

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