

## Supplementary Information

# Transparent Wood Containing $Cs_xWO_3$ Nanoparticles for Heat-Shielding-Window Applications

Ziya Yu, Yongji Yao, Jianing Yao, Liangmiao Zhang, Zhang Chen, Yanfeng Gao\* and Hongjie Luo

School of Materials Science and Engineering, Shanghai University, Shanghai 200444, China.

\* To whom correspondence should be addressed:

Professor Yanfeng Gao

E-mail: [yfgao@shu.edu.cn](mailto:yfgao@shu.edu.cn)

## Experimental Section

**Characterization.** The crystal structures of the  $\text{Cs}_x\text{WO}_3$  nanoparticles were characterized by X-ray diffraction (XRD) with a  $\text{Cu-K}\alpha$  radiation of 1.5418 Å wavelength and settings of 40 mA and 40 kV. The surface morphology and energy dispersive spectrometer (EDS) of the  $\text{Cs}_x\text{WO}_3$  nanoparticles were observed using a Scanning Electron Microscope (SEM, JEOL Manufacturing, Japan, JSM-6700F) with an EDS attachment. X-ray photoelectron spectroscopy (XPS) was employed for approximate elemental analyses. The transmittance spectra from UV to near-IR wavelengths (300-2500 nm; UH4150) of the  $\text{Cs}_x\text{WO}_3$  nanoparticles in our work was measured by coating them onto PET substrates: firstly, the as-synthesized  $\text{Cs}_x\text{WO}_3$  powders was dispersed in collodion-ethanol solution at a mass ratio of ethanol : collodion :  $\text{Cs}_x\text{WO}_3$  = 1.0 : 0.93 : 0.15; then the coating solution was uniformly coated onto the PET substrates via bar coating method before drying naturally. The sheet resistance of ITO glass was measured by a four-point probe surface resistivity meter (JG, ST2263).

## Supplementary Figures

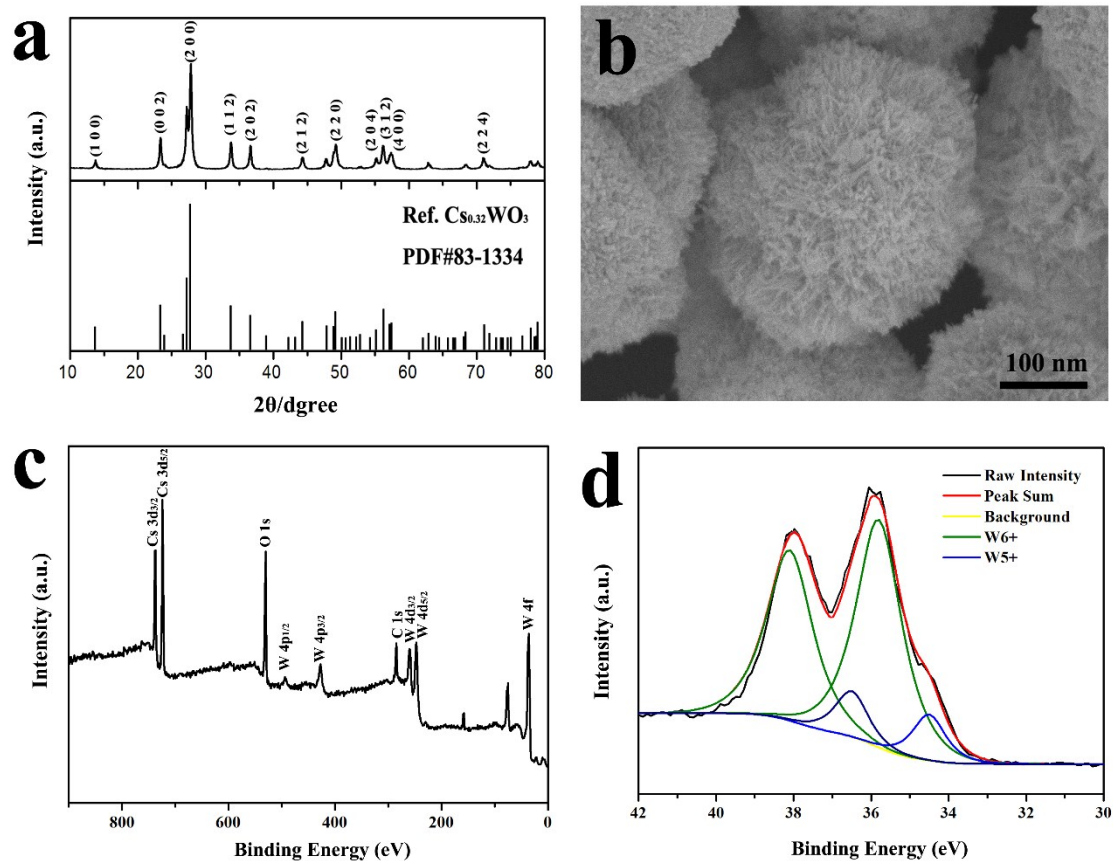


Fig. S1 (a) XRD patterns of the  $\text{Cs}_x\text{WO}_3$  particles (reference:  $\text{Cs}_{0.32}\text{WO}_3$ , JCPDS No. 831334); (b) SEM images of the  $\text{Cs}_x\text{WO}_3$  particles; XPS spectra of the  $\text{Cs}_x\text{WO}_3$  particles. (c) Full range XPS spectra; (d) deconvolution of the  $\text{W } 4f$  core-level spectrum with peaks corresponding to the  $\text{W } 6+$  and  $\text{W } 5+$  oxidation states.

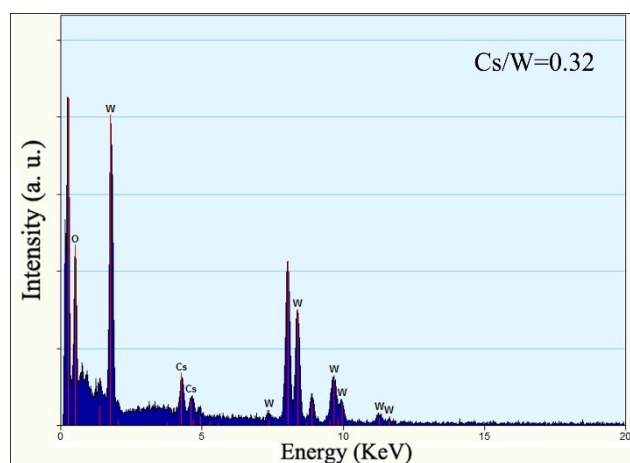


Fig. S2 EDS profile of the  $Cs_xWO_3$  nanoparticles. The atomic ratio of Cs/W of  $Cs_xWO_3$  nanoparticles was 0.32 according to the EDS measurements.

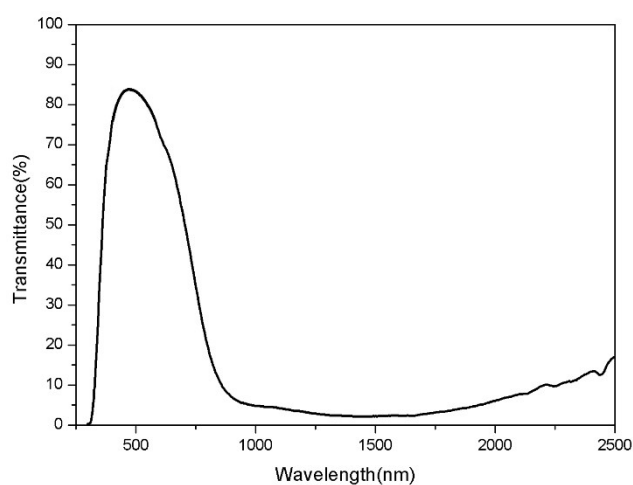


Fig. S3 Transmittance spectra of the  $Cs_xWO_3$  nanoparticles.

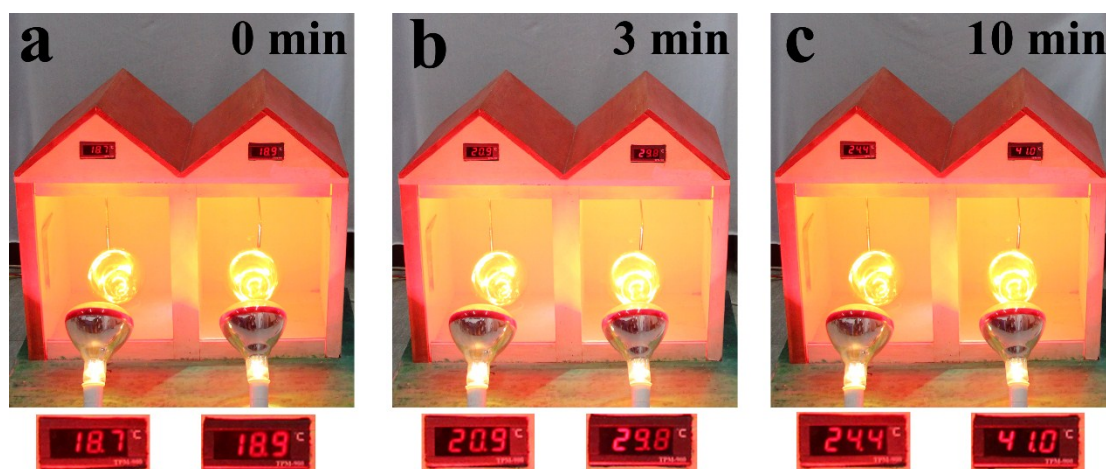


Fig. S4 Images of model houses in order to show the temperature change after continuous simulate solar radiation: ITO glass house (a) after 0 min, (b) after 3 min, (c) after 10 min. The sheet resistance of ITO glass was  $4.2 \Omega \square^{-1}$ .