

## Supplement files

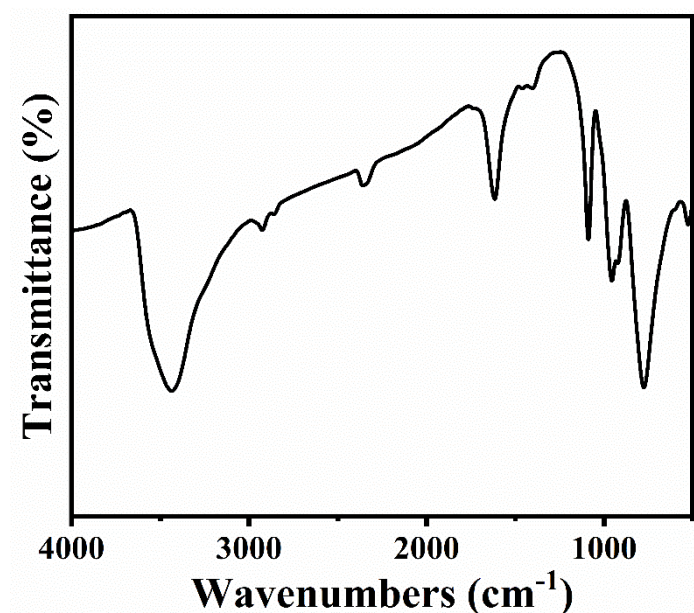


Figure S1. The IR spectra of  $\text{K}_7[\text{P}_2\text{W}_{17}\text{VO}_{62}] \cdot 18\text{H}_2\text{O}$ .

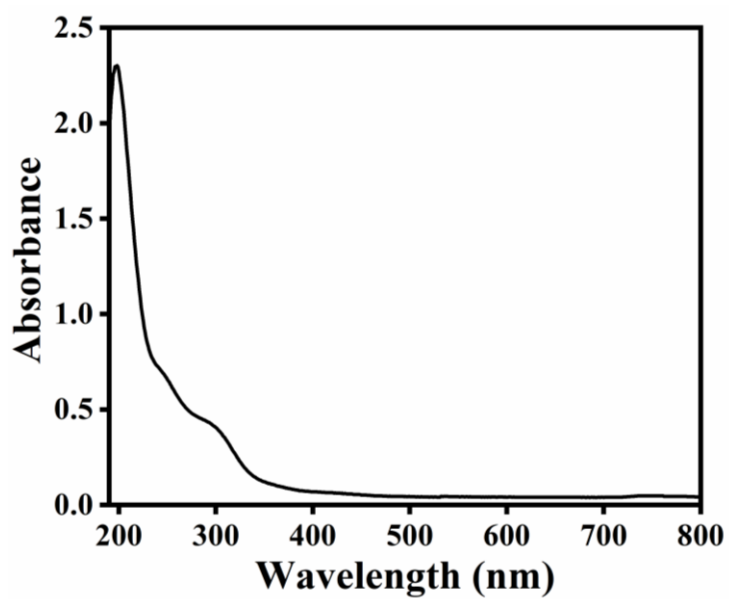
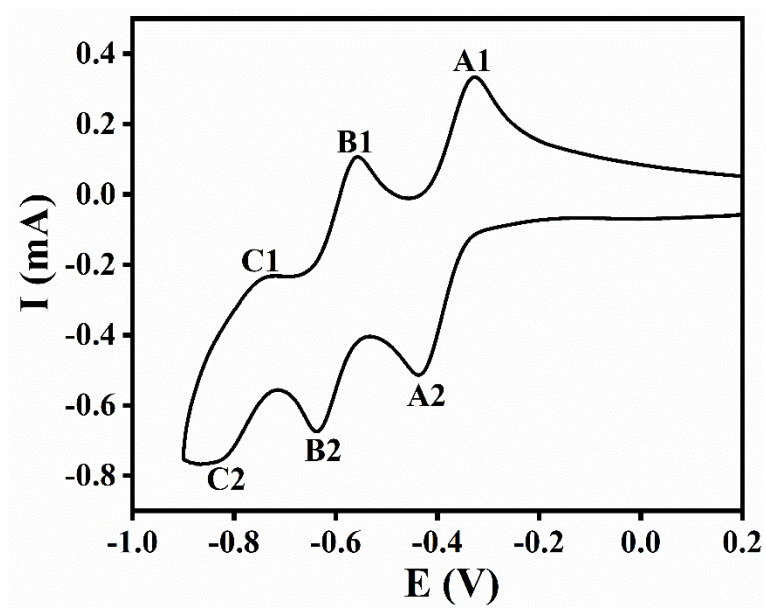
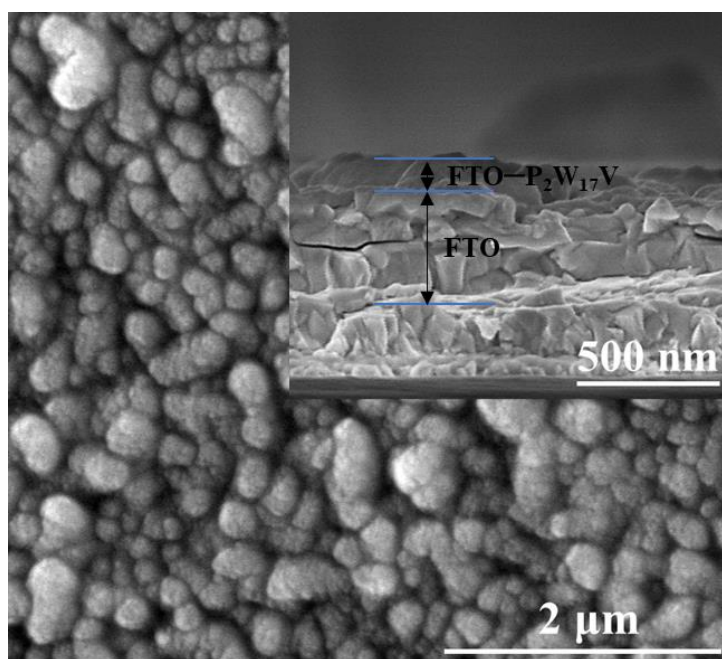


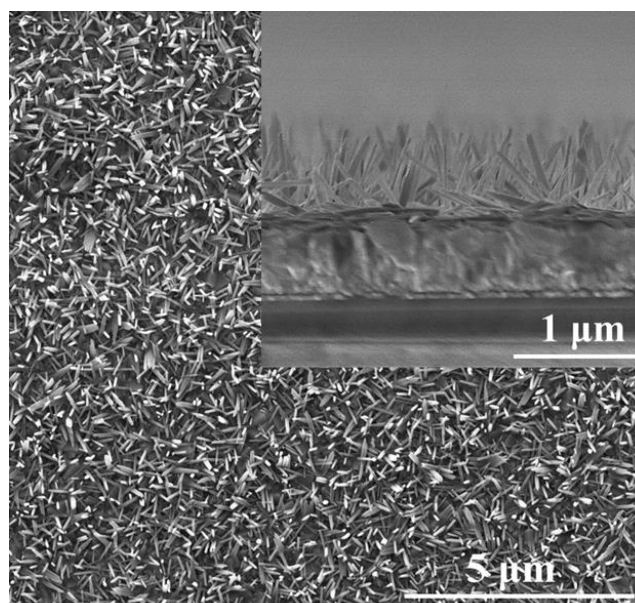
Figure S2. The UV-vis spectra of  $\text{K}_7[\text{P}_2\text{W}_{17}\text{VO}_{62}] \cdot 18\text{H}_2\text{O}$ .



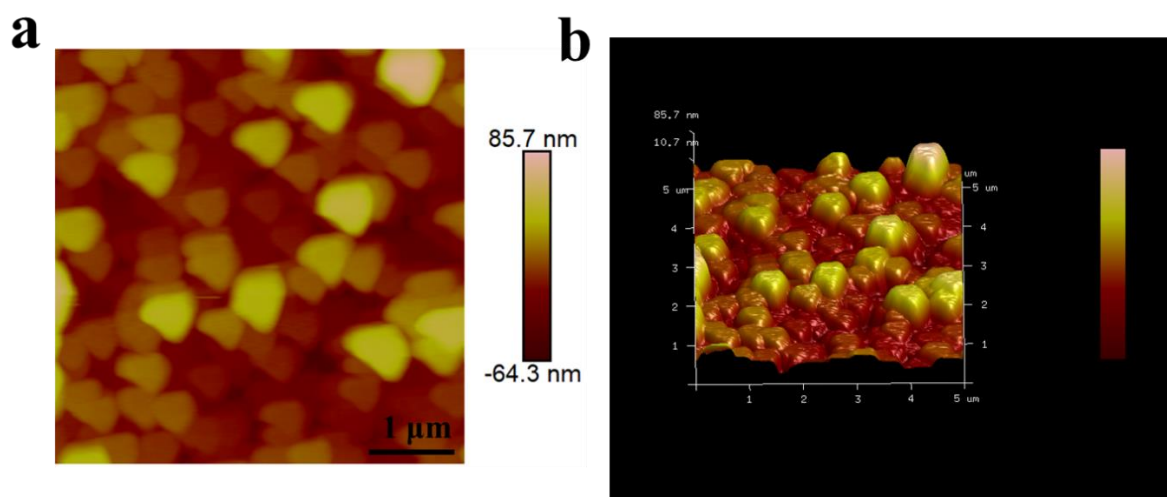
**Figure S3.** CV curve of  $K_7[P_2W_{17}VO_{62}] \cdot 18H_2O$  in HOAc-NaOAc solution (pH=3.5).



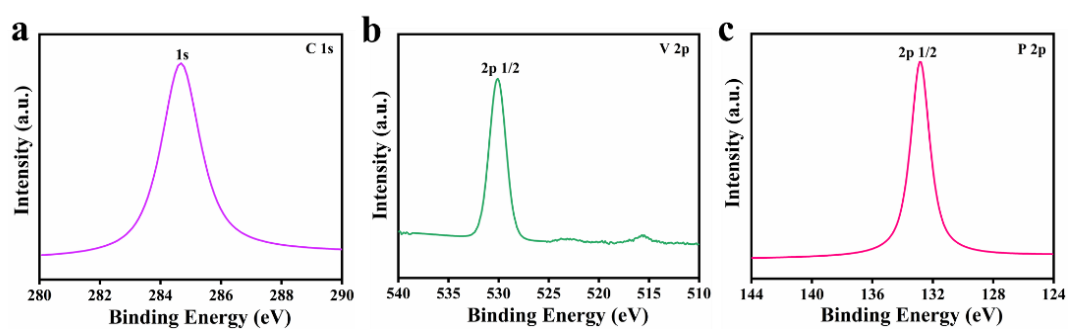
**Figure S4.** The SEM images of FTO- $P_2W_{17}V$  (inset: the cross-sectional images of prepared films).



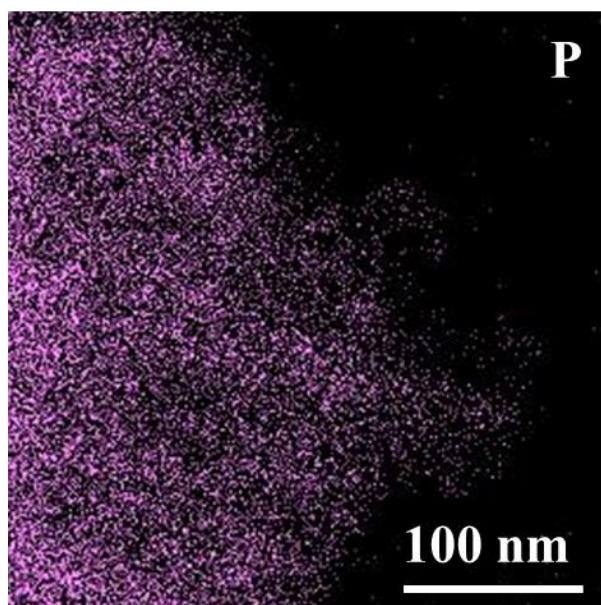
**Figure S5.** The SEM images of  $\text{TiO}_2$  NW (inset: the cross-sectional images of prepared films).



**Figure S6.** 2D AFM images of (a)  $\text{FTO-P}_2\text{W}_{17}\text{V}$  and 3D AFM images of (b)  $\text{FTO-P}_2\text{W}_{17}\text{V}$ .



**Figure S7.** High-resolution XPS spectra for C1s (a), V2p (b) and P2p (c) of FTO-P<sub>2</sub>W<sub>17</sub> film.



**Figure S8.** EDS elemental mapping patterns of P in the NW-P<sub>2</sub>W<sub>17</sub>V film.