

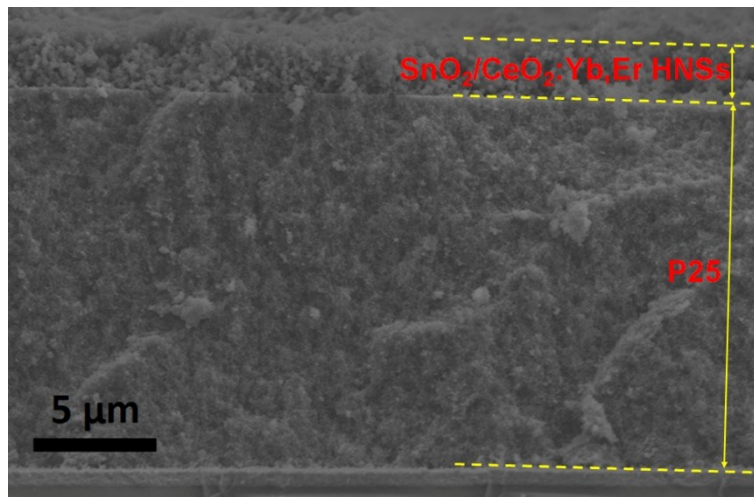
## Supporting Information

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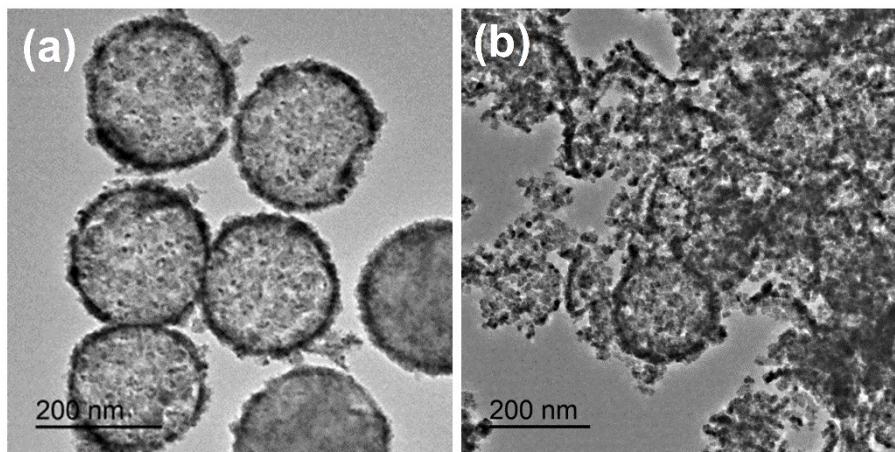
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**Figure S1** SEM image of the composite photoanode.



**Figure S2** TEM images of (a) SnO<sub>2</sub>/CeO<sub>2</sub>:Yb,Er HNSs and (b) CeO<sub>2</sub>:Yb,Er.

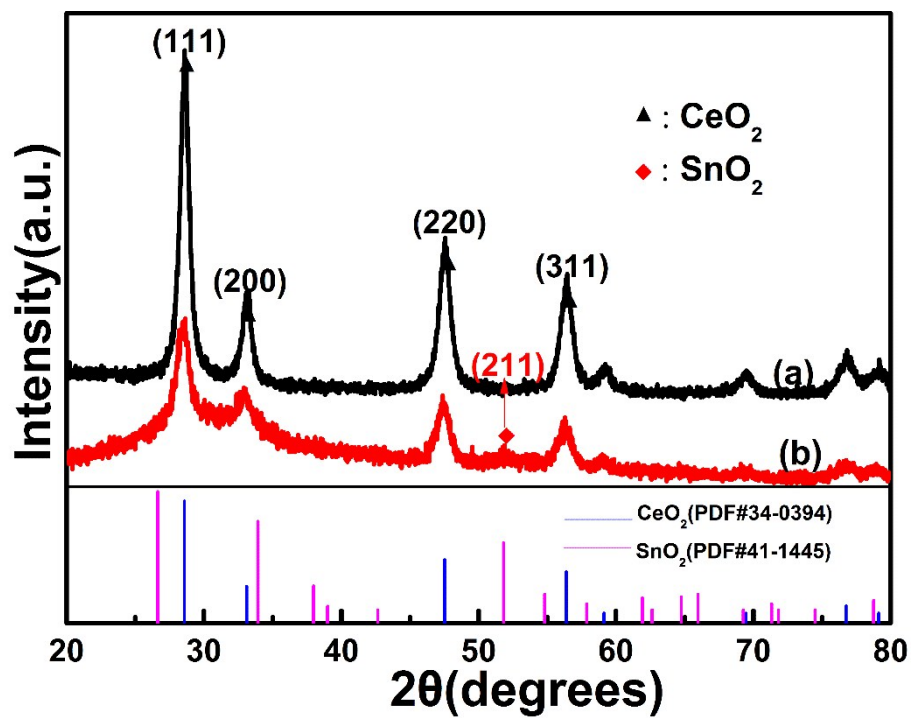


Figure S3 XRD spectra of (a)  $\text{CeO}_2:\text{Yb,Er}$ , (b)  $\text{SnO}_2/\text{CeO}_2:\text{Yb,Er}$  HNSs.

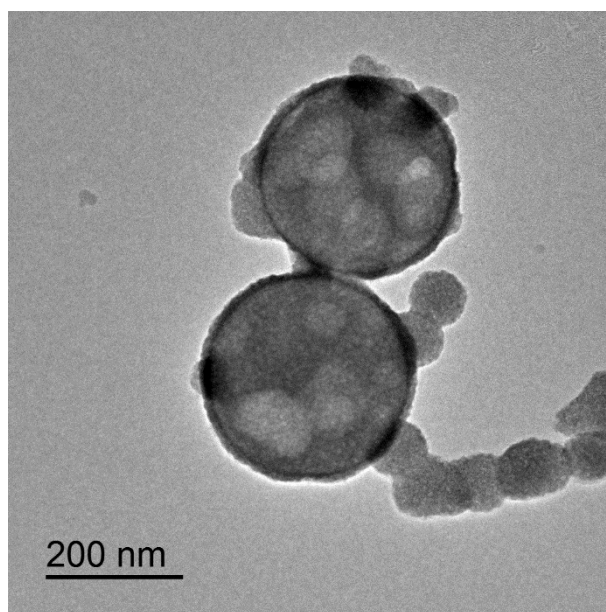
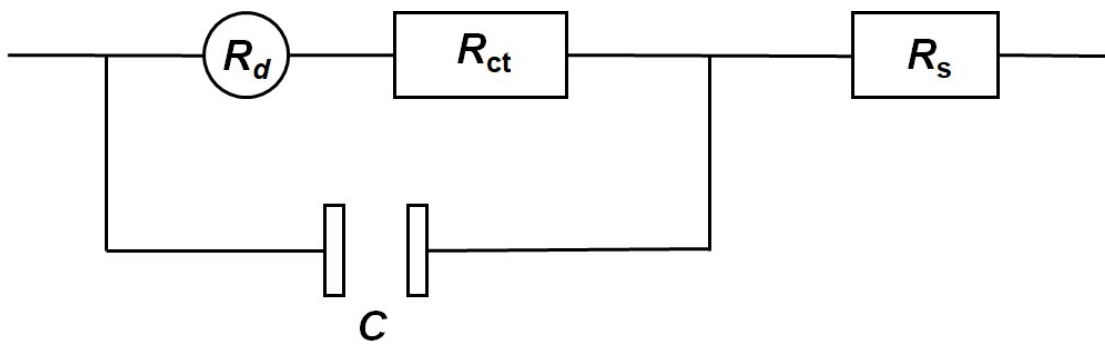


Figure S4 TEM image of  $\text{SnO}_2$  HNSs.



**Figure S5** The equivalent circuit of the DSSCs.