Electronic Supplementary Material (ESI) for Journal of Materials Chemistry

Supporting Information

Nanostructured Homogeneous CdSe/TiO_2 Composite Visible Light Photoanodes Fabricated by Oblique Angle Codeposition

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1. Top view SEM images of the OAD films

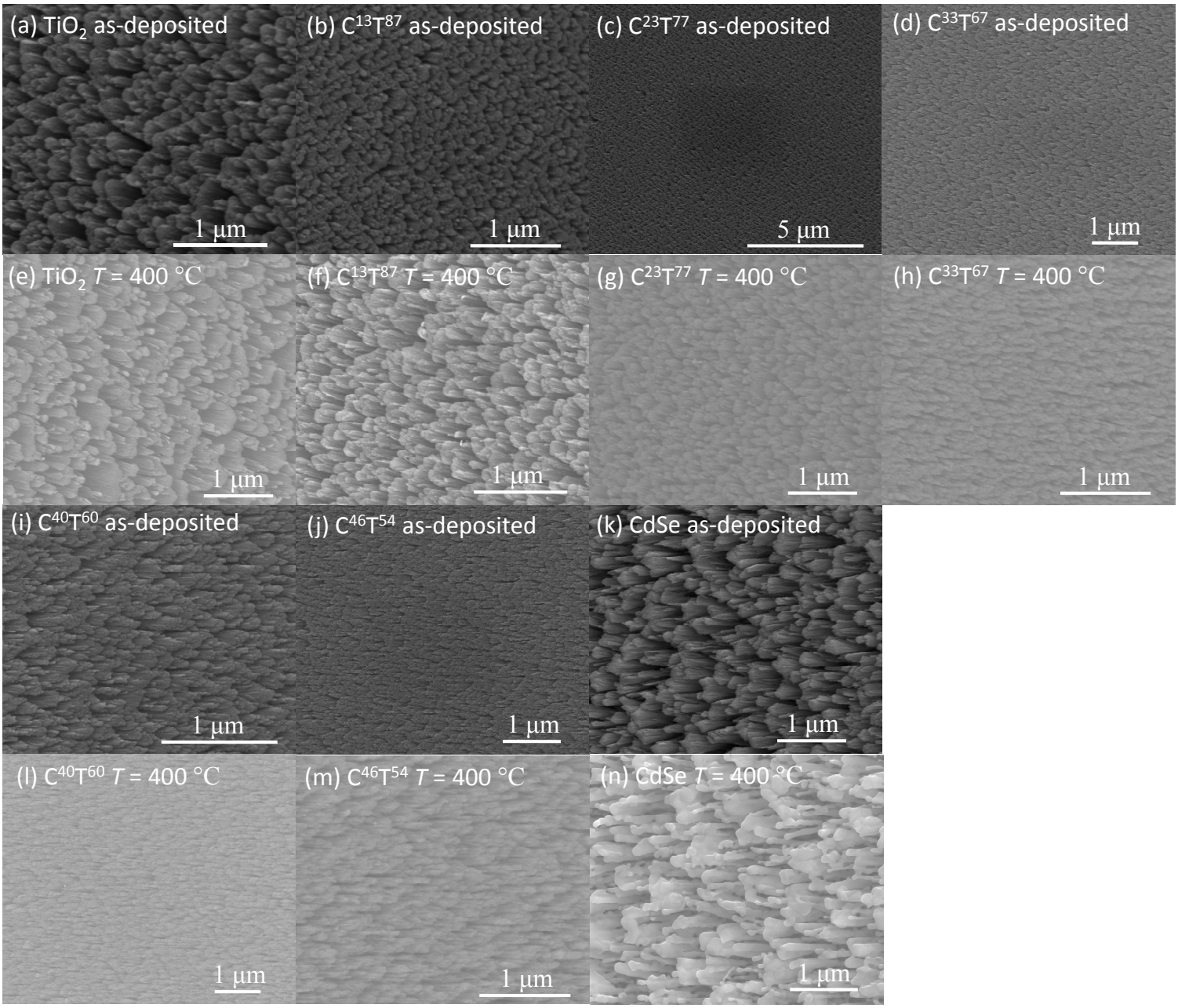


Fig. S1. *Top view SEM images of the as-deposited (a)TiO_2, (b) $C^{13}T^{87}$, (c) $C^{23}T^{77}$, (d) $C^{33}T^{67}$, (i) $C^{40}T^{60}$, (j) $C^{46}T^{54}$, (k) CdSe OAD films; and top view SEM images of the annealed (e)TiO_2, (f) $C^{13}T^{87}$, (g) $C^{23}T^{77}$, (h) $C^{33}T^{67}$, (l) $C^{40}T^{60}$, (m) $C^{46}T^{54}$, (n) CdSe OAD films.*

2. XRD and Raman spectra of annealed pure TiO_2 films

The XRD spectrum of the pure TiO_2 thick film annealed at $T = 400$ °C was left out of figure 3a of the manuscript. It is included here in figure S2a. The diffraction pattern is characteristic of polycrystalline anatase TiO_2. Similarly, the Raman spectrum of the annealed pure TiO_2 OAD film was not included in figure 6 of the manuscript, and it is shown in figure S2b. All significant peaks are attributed to phonon modes of anatase TiO_2.

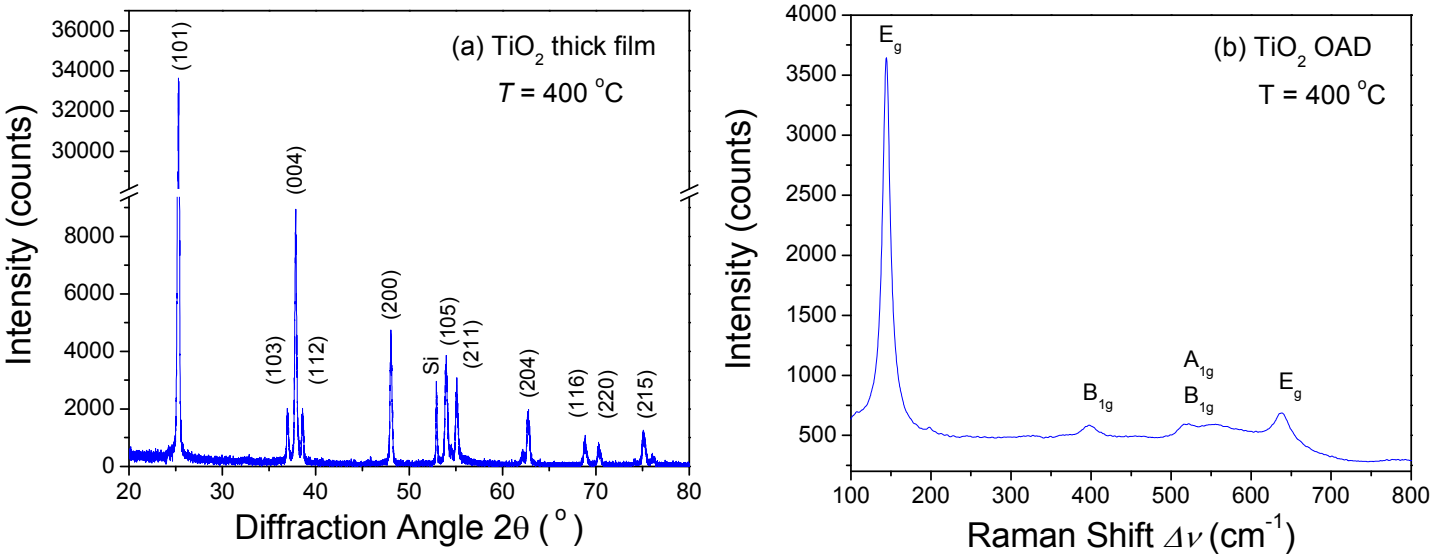


Fig. S2. *(a) XRD spectrum of the annealed TiO_2 thick film. The peaks are labeled with the corresponding anatase TiO_2 crystal plane reflections; the Si substrate peak is also labeled. (b) The Raman spectrum of the annealed TiO_2 OAD film. The peaks are labeled with the corresponding anatase TiO_2 phonon modes.*

3. Physical appearance of OAD films

A representative image of all of the OAD films is shown in Figure S3. The as-deposited OAD films show a gradual color transition from clear to dark reddish-brown with increasing CdSe percentage. The only exception to this pattern is that the $C^{46}T^{54}$ film is slightly lighter in color than the $C^{40}T^{60}$ film. Interestingly, the films become mostly transparent and lose most of their color after annealing at $T = 400$ °C.

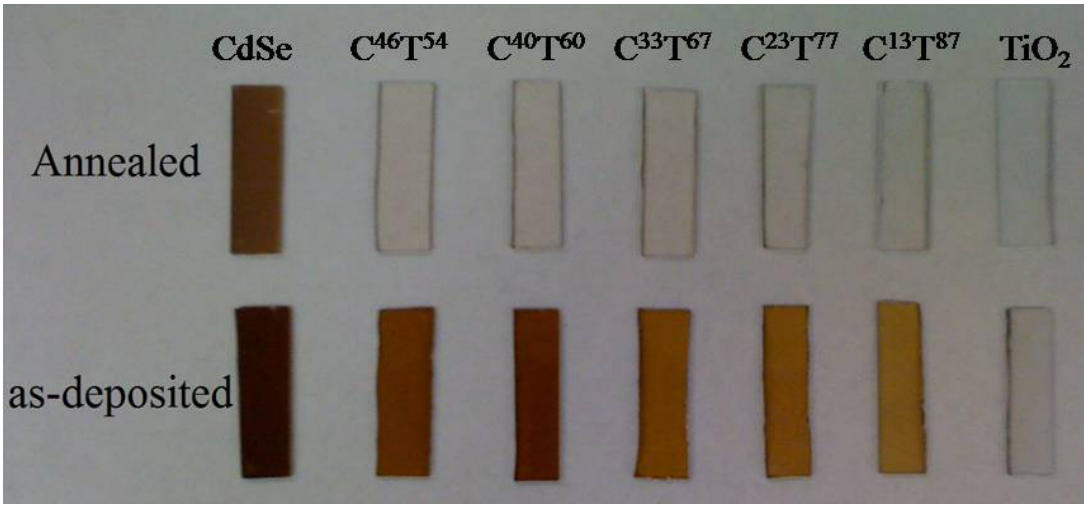
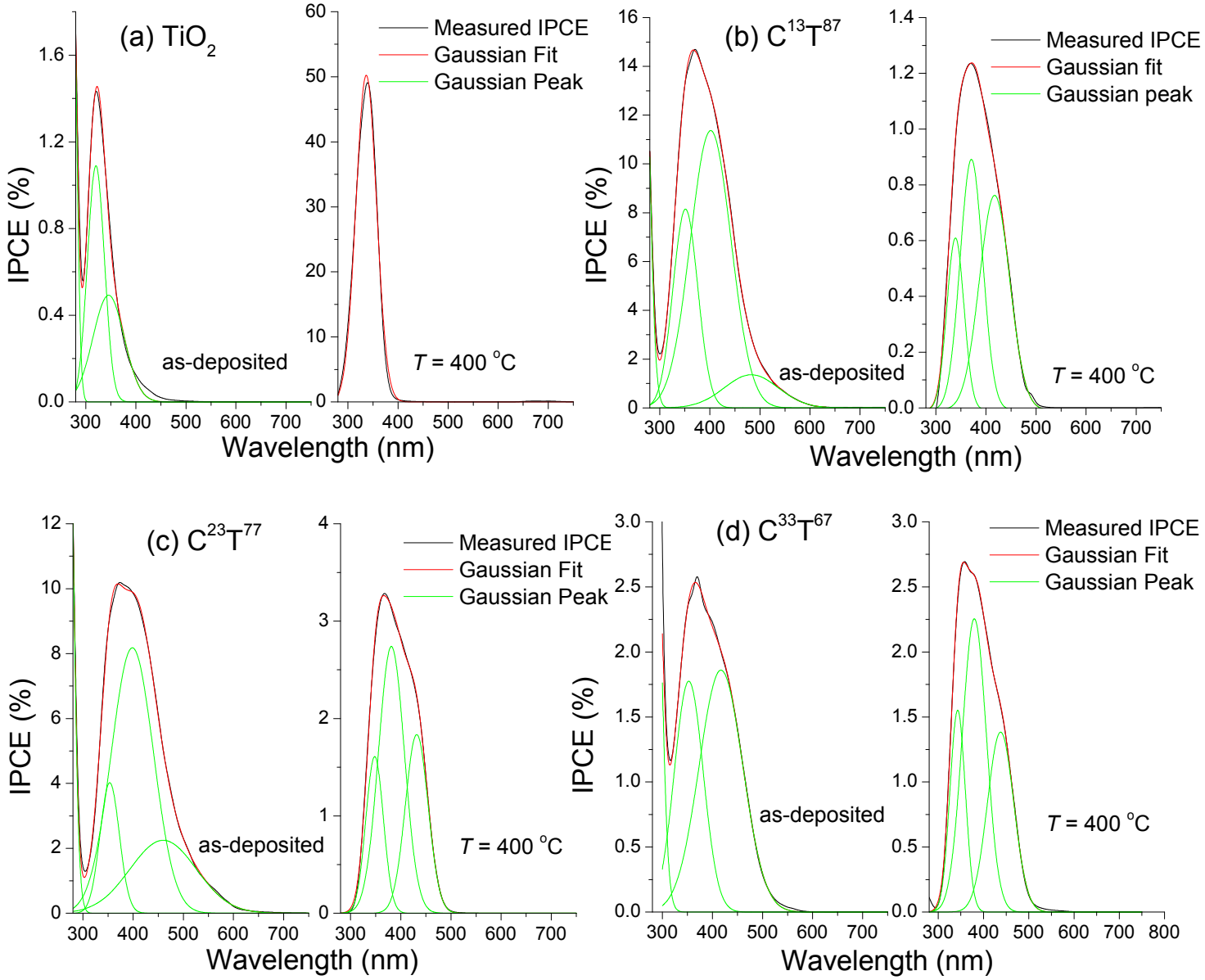


Fig S3. *Photograph of as-deposited and annealed CdSe/TiO_2 composite OAD films*

4. Deconvolution of the IPCE spectra of the OAD films

Each IPCE spectrum shows a unique structure, and deconvoluting the spectra using Gaussian functions allows for a comparison of the electronic transitions generating photocurrent for each sample. Each spectrum was deconvoluted using the minimum number of Gaussian curves that could reproduce the measured spectrum with good fidelity. The lower energy edge of each Gaussian peak is considered an electronic transition's onset. Figures S4a-S4g show the IPCE spectra and the Gaussian fittings for the pure and composite OAD films.



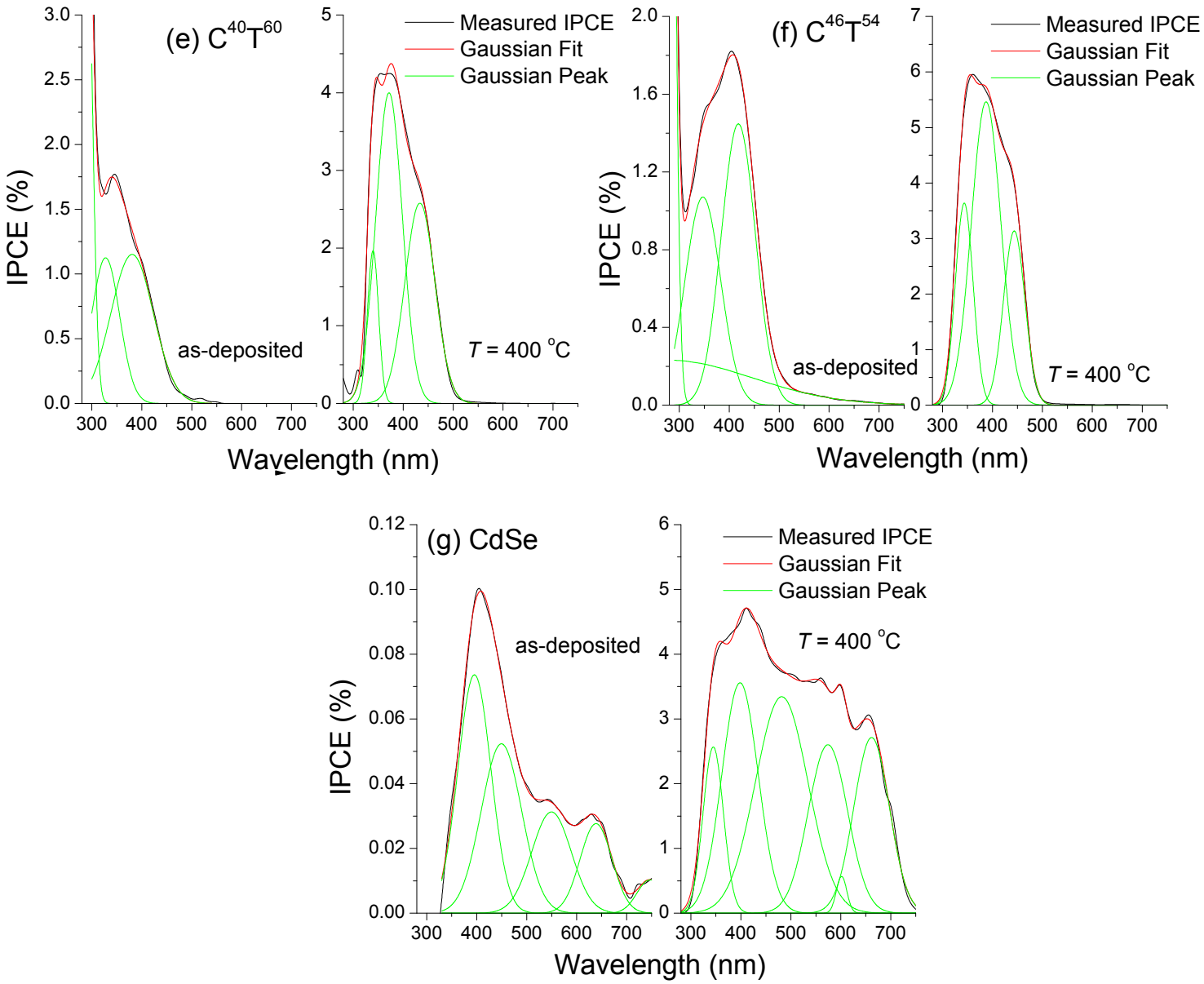


Fig. S4. *Gaussian deconvolutions of the IPCE spectra for the (a)TiO_2, (b) $C^{13}T^{87}$, (c) $C^{23}T^{77}$, (d) $C^{33}T^{67}$, (e) $C^{40}T^{60}$, (f) $C^{46}T^{54}$, (g) CdSe OAD films.*