Electronic Supplementary Material (ESI) for RSC Advances.


Electronic Supplementary Information

# Carbon dots in ZnO macroporous films with controlled photoluminescence through defects engineering

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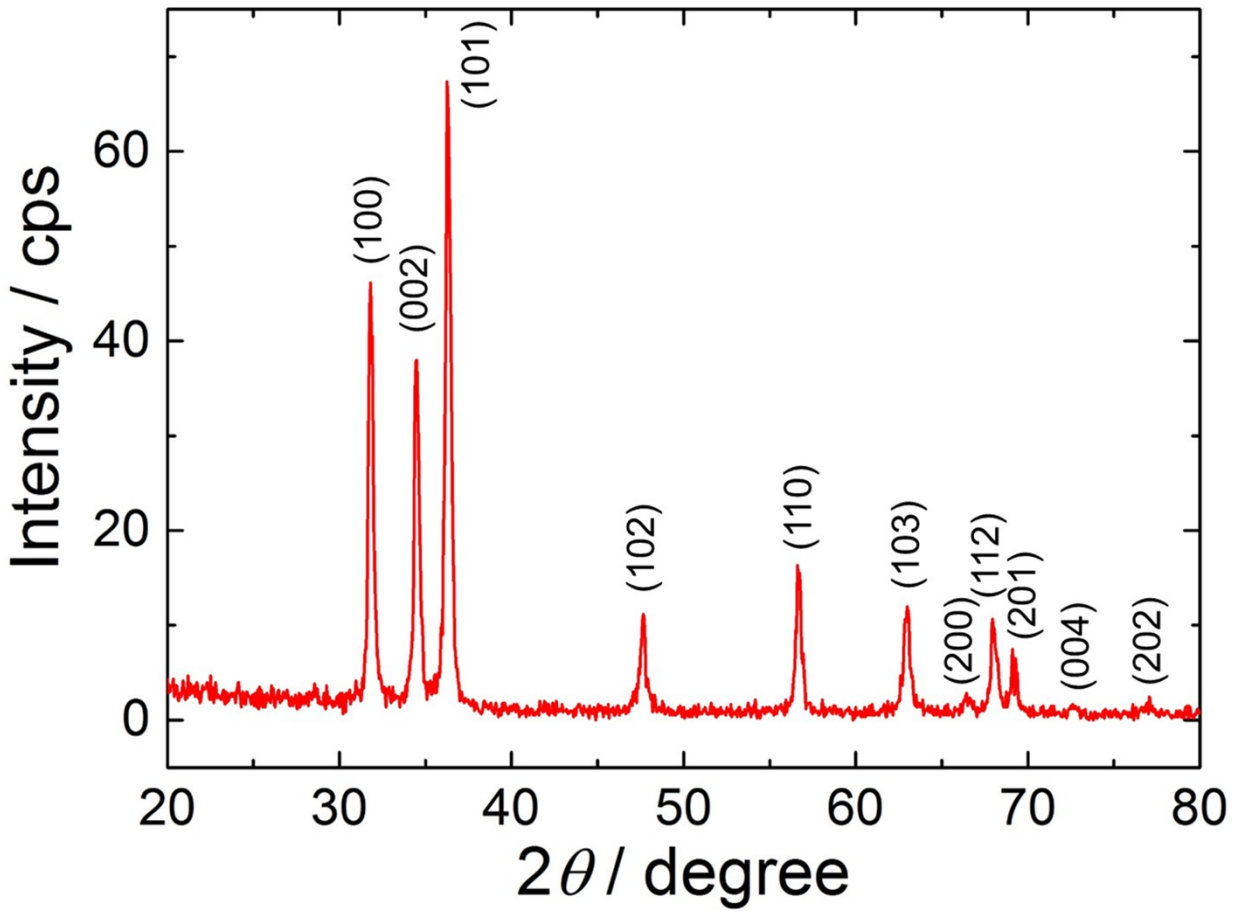


**Fig. S1** X-ray diffraction pattern of the ZnO macroporous film with plane indices of Wurtzite phase.

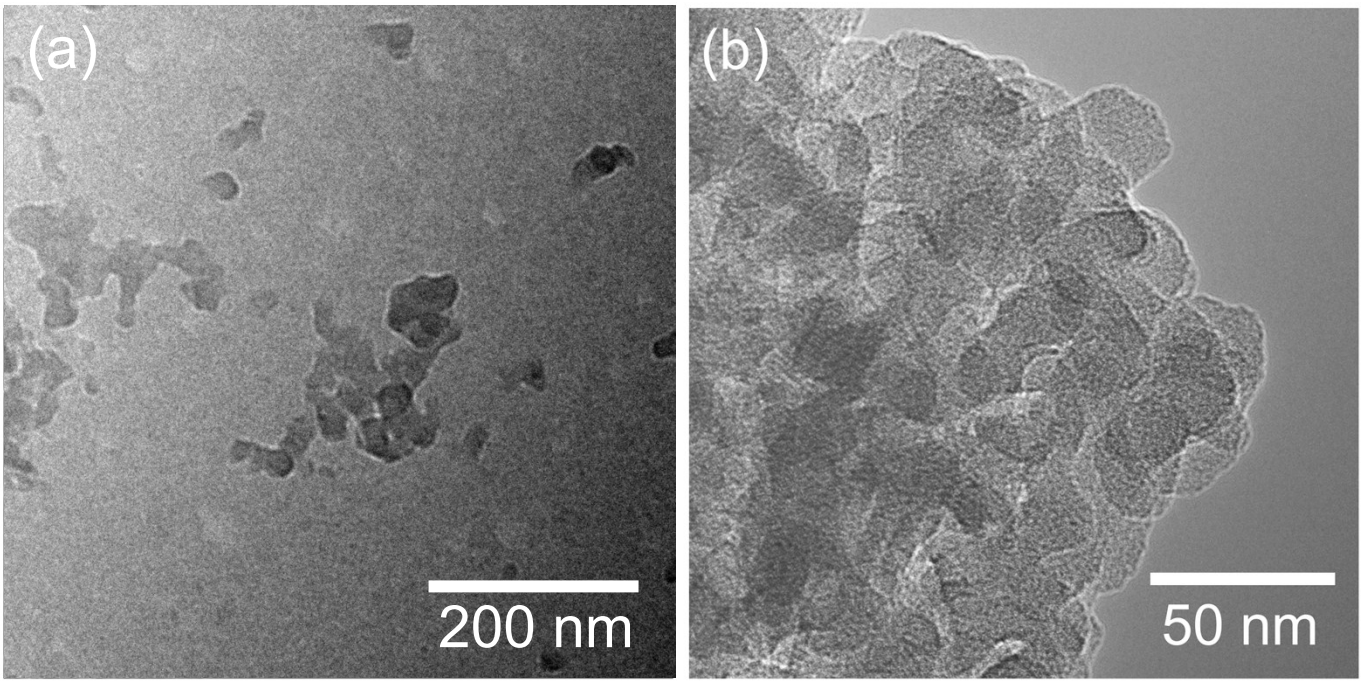


**Fig. S2** (a),(b) TEM images of the amino-functionalized amorphous C-dots. The size of the C-dots is estimated to be 20 ± 10 nm by direct observation.

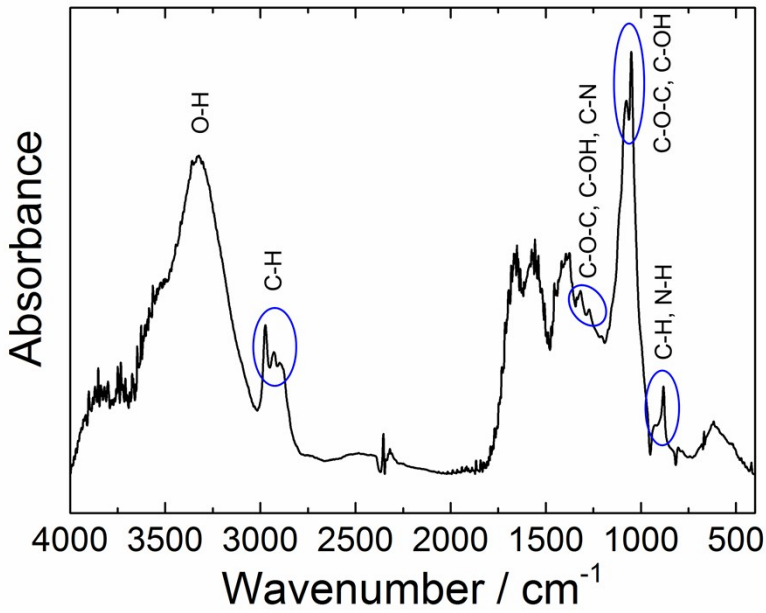


**Fig. S3** FTIR spectrum in the 4000-400 $cm^{-1}$ range of the C-dots sol casting on a KBr pellet. The attribution of the most significant absorption bands is reported in the figure.

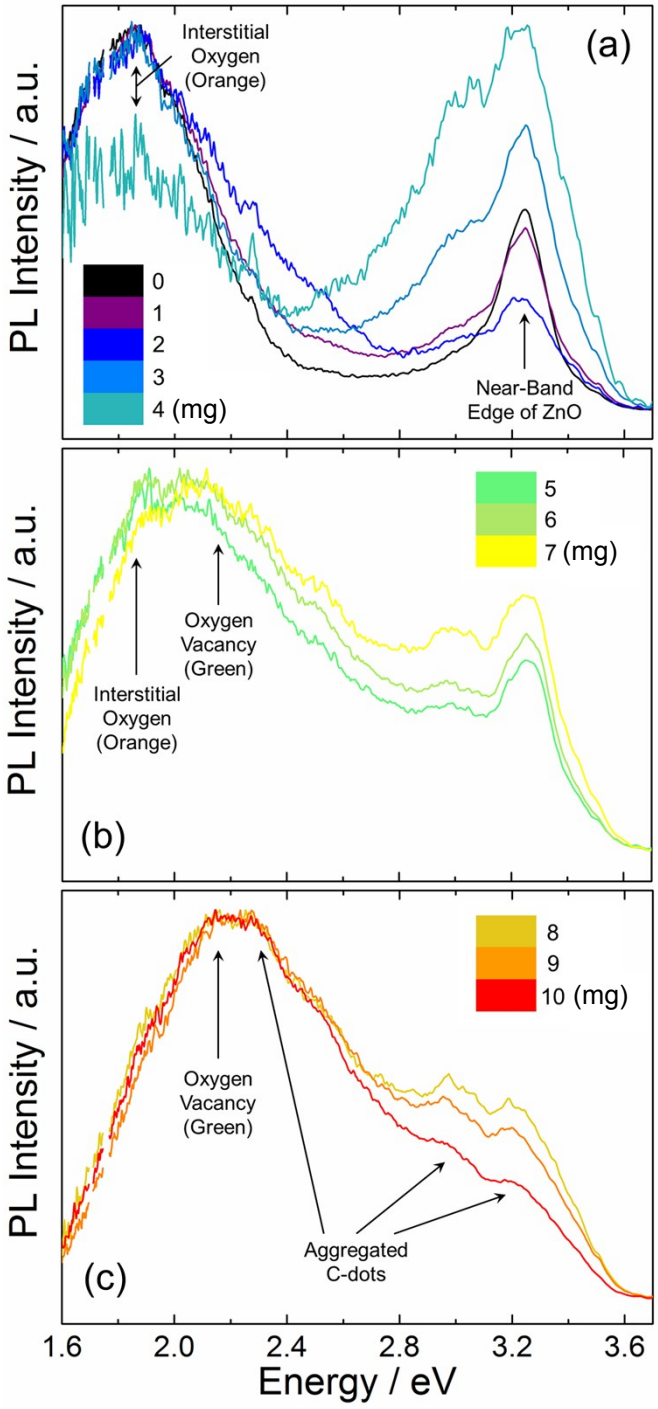


**Fig. S4** Photoluminescence spectra ($\lambda_{ex}$ = 325 nm, 3.82 eV) for the CZO films as a function of the C-dots amount: (a) 0–4, (b) 5–7 and (c) 8–10 mg.

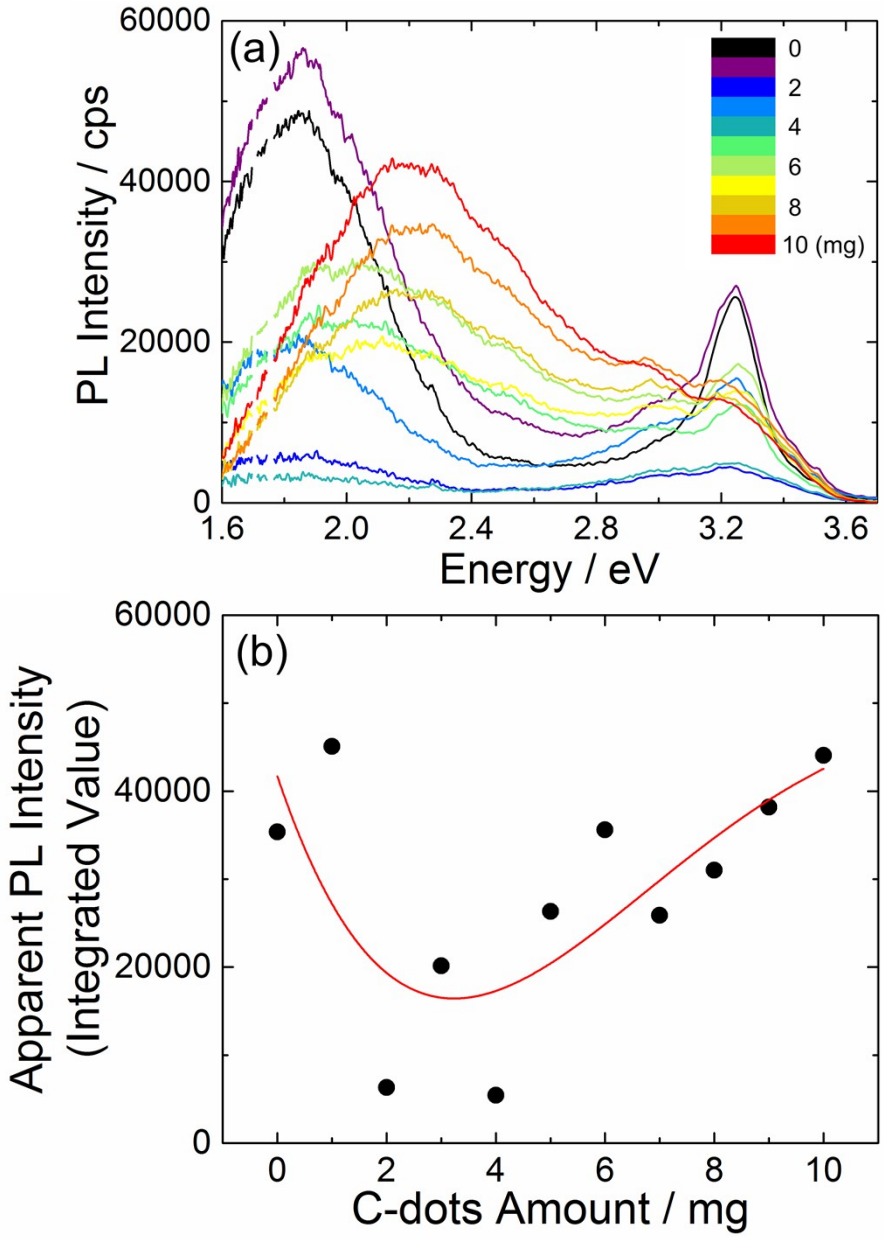


**Fig. S5** (a) Photoluminescence spectra of the CZO films (without normalization, $\lambda_{ex}$ = 325 nm, 3.82 eV) with increasing C-dots concentration from 0 to 10 mg. (b) C-dots concentration *vs.* 'apparent PL intensity'.

The apparent PL intensity indicates the integrated intensity of the original photoluminescence spectra (not normalized) shown in Fig. S5a measured under the same optical conditions. Black dots show the apparent PL intensity and red line indicates the fitted curve of the black dots. The trend of the apparent PL intensity shows a minimum value at intermediate C-dots concentration, which can be due to the two different components of the defect-related emissions.