

Electronic Supplementary Information

Towards efficient photoinduced charge separation in carbon nanodots and TiO₂ composites in visible region

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Characterization

The UV-Vis absorption spectra of CDs-V in water and CdSe/ZnS core/shell QDs in toluene were recorded on a UV-3101PC UV-Vis-NIR scanning spectrophotometer (Shimadzu). The mass extinction coefficients of the CDs-V and CdSe/ZnS core/shell QDs were calculated using Lambert-Beer's law: $A = \varepsilon CL$. A is the absorbance of sample solution. C (g/L) is the mass concentration. L (cm) is the path length of radiation beam across the sample solution in quartz cuvette, which is 1 cm. ε ($\text{cm}^{-1}(\text{g/L})^{-1}$) is the mass extinction coefficient. The PL spectra were recorded by a Hitachi F-7000 spectrophotometer. The diffuse reflectance spectra were also measured by Hitachi F-7000 spectrophotometer with an integrating sphere scanning from 200-700 nm with BaSO_4 as the reference. The morphology of CDs-V/ TiO_2 composites was measured by a Philips TECNAI G2 transmission electron microscope. The time-resolved PL spectra were measured by a LifeSpec-II dedicated lifetime spectrometer (Edinburgh Instruments). The excitation source was picosecond pulsed diode laser with a laser wavelength of 405 nm. The real-time monitoring of the characteristic absorption peak of RhB was managed using the absorbance mode of USB4000-UV-VIS Spectrometer with reference light from Ocean Optics HL-2000 light source. 510 nm cut-off filter was equipped on the light source to prevent the excitation of CDs-V and CDs-U. The pH values of the RhB and mixed solutions of RhB with CDs-V, TiO_2 , CDs-U/ TiO_2 and CDs-V/ TiO_2 composites were measured by PHS-3C pH meter. The illumination intensity at the solution surface was measured by an Ophir LaserStar laser power meter with a 3A laser sensor. The IPCE spectra of CD-sensitized solar cells were measured by a Keithley 2000 multimeter with illumination by a 300 W tungsten lamp with a Spectral Product DK240 monochromator. Three cells were constructed and evaluated in parallel.



Fig. S1 Optical images of pure TiO_2 (a) and CDs-V/ TiO_2 composites (b).

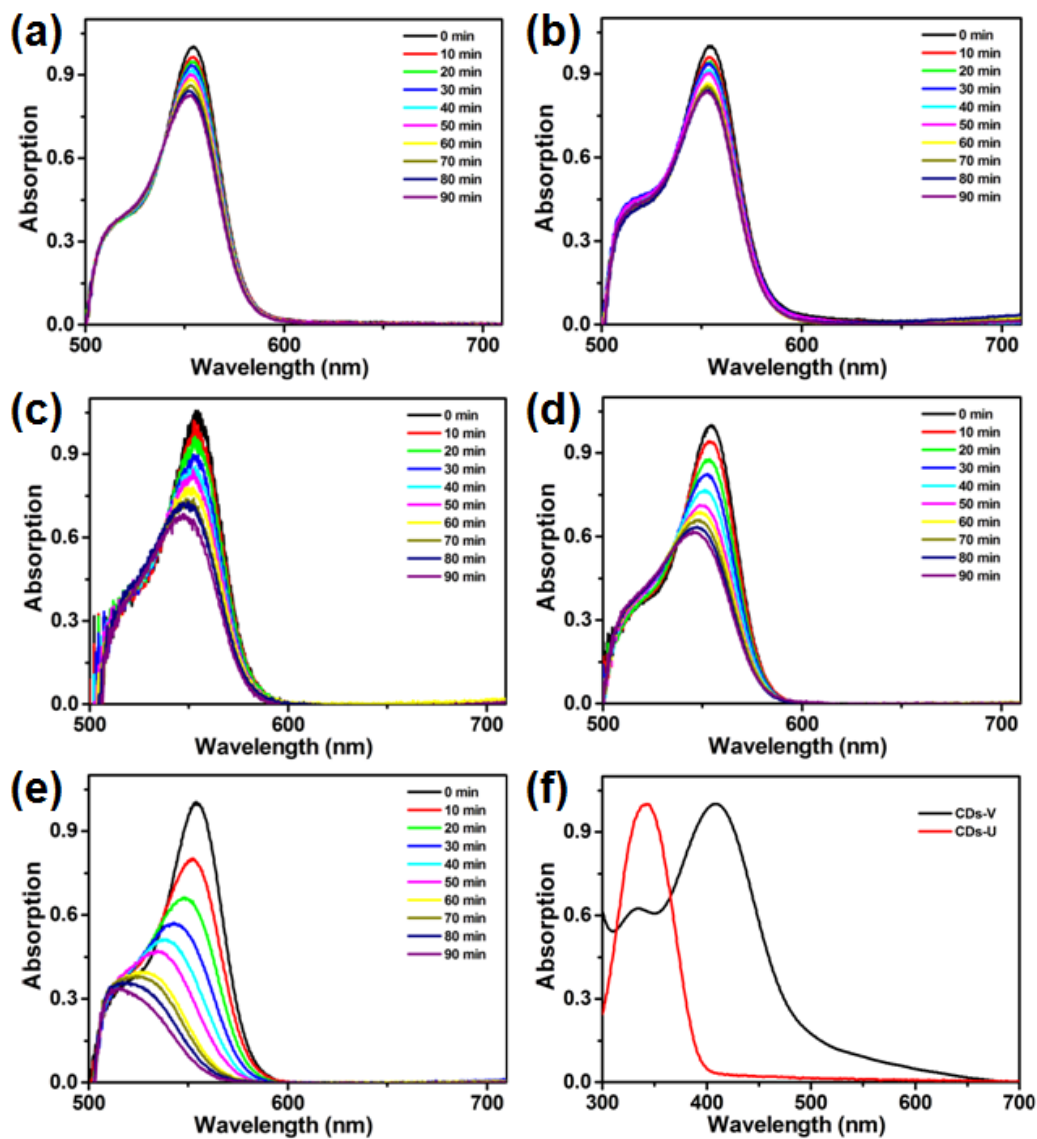


Fig. S2 The normalized absorption spectra of RhB solution (a) and RhB solutions mixed with CDs-V (b), pure TiO₂ (c), CDs-U/TiO₂ (d) and CDs-V/TiO₂ composites (e) after different visible light irradiation time. (f) Normalized UV-Vis absorption spectra of CDs-U and CDs-V.