Supporting Information

# The Shell Matters: Self-Organized CdS-ZnS/MnS-Core-Shell - Porphyrin - Polymer Nano-Assemblies for Photocatalysis

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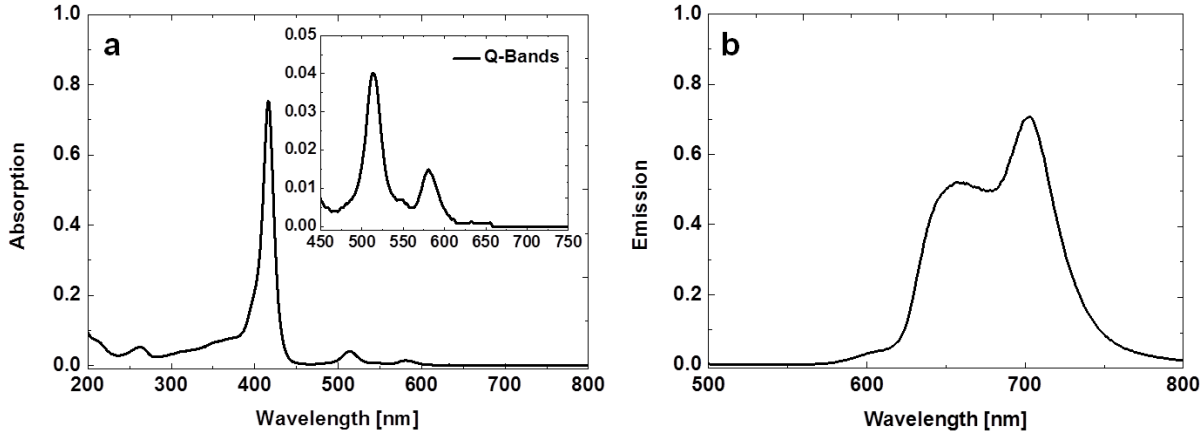



**Figure S1.** a) Absorption and b) emission spectrum of $H_2$TAPP in water (excited at 425 nm, slit width 3 nm, integration time 0.1 s).

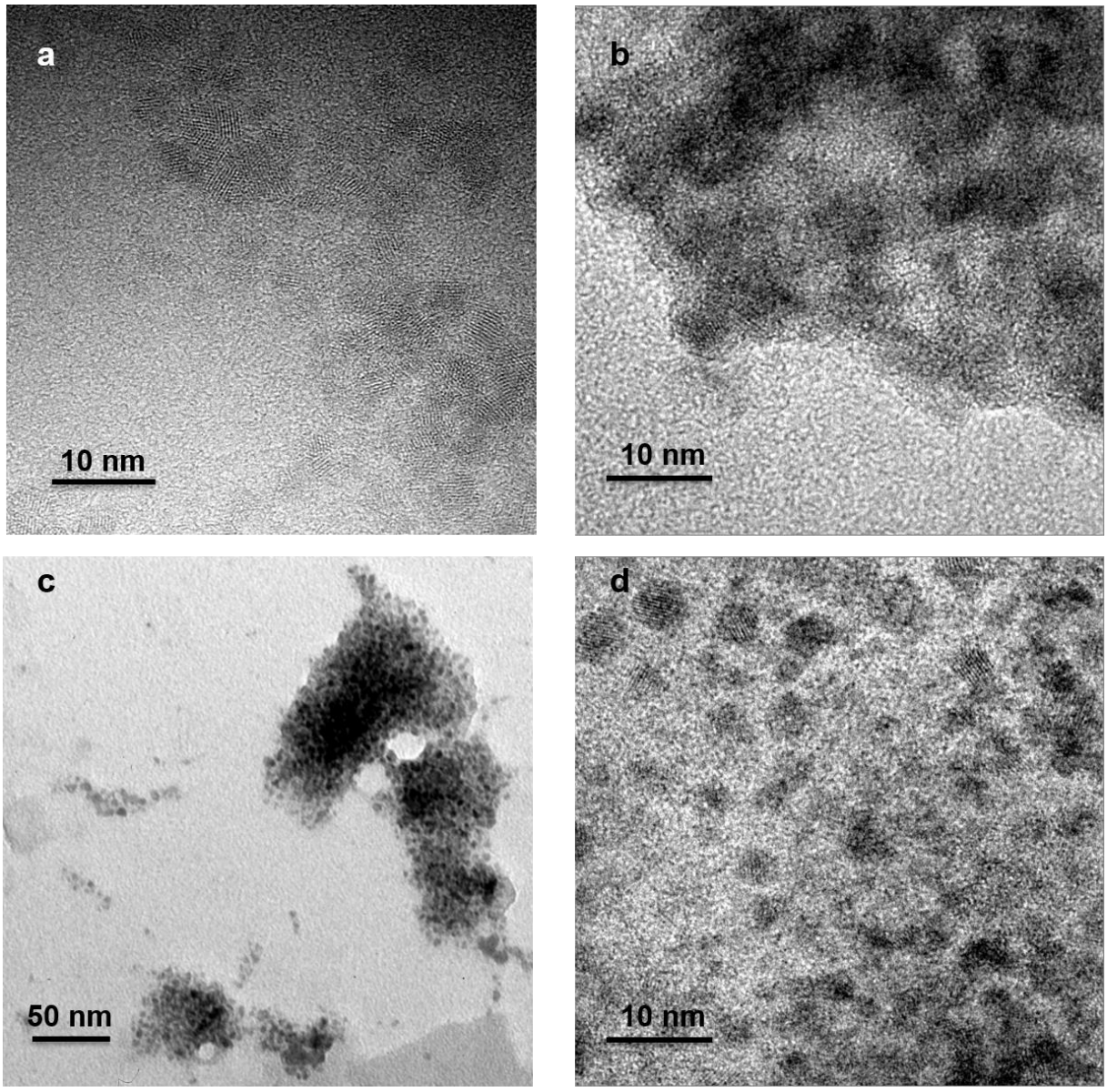



**Figure S2** a) TEM image of CdS-ZnS, b) TEM image of CdS-Zn0.5Mn0.5S, c) TEM image of CdS-Zn0.05Mn0.95S, d) TEM image of CdS-MnS.

The size of the nanoparticles was determined by measuring 25 particles. Yielding a size of 3.6 nm with a distribution of 0.6 nm for CdS-ZnS. For CdS-$Zn_{0.5}Mn_{0.5}S$ yielding a size of 4.1 nm with a distribution of 0.6 nm. For CdS-$Zn_{0.05}Mn_{0.95}S$ yielding a size of 4.3 nm with a distribution of 0.3 nm. For CdS-MnS yielding a size of 3.9 nm with a distribution of 0.7 nm.

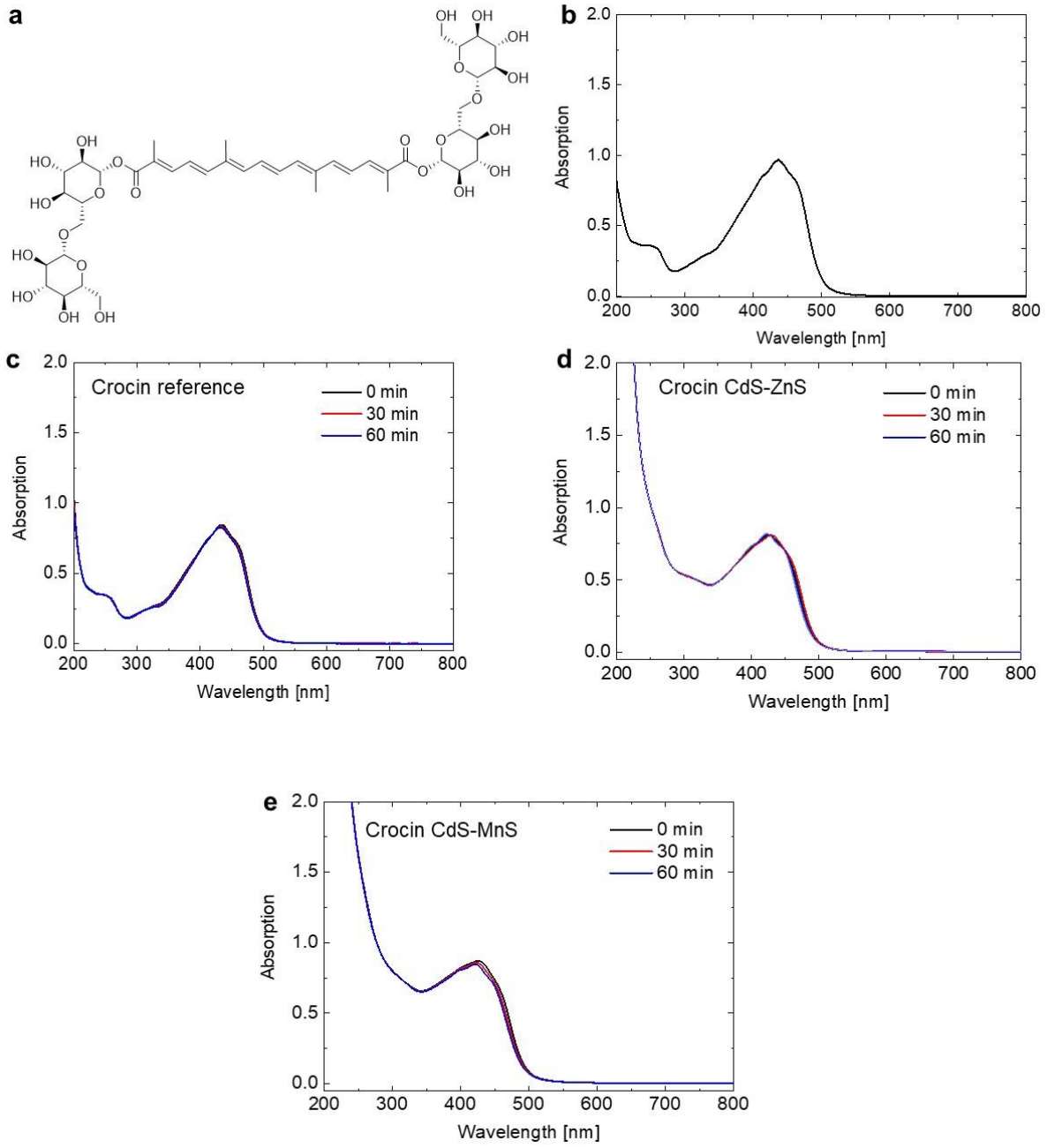
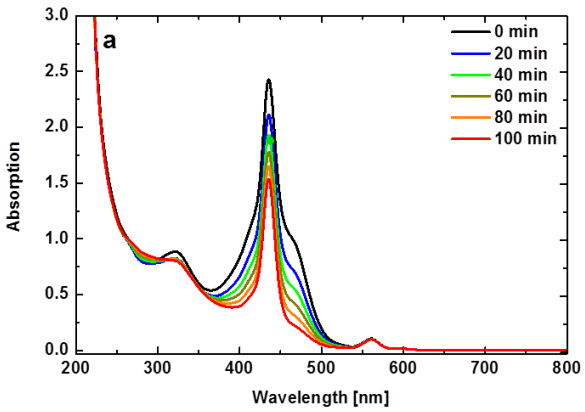
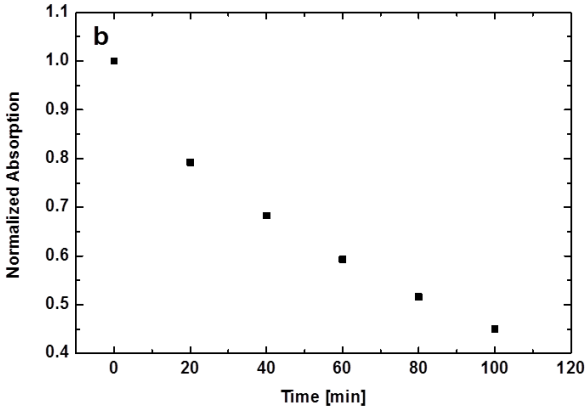
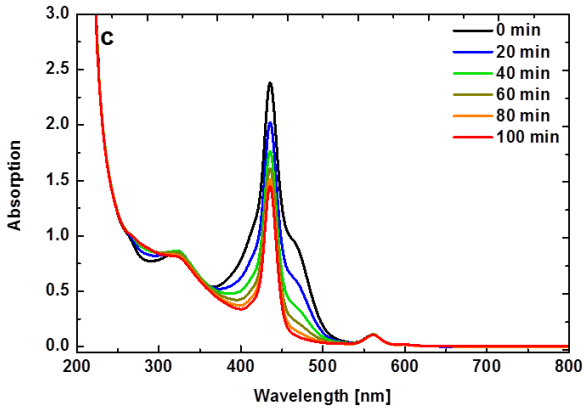
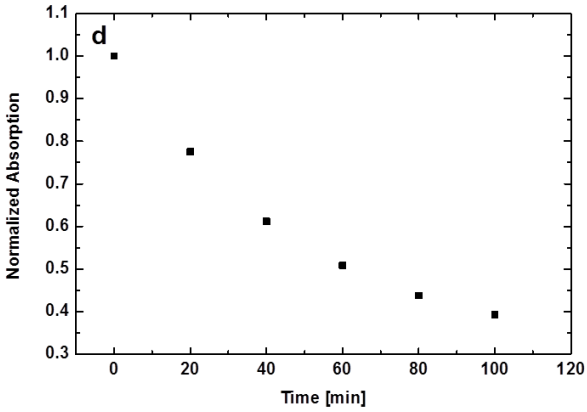


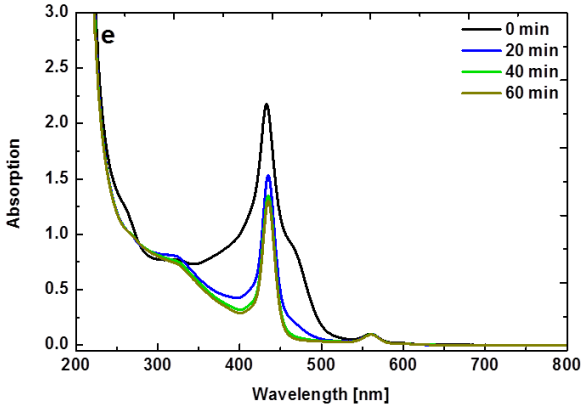

**Figure S3.** a) Chemical structure, b) absorption spectrum of crocin in water c) decomposition of crocin under irradiation without additive d) crocin degradation in presence of CdS-ZnS particles e) crocin degradation in presence of CdS-MnS particles.

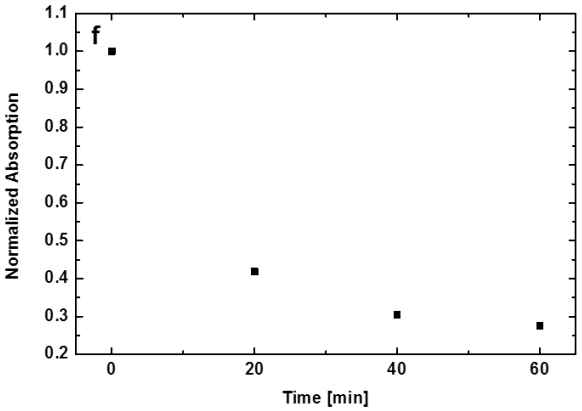

a
0 min
20 min
40 min
60 min
80 min
100 min
Absorption
Wavelength [nm]


b
Normalized Absorption
Time [min]


c
0 min
20 min
40 min
60 min
80 min
100 min
Absorption
Wavelength [nm]


d
Normalized Absorption
Time [min]


e
0 min
20 min
40 min
60 min
Absorption
Wavelength [nm]


f
Normalized Absorption
Time [min]

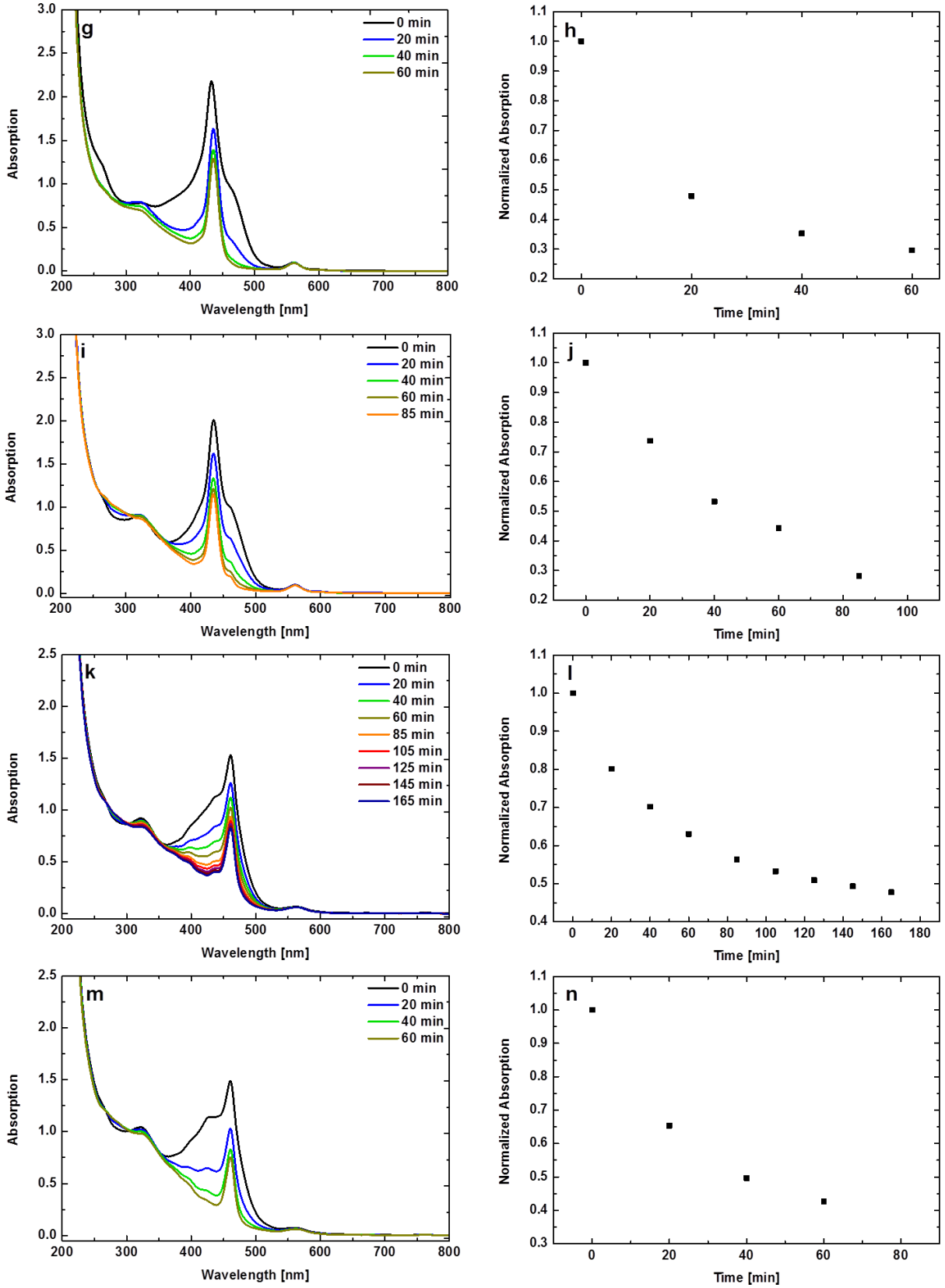



**Figure S4.** Absorption spectra of crocin with CdS-Core-shell zinc manganese mixtures of a) 100:0, c) 95:5, e) 67:33, g) 50:50, i) 33:67, k) 5:95 and m) 0:100 (Zn:Mn); normalized absorption values at 406.5 nm for the respective absorption spectra b) 100:0, d) 95:5, f) 67:33, h) 50:50, j) 33:67, l) 5:95 and n) 0:100 (Zn:Mn) in dependence of time.

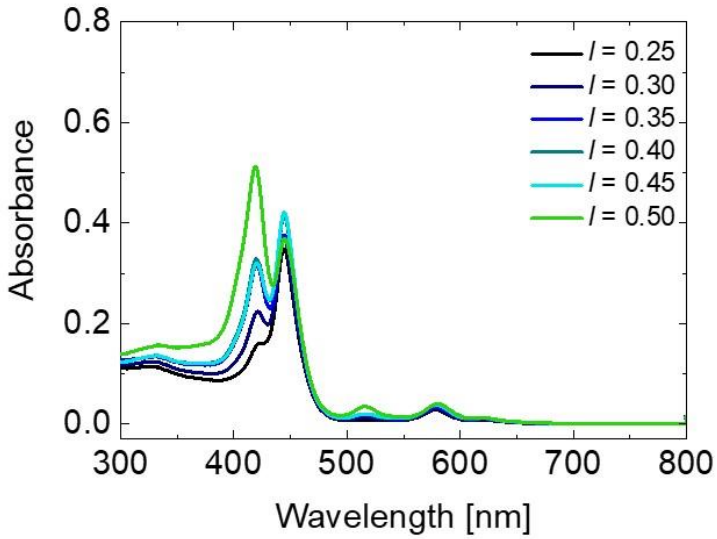



**Figure S5.** Absorption spectra of CdS-PAA100k particles assembled with TAPP at different loading ratios, with CdTAPP sitting atop complex with Soret band at $\lambda$ = 447 nm and TAPP Soret band at $\lambda$ = 413 nm. The surface is saturated and additional TAPP is not metalated anymore.