

Supplementary Material

XPS:

All samples were dropcast onto freshly cleaned gold-coated 1 cm² squares of silicon for XPS analysis. The 'cleaned' sample was prepared by placing 1 mL of the original into a centrifuge tube, adding 1 mL of methanol and centrifuging for 15 minutes at 6000 rpm according to the original recipe published earlier⁷³. The solution was decanted from the CdTe NPs and 1 mL fresh pH 9 water was placed into the centrifuge tube. All of the other CdTe NP samples were drop-cast onto clean gold-coated 1 cm² squares of silicon for XPS analysis. (Note: Gold, rather than silicon substrates were used to allow the S 2p region to be detected.) The substrates were placed into the ultra-high vacuum chamber within several minutes after the dispersions was dried to avoid oxidation of the CdTe NPs. Table 1 shows the atomic percentage of Cd, Te, S, and C for each sample.

The original samples (as prepared) were found to have very low Cd (5.1 %) and Te (0.6%) content compared with relatively large quantities of C and S (Table 1). Given that XPS is a surface sensitive technique, this indicates that a relatively thick layer of organic material coats the NPs, thereby reducing the signal detected from the NP cores. This is not surprising as it is well-known that as prepared CdTe NP dispersions have excess TGA in the solution. The cleaned sample had a smaller atomic percentage of C and S, and far more Cd (16.4 %) and Te (2.9%) was detected indicating that the amount of TGA around the NPs has been significantly reduced. The Te signal compared with the Cd signal was, however, still smaller than expected indicating that there is still a significant amount of TGA coating the NPs (Table 1). Separated 1 was taken from a section of the well-plate

with low QY. The appearance of the dispersion was similar to agglomerated CdTe NPs. The composition of Separated 1 was significantly different to both the original and cleaned samples. Considerably more Te was present (15.1 %), however, the amount of Te was greater than the Cd (8.5%). We believe that a fraction of the original CdTe NP solution contains agglomerated NPs that have a significantly different composition to the rest of the sample.

Separated 2 (Table 1), had a composition that was similar to the cleaned sample. Less C (65.6 %) and S (11.5 %) were detected compare with both cleaned sample and the original sample. This is indicative of even less TGA stabilizer present in the NP dispersions. Furthermore, we find that more Te (8.0 %) is present, and the ratio of Cd:Te is closer to the 1:1 ratio that would be expected at the core, than found for the original or even cleaned sample. In effect, the FFE separation process appears to also clean the NPs of impurities and excess stabilizers found in as prepared dispersions. Separated 3 (Table 1) was found to have an almost identical composition to Separated 2 confirming that the composition of the separated luminescent dispersions have very similar compositions.

Table 1 Atomic percentage of CdTe NPs before and after FFE by XPS.

	Original	Original (cleaned)	Separated 1	Separated 2	Separated 3
S	14.4	13.2	10.4	11.5	10.8
C	79.9	67.5	66	65.6	67.6
Cd	5.1	16.4	8.5	14.9	13.9
Te	0.61	2.9	15.1	8	7.6