

Supporting information

The purification procedure detailed in the experimental section in the main text is an iterative process of diafiltration. The QD-polymer hybrid NP aqueous solution, which immediately after complexation contains excess PMAL-d, is centrifuged in a diafiltration device which allows the unbound PMAL-d to pass through a membrane whilst retaining the QD-polymer NPs (Figure S1).

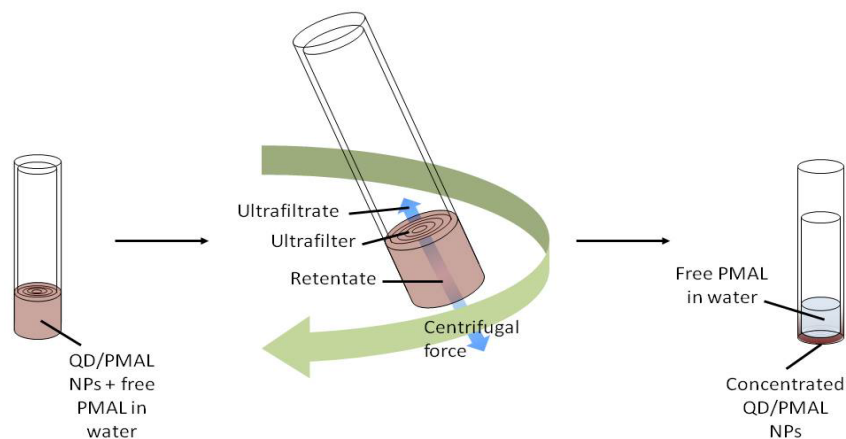


Figure S1: Purification method for removing excess PMAL-d from solution after the formation of QD-polymer hybrid NPs.

The absorption of the waste solution at two wavelengths (300 nm and 350 nm), measured after subsequent iterations, was shown to decay exponentially for both of the wavelengths considered with identical decay constants (within experimental error, Figure S2):

$$\tau_{350} = 0.61 \pm 0.04$$

$$\tau_{300} = 0.66 \pm 0.01$$

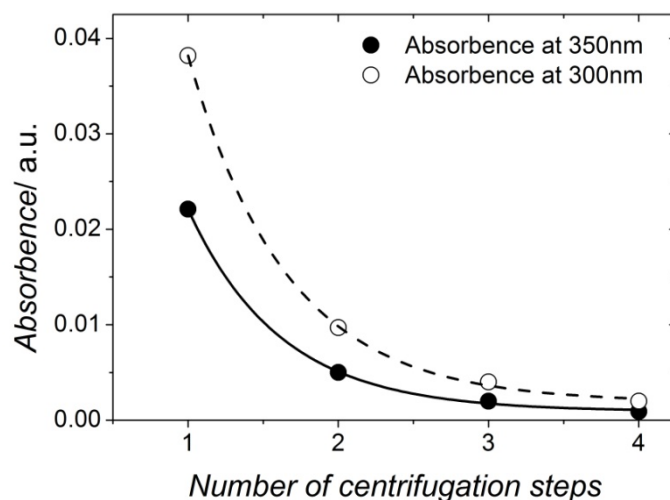


Figure S2: Evaluation of the purification procedure used to remove excess PMAL-d from solution after formation of QD-PMAL-d hybrid NPs.

The hydrodynamic radius of the CIS/ZnS/PMAL-d NPs was measured over the pH range 3 to 11, with no significant trend observed (Figure S3). The experimental error associated with each measurement is at least 5nm, which is more than the range between the largest sample (at pH 9) and the smallest sample (at pH 3).

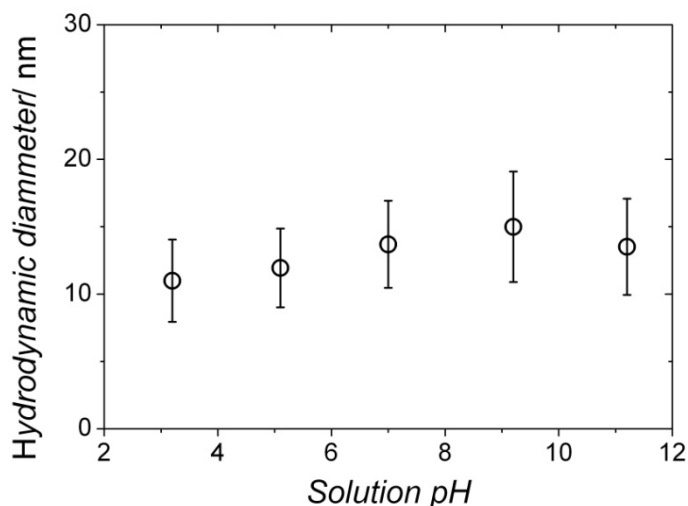


Figure S3: Hydrodynamic radius as measured by dynamic light scattering of CIS/ZnS/PMAL-d NPs over a range of solution pH.

To determine whether the fluorescence quenching observed of the nanoparticles in the presence of Cu(II) ions in solution is a result of a simple absorption process, the absorption spectrum of Cu(II)Cl₂ was compared with the photoluminescence spectra of both CIS/ZnS/PMAL-d NPs and CIS/PMAL-d NPs. The entire PL spectrum of CIS/PMAL-d NPs lies within the wavelength region in which Cu(II)Cl₂ absorbs, whilst the overlap between the Cu(II) absorption spectrum and the PL spectrum of the CIS/ZnS/PMAL-d NPs is much less significant (Figure S4). If the quenching mechanism was simply absorption by the Cu(II) ions then we would therefore expect a more pronounced effect in the core-only NP sample in comparison to the core/shell NP sample. Since this is not the case (see Figure 4 in the main text), we conclude that absorption by Cu(II) contributes negligibly to the quenching process.

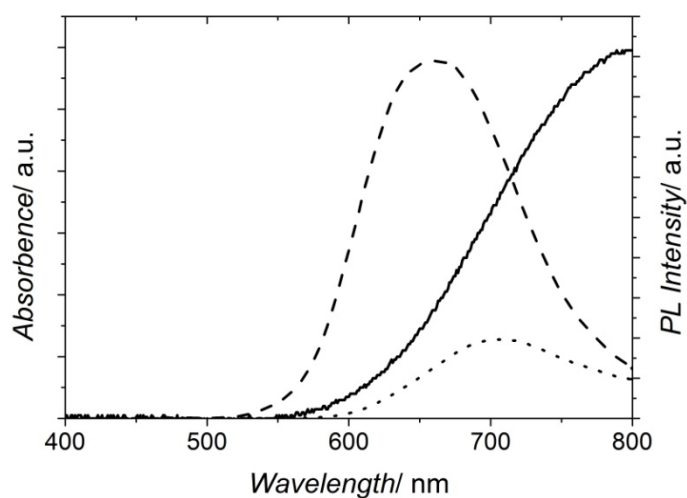


Figure S4: Overlap between the absorption spectrum of Cu(II)Cl₂ in water (solid line) and the PL spectral peaks of CIS/PMAL-d NPs (dotted line) and CIS/ZnS/PMAL-d NPs (dashed line).

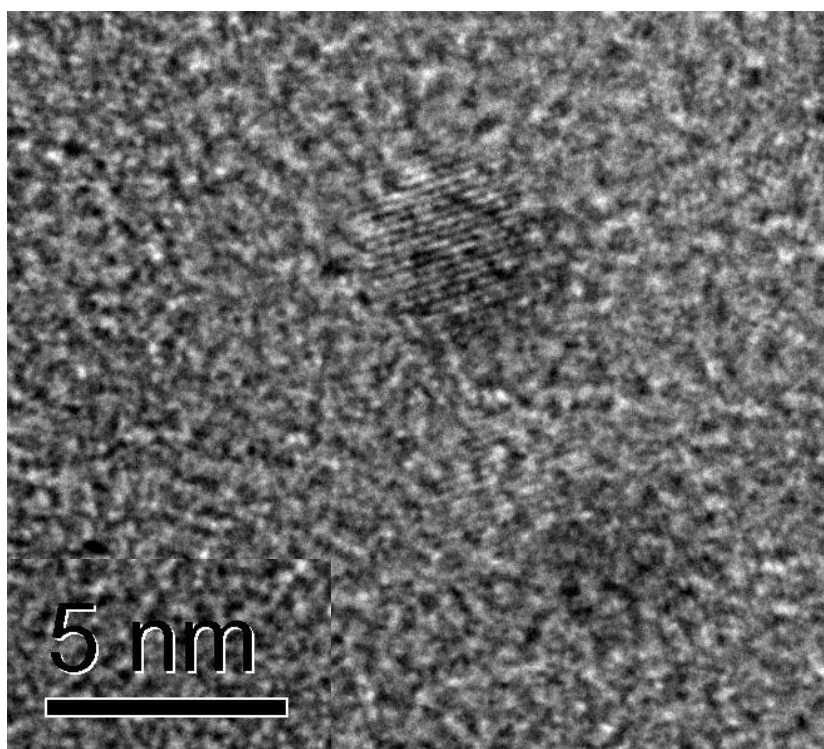


Figure S5: High resolution TEM image of CIS/ZnS/PMAL-d NPs.