Glutathione-Functionalized Mn:ZnS/ZnO core/shell quantum dots as potential time-resolved FRET bioprobes

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Figure S1. Excitation spectra of the Mn$^{2+}$ emission (585 nm) at room temperature.

**Determination of Photoluminescence (PL) Quantum Yield (QY).** The room-temperature PL QY of the Mn:ZnS/ZnO QDs was estimated following the reference S1 by using quinine sulfate (QY = 55%, in 0.5-M H$_2$SO$_4$)$^{S2,S3}$ as a reference standard. All the samples are excited at 325 nm wavelength.

\[
QY(QDs) = \left( \frac{\text{Slope}_{\text{QDs}}}{\text{Slope}_{\text{ref}}} \right) \left( \frac{n^2_{\text{QDs}}}{n^2_{\text{ref}}} \right) QY(\text{ref})
\]

QDs=the Mn:ZnS/ZnO QDs , REF=Reference, η=refractive index of a solvent

Figure S2. Determination of PL QY for the Mn:ZnS/ZnO QDs.

Figure S3 exhibited biotin absorption spectrum, and a small peak at 209 nm was attributed to biotin specific absorption. The amount of loaded biotin for the QDs was determined by a UV-vis spectrophotometer at 209 nm. The yield of the biotin-QDs coupling was calculated by the following equations:

Coupling yield(%) = 1 - \frac{\text{Amount of free nonconjugated biotin removed by ultrafiltration}}{\text{Initial amount of biotin}} \times 100%
Figure S3 Uv-Vis spectrum of biotin.

Figure S4 Photoluminescence decay of Mn:ZnS/ZnO core/shell QDs at the emission of 585 nm dispersed in PBS solution, pH7.4.