# Supporting Information

# Single-Photon-Driven Up-/Downconversion Nanohybrids for *In vivo* Mercury Detection and Real-Time Tracking

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**Optimization of the ratio of sensitizer to acceptor**

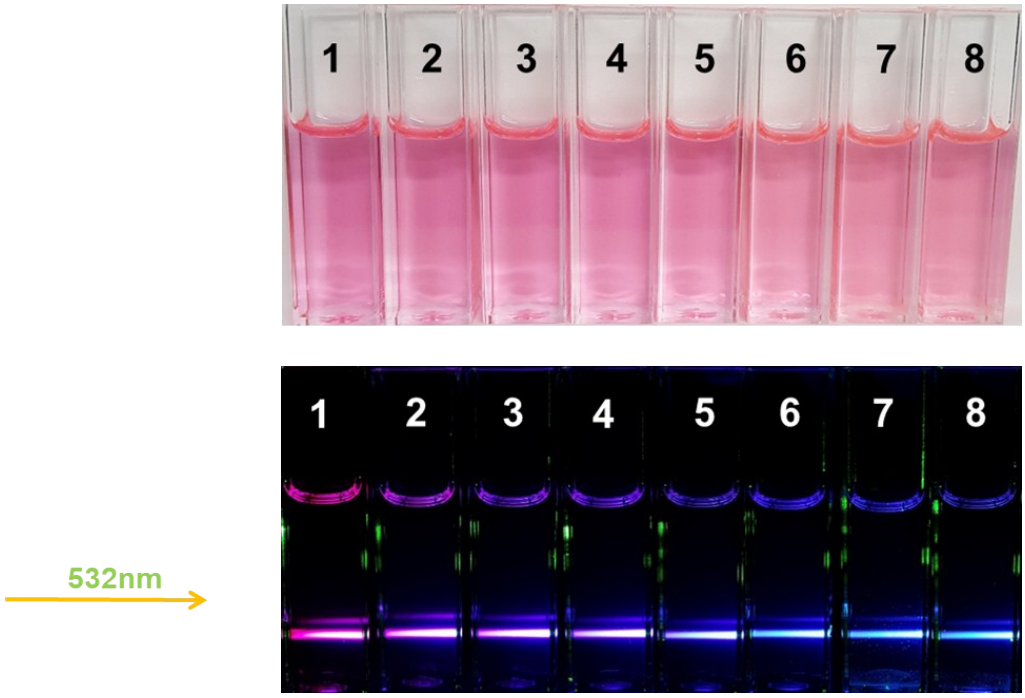


**Figure S1**. The upconverted emission light dependent on the volume ratio of Sensitizer : Acceptor; Sensitizer(0.0018 M) 100 uL, Acceptor(0.06053M) 50 uL; 100 uL; 200 uL; 300 uL; 500 uL; 1000 uL; 1200 uL; 1400 uL.

**SEM data of the monodispersed TTA-UC nanocapsules**

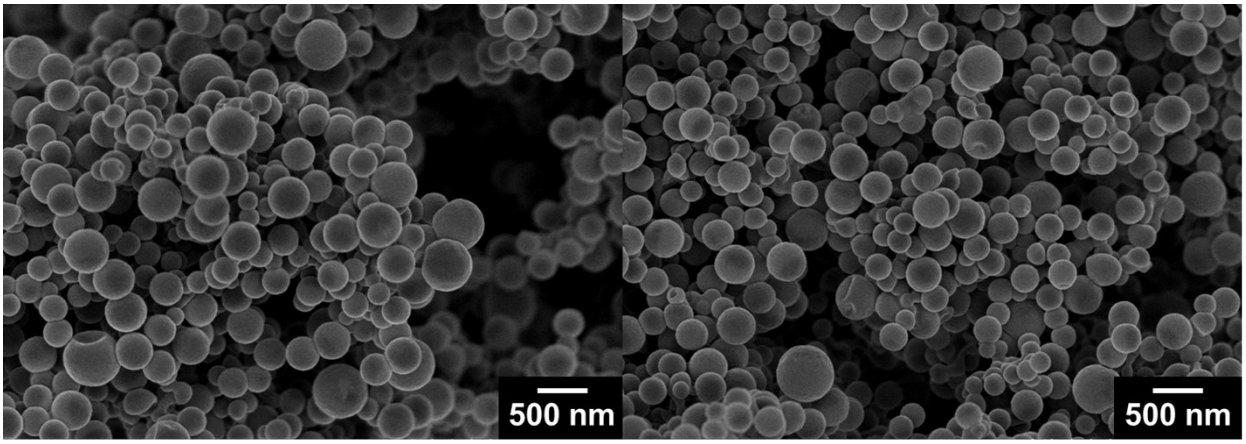


**Figure S2**. SEM data of the monodispersed TTA-UC nanocapsules.

**Quantum Yield (QY) calculation method**

$$\Phi_{UC} = 2\Phi_{std}\left(\frac{A_{std}}{A_{UC}}\right)\left(\frac{I_{UC}}{I_{std}}\right)\left(\frac{\eta_{UC}}{\eta_{std}}\right)^2$$

| Power | UC QY | $I_{UC}/I_{std}$ |
|---|---|---|
| 19 | 0.02811 | 0.012887 |
| 27.16667 | 0.05648 | 0.025894 |
| 37.66667 | 0.15094 | 0.069201 |
| 47 | 0.25367 | 0.116299 |
| 53 | 0.2969 | 0.136119 |
| 76.33333 | 0.33006 | 0.151322 |
| 102.6667 | 0.42484 | 0.194775 |
| 125 | 0.60571 | 0.277698 |
| 146 | 0.60865 | 0.279046 |
| 174.3333 | 0.70599 | 0.323673 |
| 400 | 1.0243 | 0.469607 |
| 600 | 1.17025 | 0.536521 |
| 950 | 1.354 | 0.620764 |
| 1600 | 1.5232 | 0.698336 |
| 2100 | 1.62 | 0.742716 |
| 2700 | 1.6501 | 0.756516 |
| 3010 | 1.658 | 0.760138 |

**Figure S3.** Quantum Yield (QY) calculation method: where $\Phi_{UC/std}$ (Quantum yield of DPA/PdTPBP dissolved in OA; UC, Rhodamine 6G; std), $A_{UC/std}$ (Absorbance of DPA/PdTPBP dissolved in OA; UC, Rhodamine 6G; std), $I_{UC/std}$ (PL intensity of DPA/PdTPBP dissolved in OA; UC, Rhodamine 6G; std) and $\eta_{UC/std}$ (refractive index of DPA/PdTPBP dissolved OA; UC, Rhodamine 6G; std) denote the quantum yield. And the calculated quantum yield of upconversion is presented in the table.

**Photo-stability test of the TTA-UC nanocapsules**

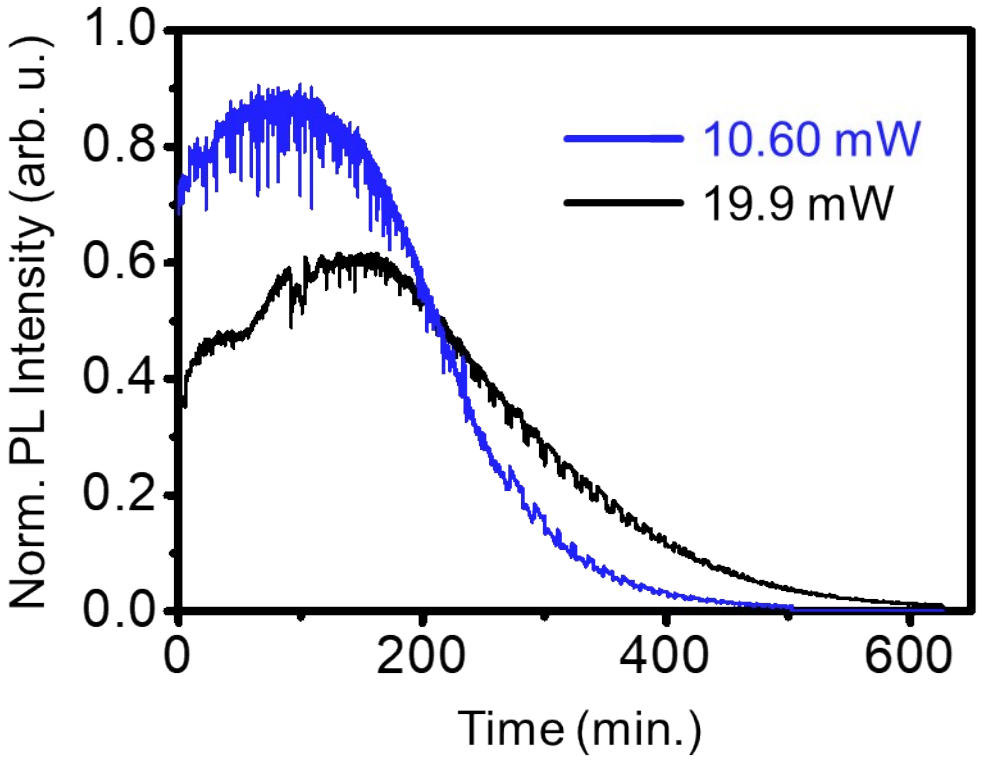


**Figure S4.** Photo-stability test of the TTA-UC nanocapsules.

**Schematic diagram of the detection of the TTA-UC nanocapsules**

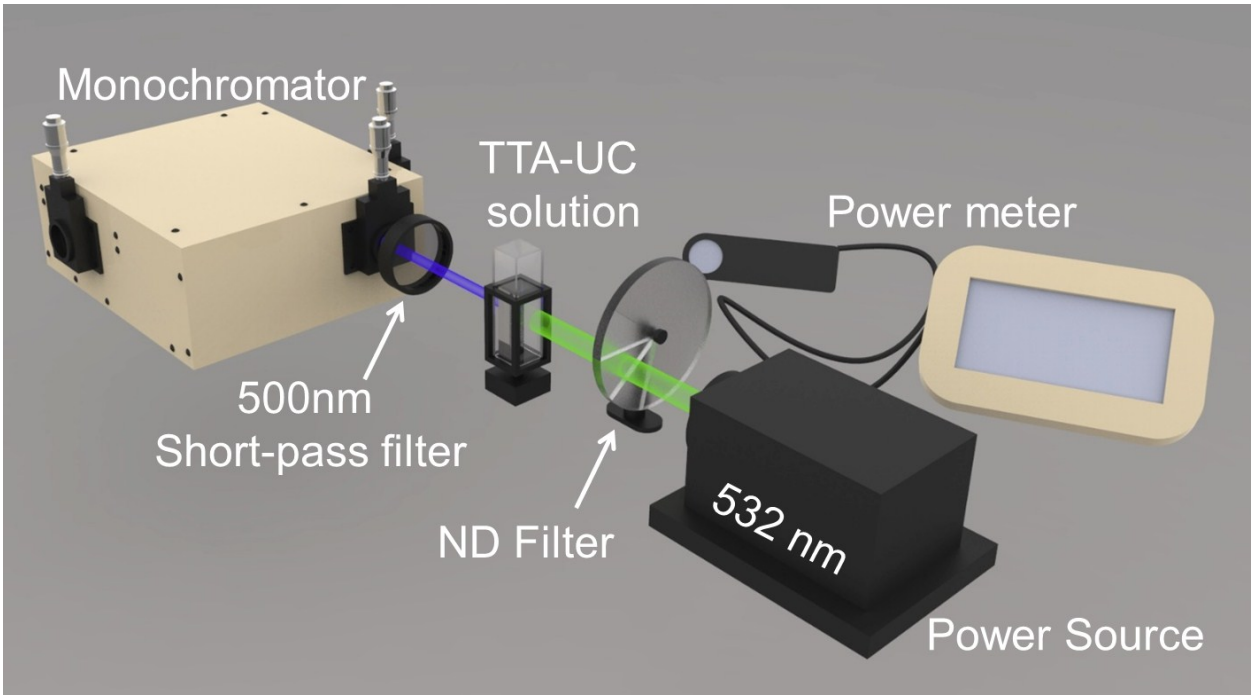


**Figure S5.** Schematic diagram of the detection of the TTA-UC nanocapsules.

**NMR data of Rho-Hz**

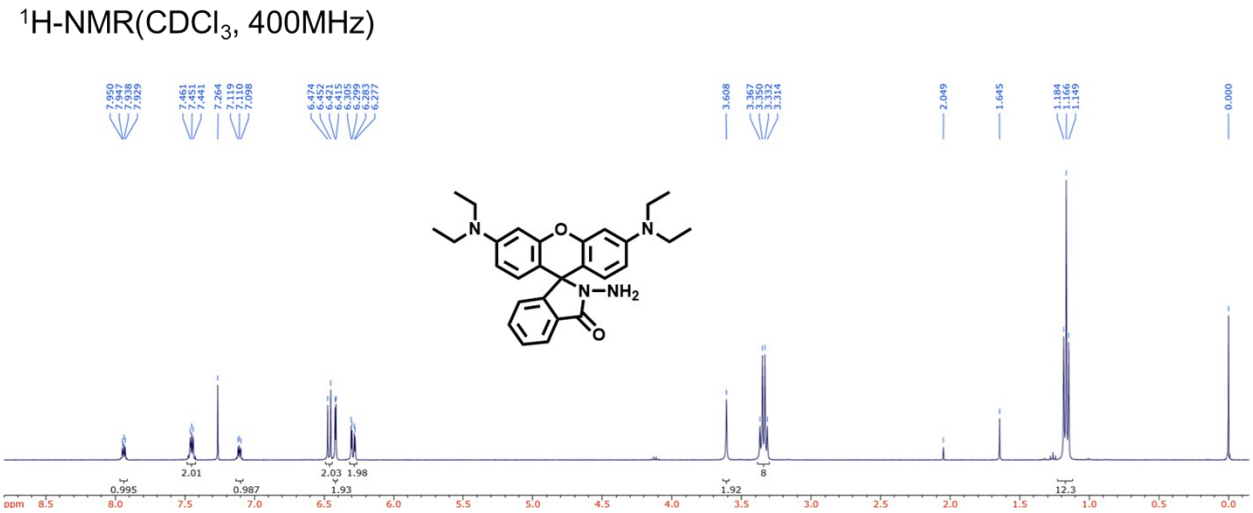


**Figure S6.** The NMR data and structure (inset) of Rho-Hz; $^{1}$H-NMR ($CDCl_3$, 400MHz).

**Mass spectrometry data of Rho-Hz (Figure S7)**

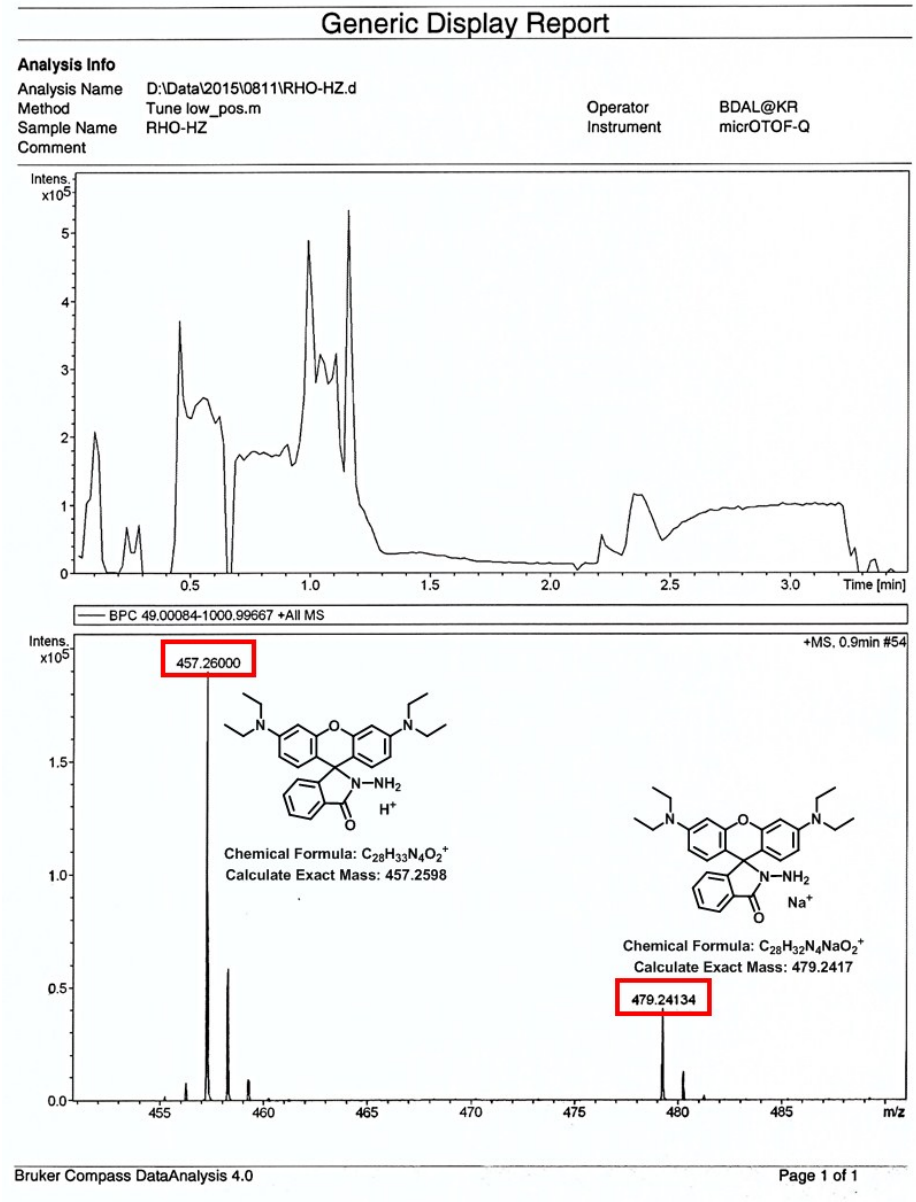


**Figure S7.** The high resolution mass spectrometry data of Rho-Hz.