

Supporting information

A novel upconversion luminescence turn-on nanosensor for ratiometric detection of organophosphorus pesticides

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Supplementary figures

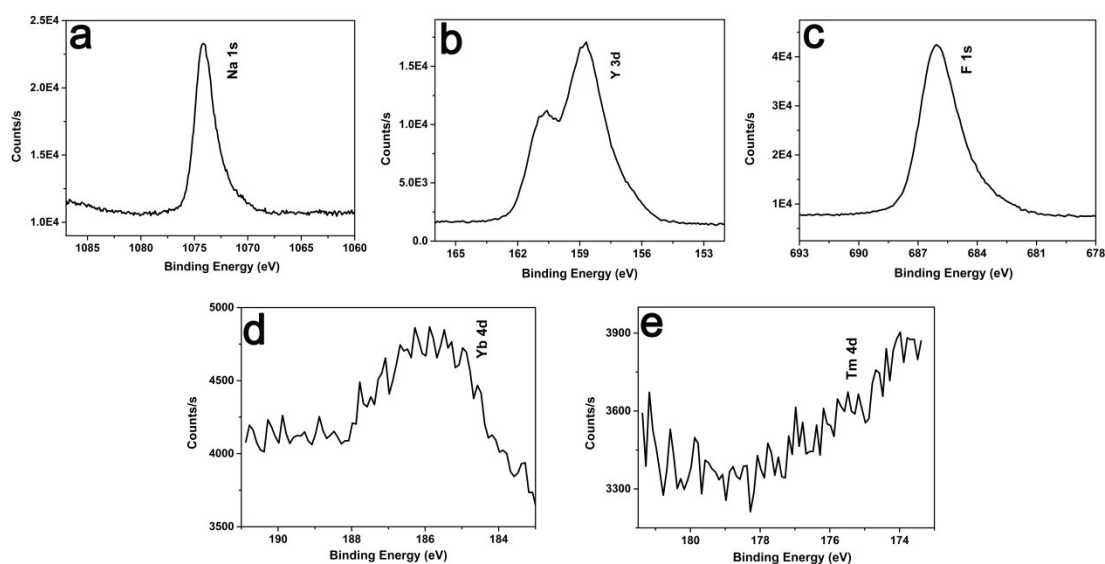


Fig. S1 Narrow range XPS spectra of Na 1s, Y 3d, F 1s, Yb 4d and Tm 4d. Note that Tm was only doped with an amount of 0.1% in the core layer, thus the peak at its characteristic binding energy was very weak.

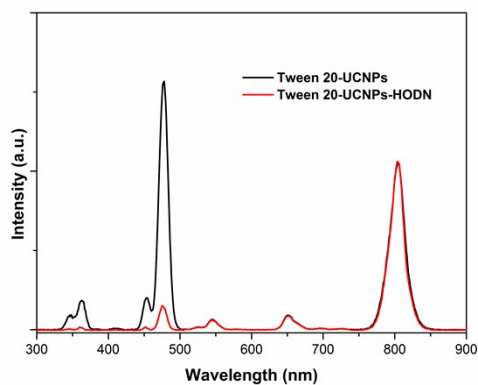


Fig. S2 UCL spectra of Tween 20 modified UCNP before (black line) and after (red line) loaded with pesticide probe **HODN**.

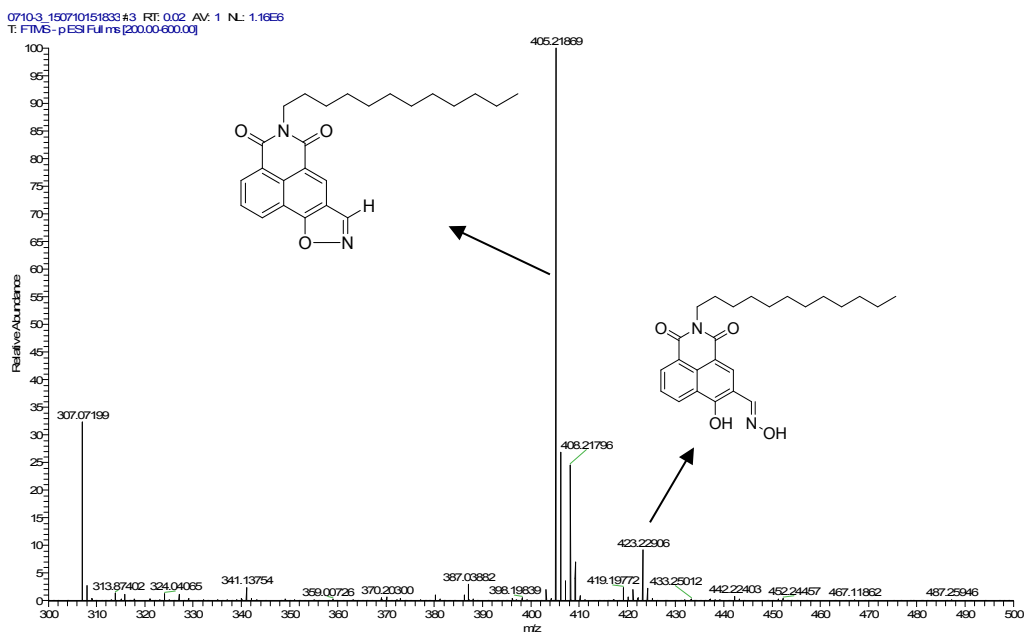


Fig. S3 HR-MS spectrum analysis for the determination of the reaction mechanism between **HODN** and DCP.

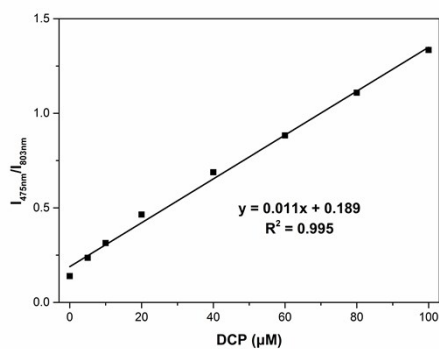


Fig. S4 Linear plot of relative UCL increasing ($I_{475\text{ nm}}/I_{803\text{ nm}}$) as a function of DCP concentration. The detection limit (LOD) was given by the equation $\text{LOD} = 3S_0/S$; where 3 is the factor at the 99% confidence level, S_0 is the standard deviation of the blank measurements ($n = 8$), and S is the slope of the calibration curve.

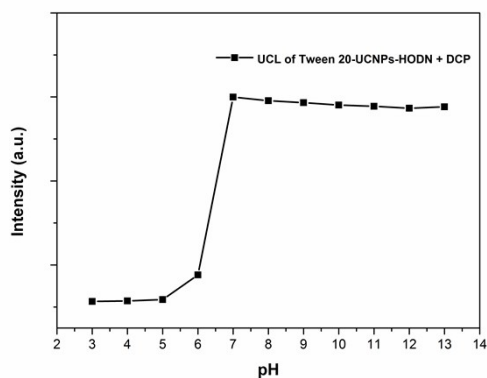


Fig. S5 Evaluation of the sensing ability of Tween 20-UCNPs-HODN within the pH range of 3-13.

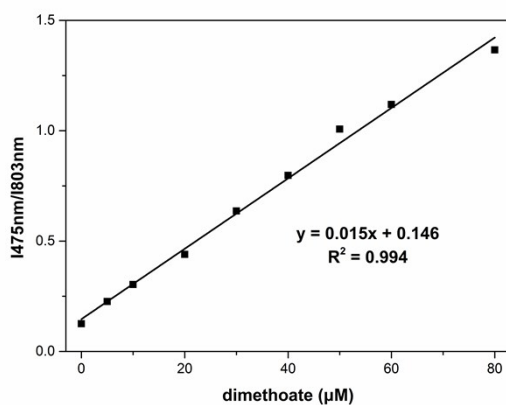


Fig. S6 Linear plot of relative UCL increasing ($I_{475\text{ nm}}/I_{803\text{ nm}}$) as a function of dimethoate concentration.

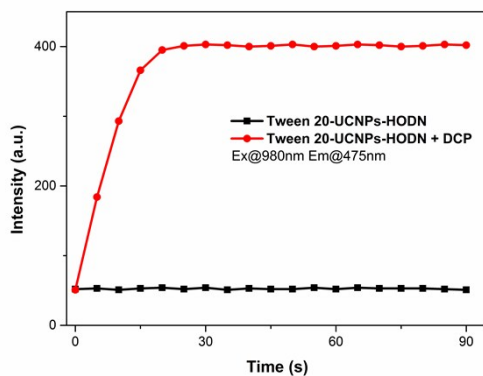


Fig. S7 Time course of reaction of **Tween 20-UCNPs-HODN** (0.3 mg mL^{-1}) with DCP ($200\text{ }\mu\text{M}$) at $25\text{ }^{\circ}\text{C}$ in PBS (pH 7.4, containing 20% DMF) solution.

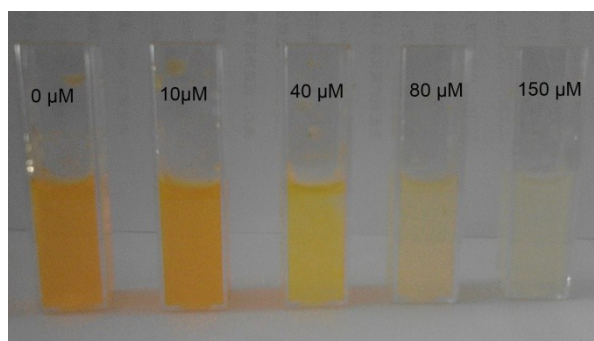


Fig. S8 The photographs of **Tween 20-UCNPs-HODN** (0.3 mg mL^{-1}) solution in presence of different concentration of DCP.

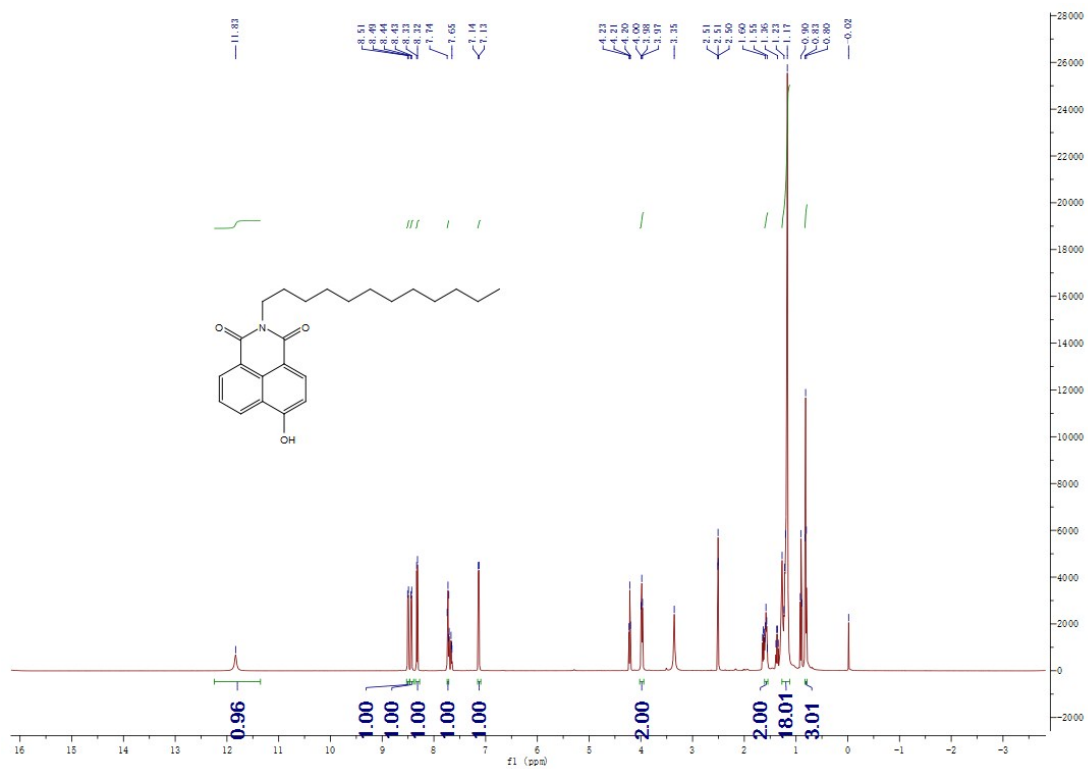


Fig. S9 $^1\text{H-NMR}$ spectrum of compound 3.

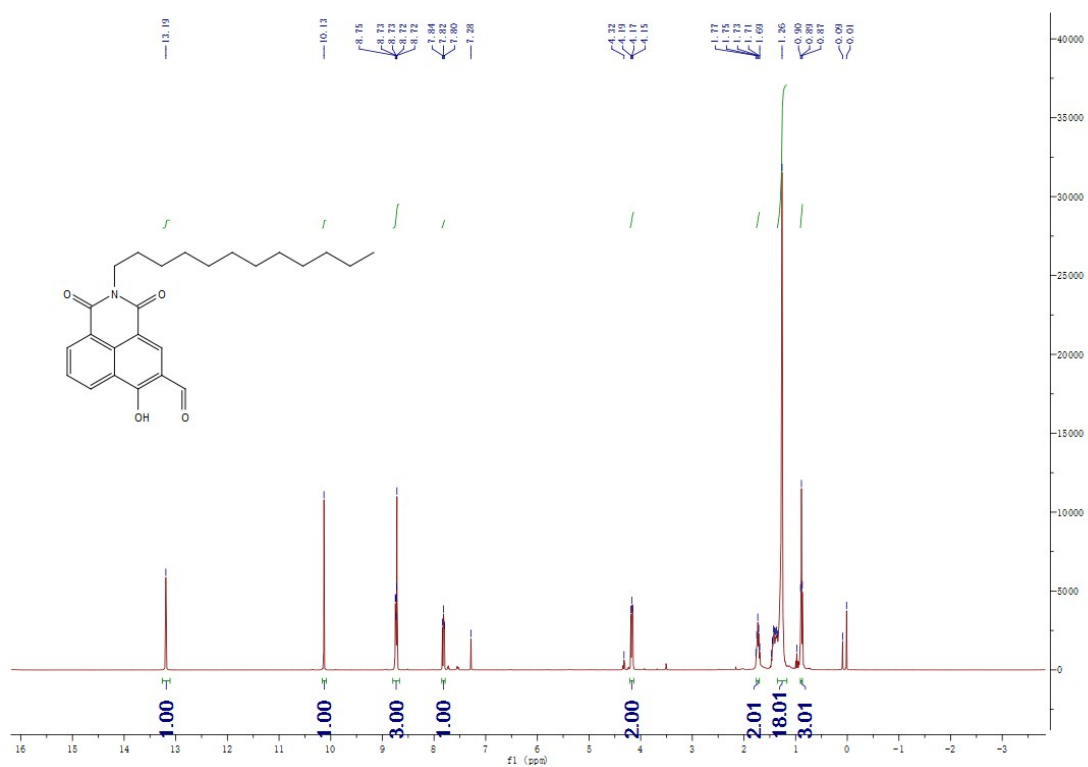


Fig. S10 $^1\text{H-NMR}$ spectrum of compound 4.

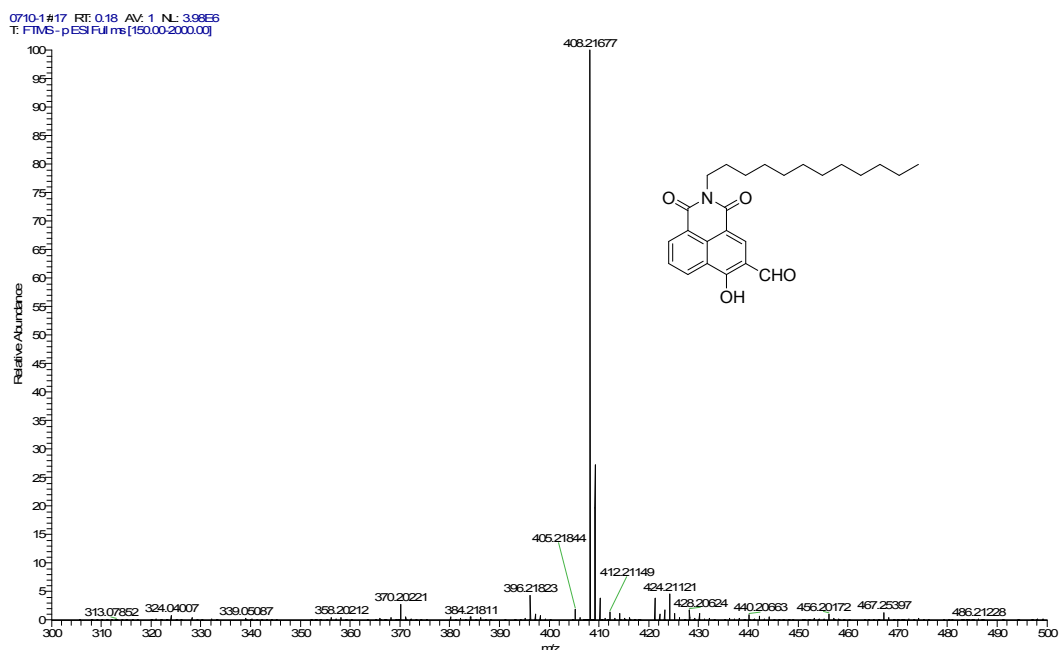


Fig. S11 HR-MS spectrum of compound 4.

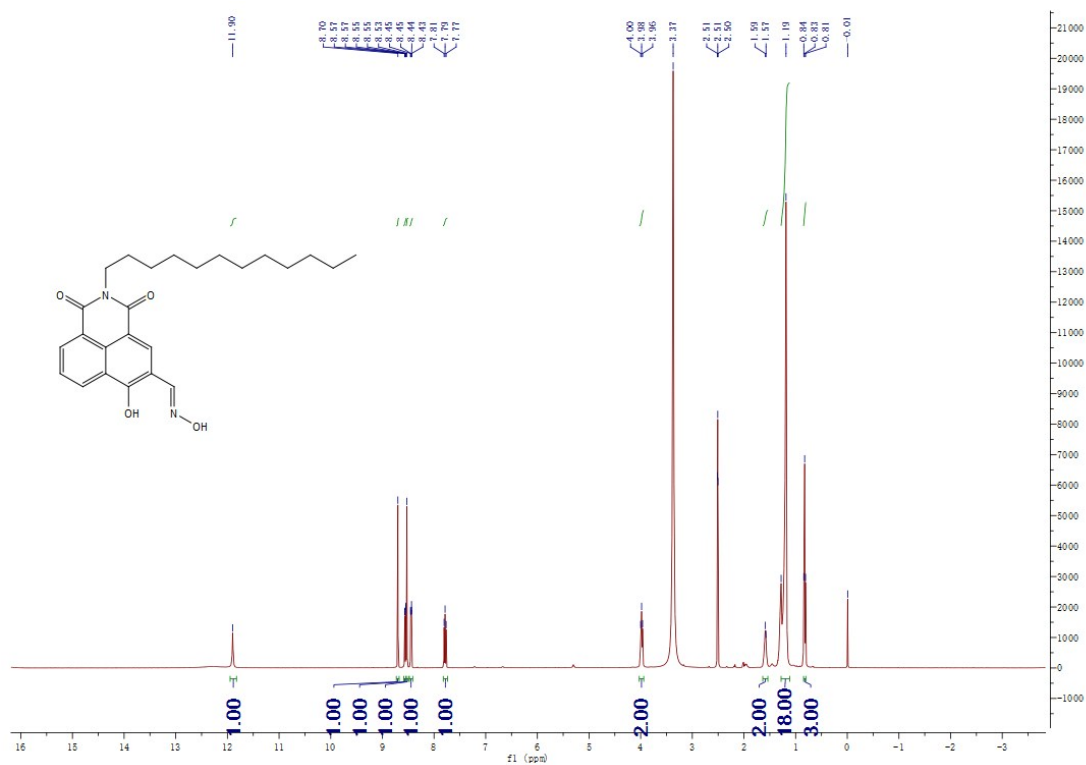


Fig. S12 ¹H-NMR spectrum of HODN.

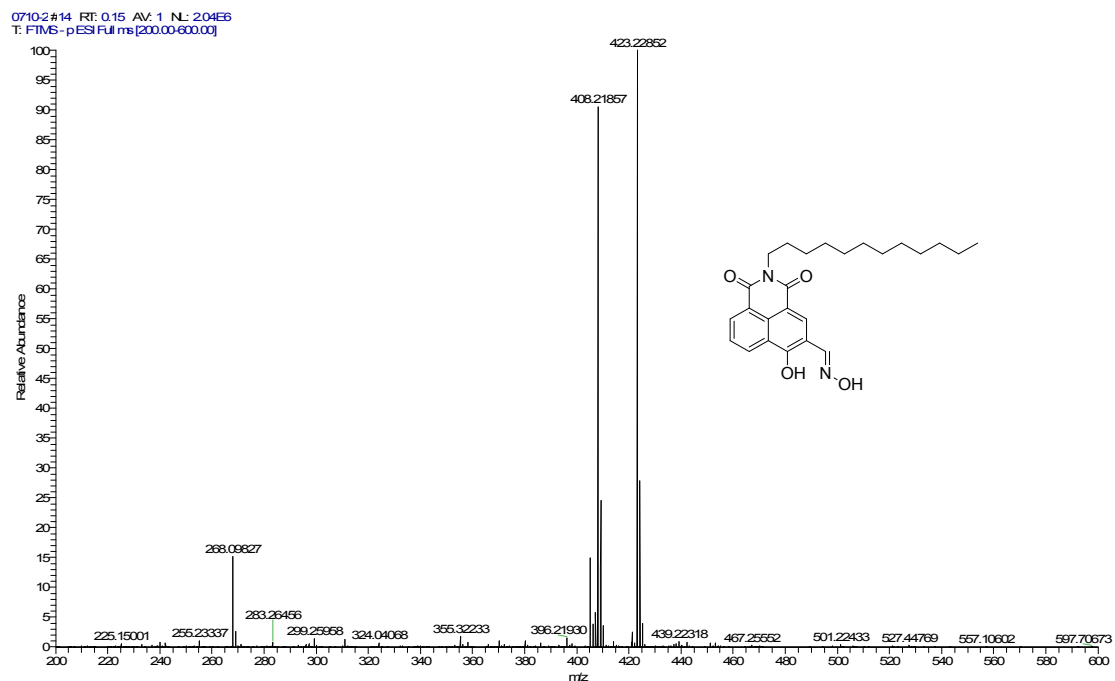


Fig. S13 HR-MS spectrum of **HODN**, note that the peak located at $m/z = 408$ was attributed to the residue of compound **4** in the LC-MS equipment.

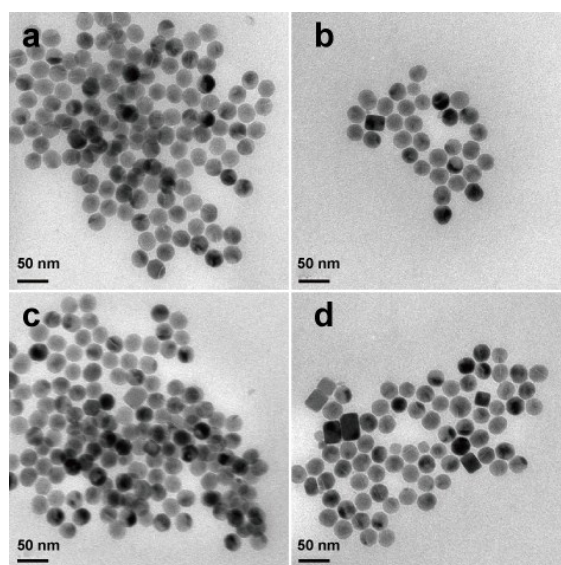


Fig. S14 TEM images of OA-capped UCNPs (a, b, c) and Tween 20 modified UCNPs (d) captured under different horizons.