

## Supporting information

### **Periodic Mesoporous Organosilica Based Rattles for Broad Range Mercury Detection by Simultaneous Downshifting/Upconversion Luminescence**

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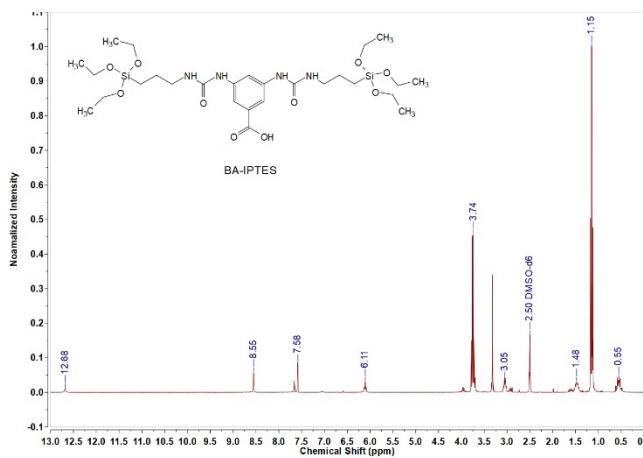


Figure S1.  $^1\text{H}$  NMR of 3,5-bis(3-(triethoxysilyl)propyl)ureido)benzoic acid (BA-Si)

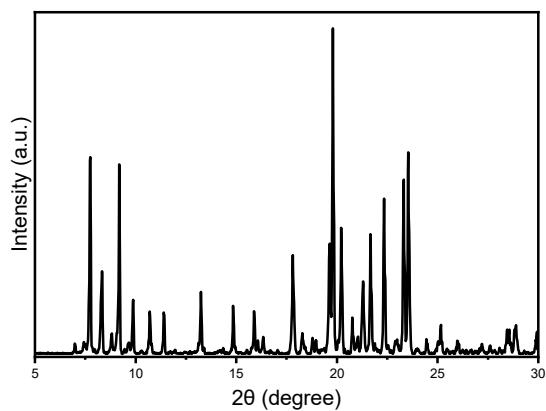


Figure S2. XRD pattern of  $\text{Tb}(\text{hfac})_3 \cdot n(\text{H}_2\text{O})$

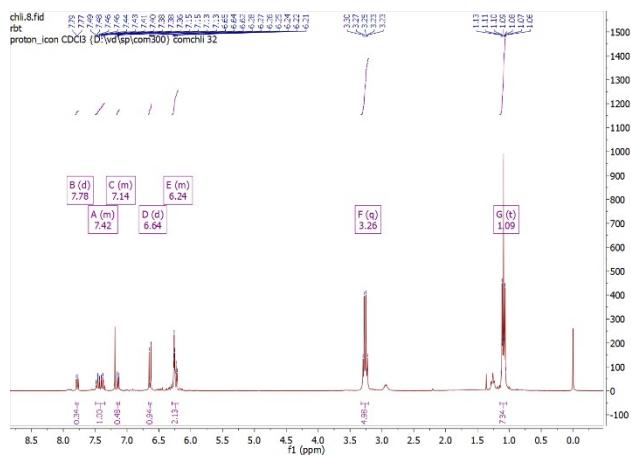


Figure S3.  $^1\text{H}$  NMR of rhodamine B thiolactone (RBT)

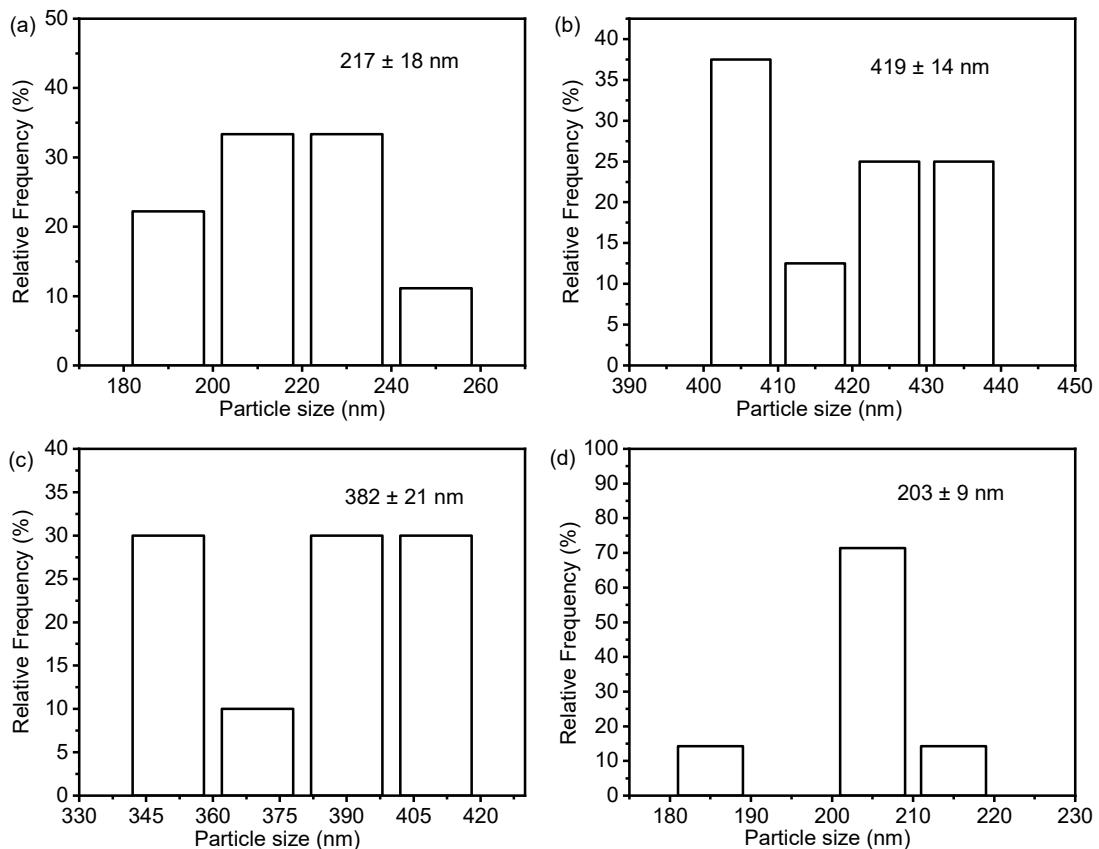


Figure S4 Histograms showing the particle size distribution of : (a) SiO<sub>2</sub> nanoparticles; (b) PMO@SiO<sub>2</sub>; (c) HPMO; (d) UCNP.

Table S1. Relative metal contents for the samples during synthesis (calcd.) and as determined by XRF.\*

Sample	Y <sup>3+</sup> ion (mol%)		Yb <sup>3+</sup> ion (mol %)		Er <sup>3+</sup> ion (mol %)		Si (mol %)		Tb <sup>3+</sup> ion (mol %)	
	Calcd.	XRF	Calcd.	XRF	Calcd.	XRF	Calcd.	XRF	Calcd.	XRF
LnHPMO@UCNP	80	74	15	24	5	2	91	75	9	25
LnHPMO										

\* We assume that the concentration ratios are in accordance to the amounts of reagents used. The XRF results are not fully consistent with that, meaning one of the reasons why LnHPMO@UCNP has both the alpha and beta phases of NaYF<sub>4</sub>:Yb,Er y in the XRD pattern is indeed due to the varying percentage of lanthanide ion.