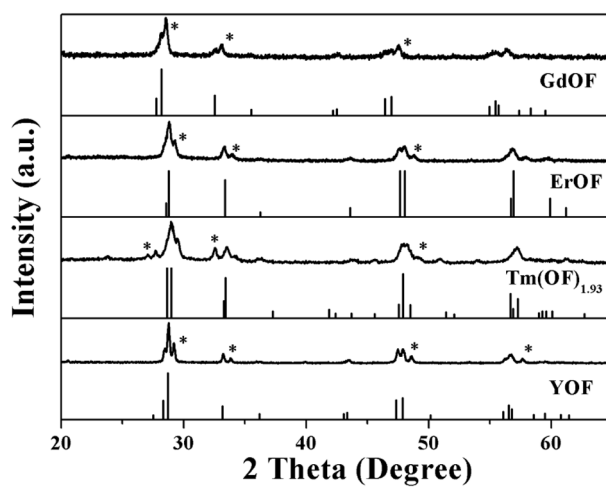


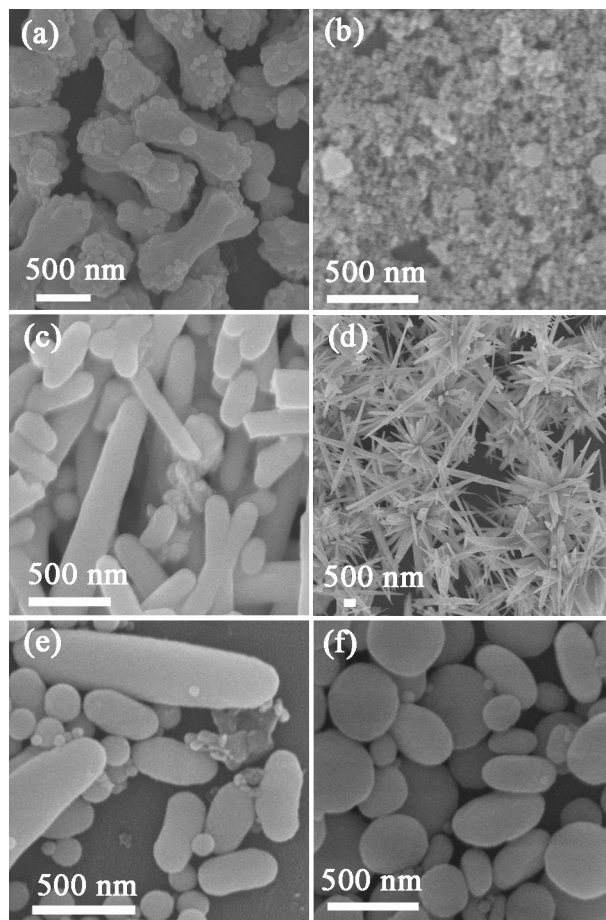
## Electronic Supplementary Information (ESI)



**Fig. S1** The XRD patterns of GdOF, ErOF, Tm(OH)<sub>1.93</sub> and YOF obtained after calcinations at 800 °C for 3 h and the corresponding standard data of GdOF, ErOF, Tm(OH)<sub>1.93</sub> and YOF.

**Table S1** The accurate amounts of Ln<sup>3+</sup> and F<sup>-</sup> for LaOF, GdOF, ErOF and YOF: 0.20Yb<sup>3+</sup>, 0.04Er<sup>3+</sup>, respectively.

sample	Ln <sup>3+</sup> (ppm)	F <sup>-</sup> (ppm)	atomic ratio (Ln <sup>3+</sup> /F <sup>-</sup> )
LaOF	24030	3430	173/180
GdOF	26290	3101	167/163
ErOF	25590	3040	153/160
YOF: 0.20Yb <sup>3+</sup> , 0.04Er <sup>3+</sup>	Y <sup>3+</sup> : 19390 Yb <sup>3+</sup> : 11640 Er <sup>3+</sup> : 1897	5701	72.7/22.4/3.78/100



**Fig. S2** SEM images of the ErOF precursor under different experimental conditions (a) pH = 2, urea/Ln<sup>3+</sup> = 66, with LiF; (b) pH = 2, urea/Ln<sup>3+</sup> = 66, with KF; (c) pH = 6, urea/Ln<sup>3+</sup> = 66, with NaF; (d) pH = 10, urea/Ln<sup>3+</sup> = 66, with NaF; (e) pH = 2, urea/Ln<sup>3+</sup> = 80, with NaF and (f) pH = 2, urea/Ln<sup>3+</sup> = 100, with NaF.