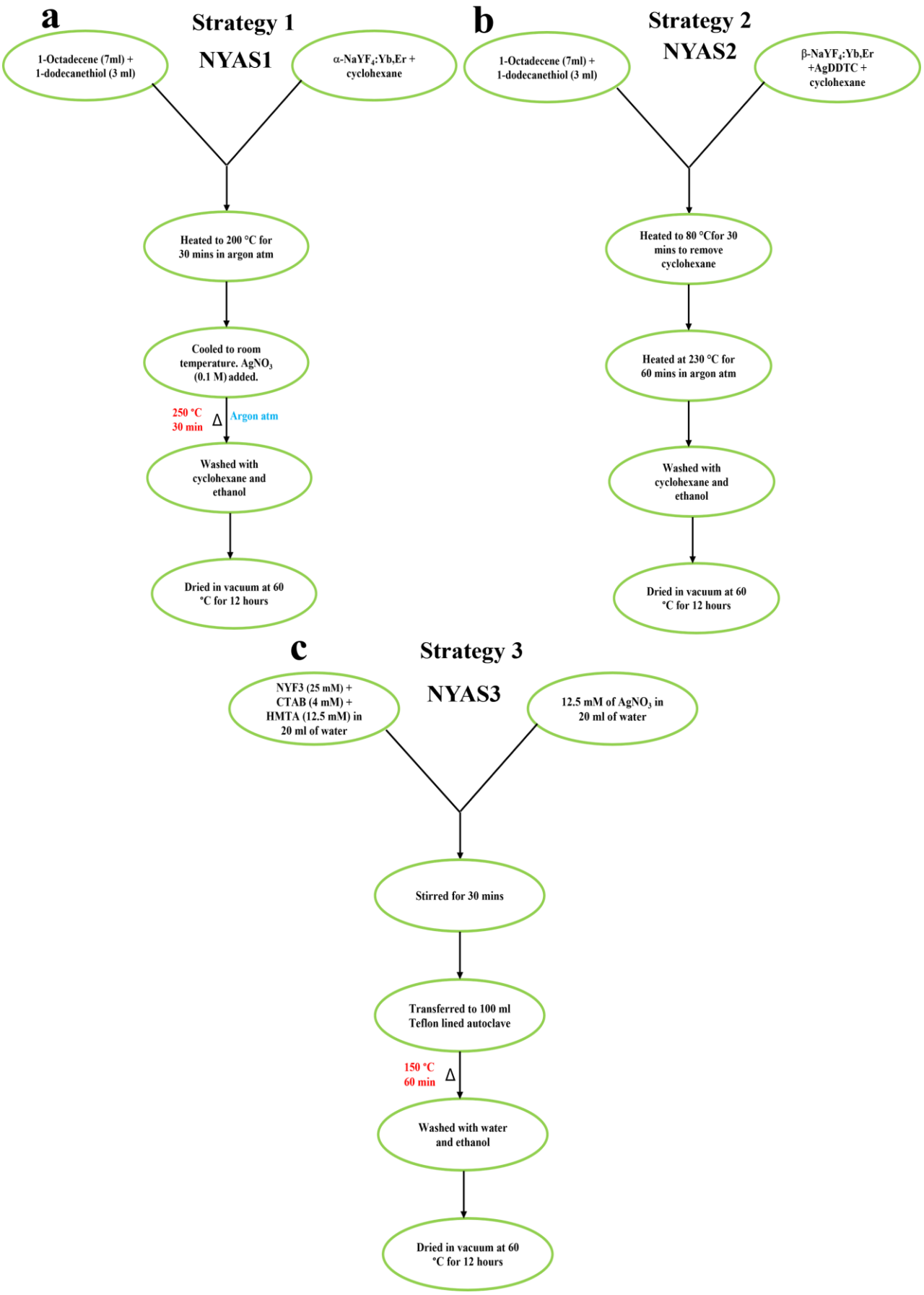

Fig. S1: Flow chart of the synthesis technique followed in the synthesis of samples NYAS1, NYA2 and NYAS3.

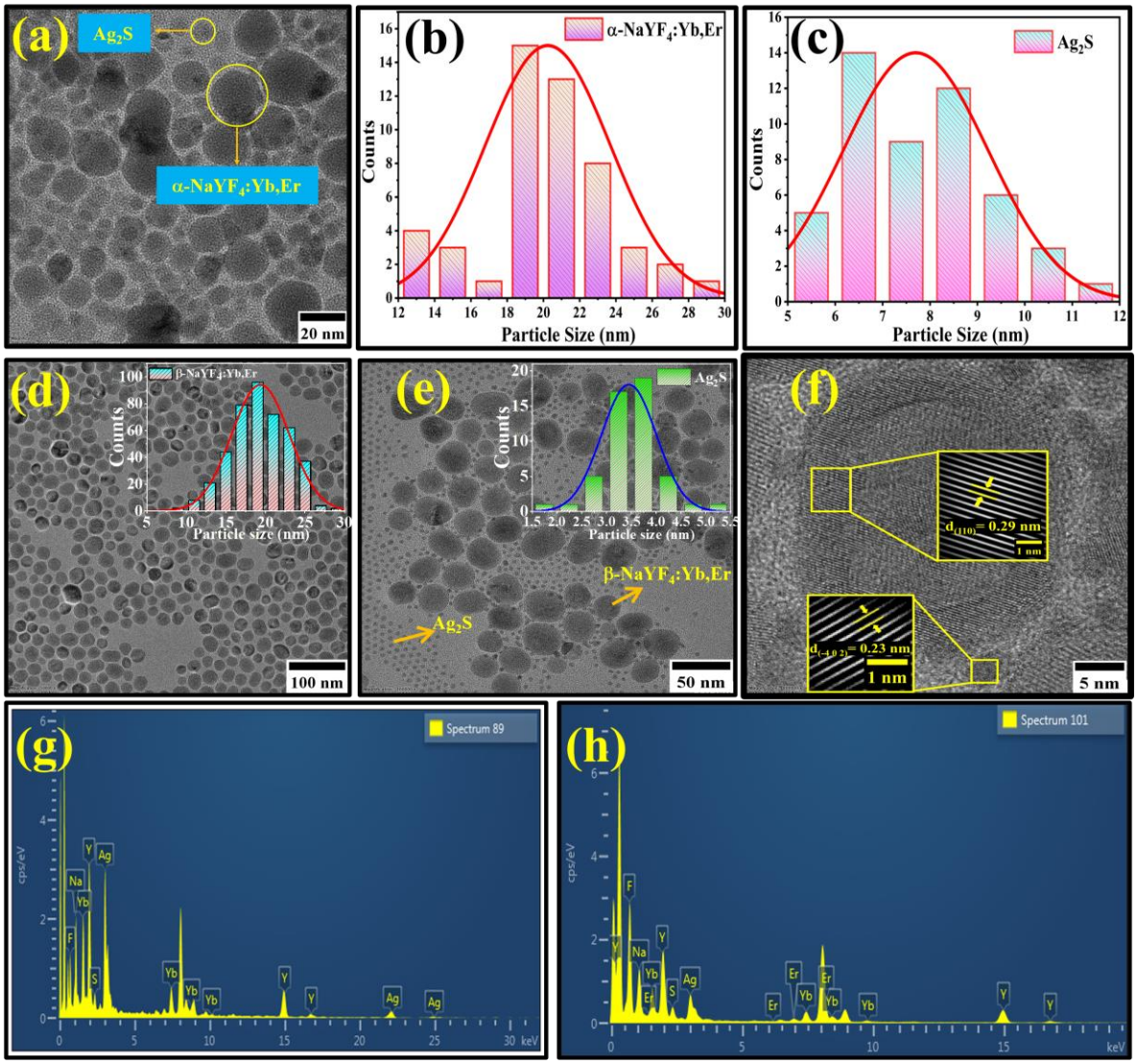

Fig. S2: (a) TEM image of NYAS1. (b),(c) particle size distribution of α-$NaYF_4$:Yb, Er and Ag_2S in NYAS1. (d) TEM image of NYF2 with particle size distribution. (e)TEM image of NYAS2 with the particle size distribution of Ag_2S nanoparticle present in it. (f) HR-TEM image of NYAS2 showing the lattice spacing of β-$NaYF_4$:Yb, Er and Ag_2S. (g) EDS spectrum of NYAS1. (h) EDS spectrum of NYAS2

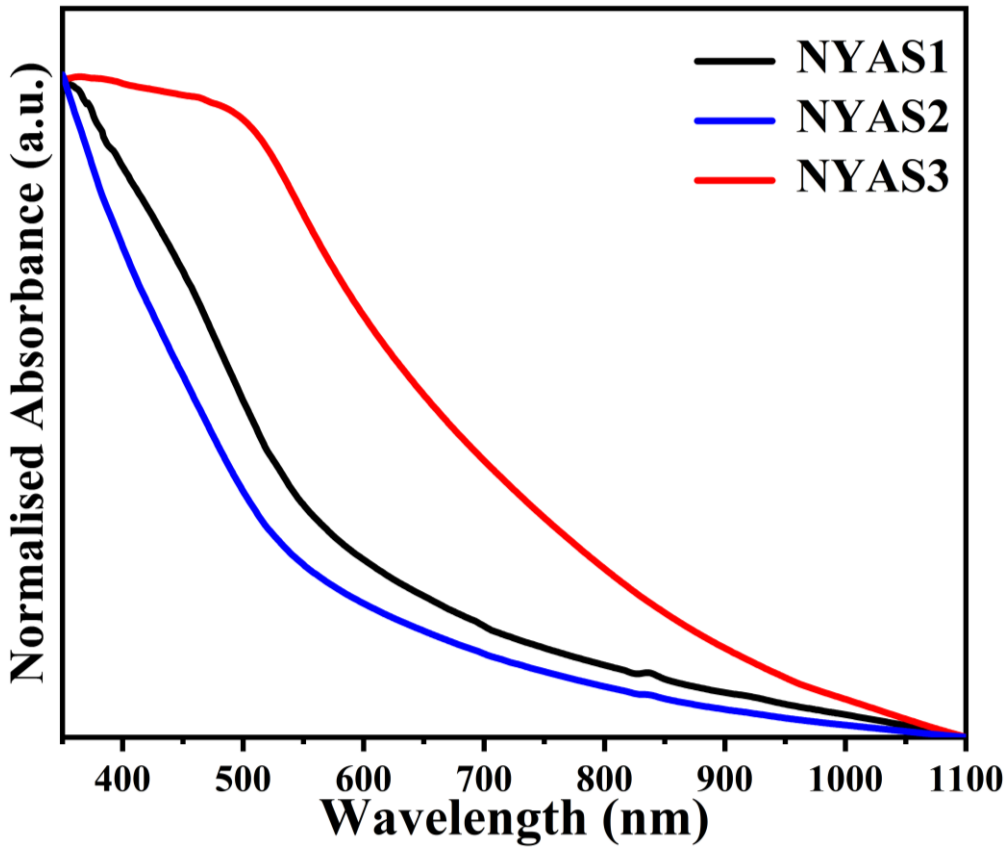

Fig. S3 Absorption spectrum of NYAS1, NYAS2, NYAS3.

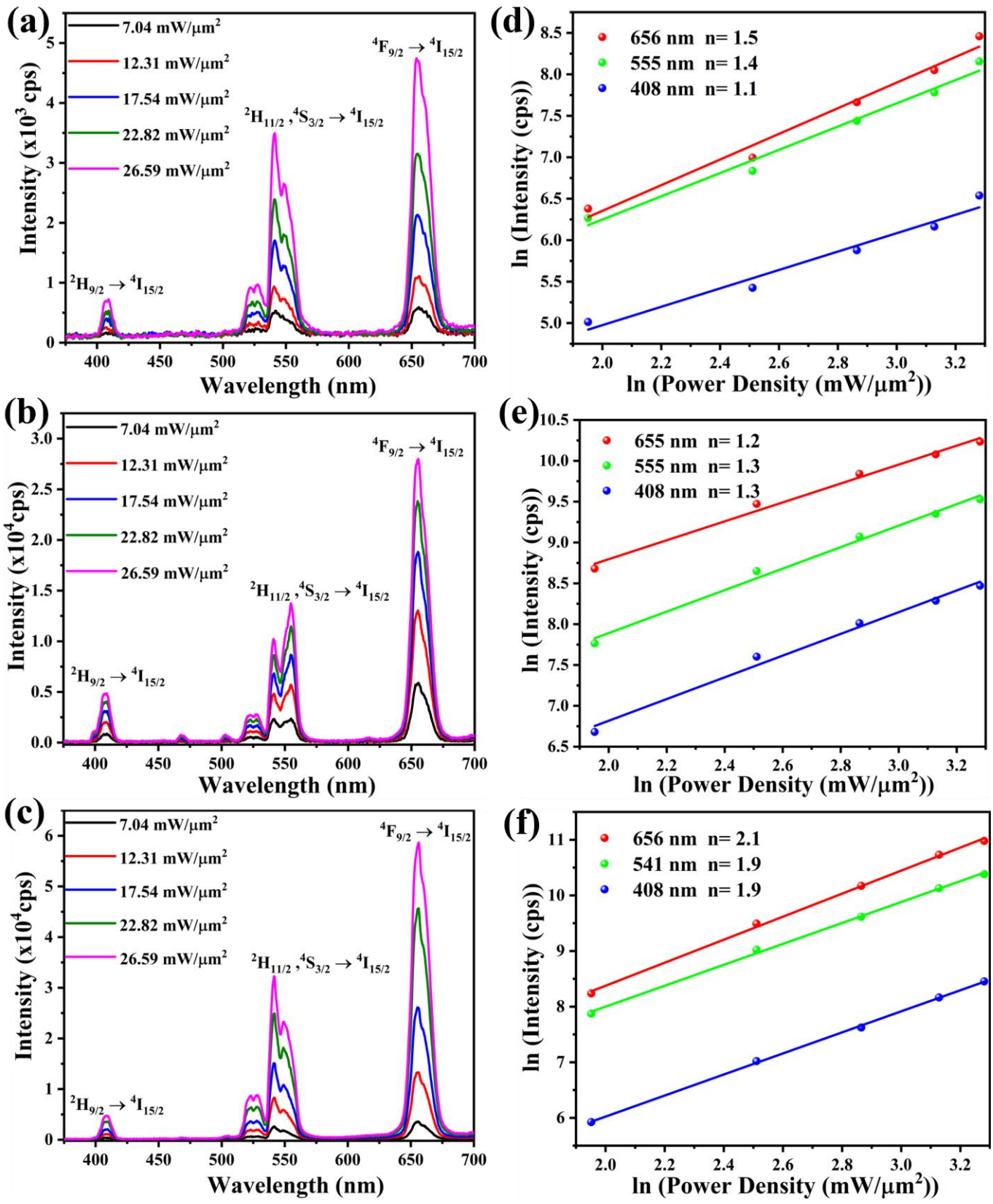

Fig.S4 (a-c) Power-dependent upconversion emission spectrum of NYF1, NYF2, NYF3, (d-f) their respective log-log plot.

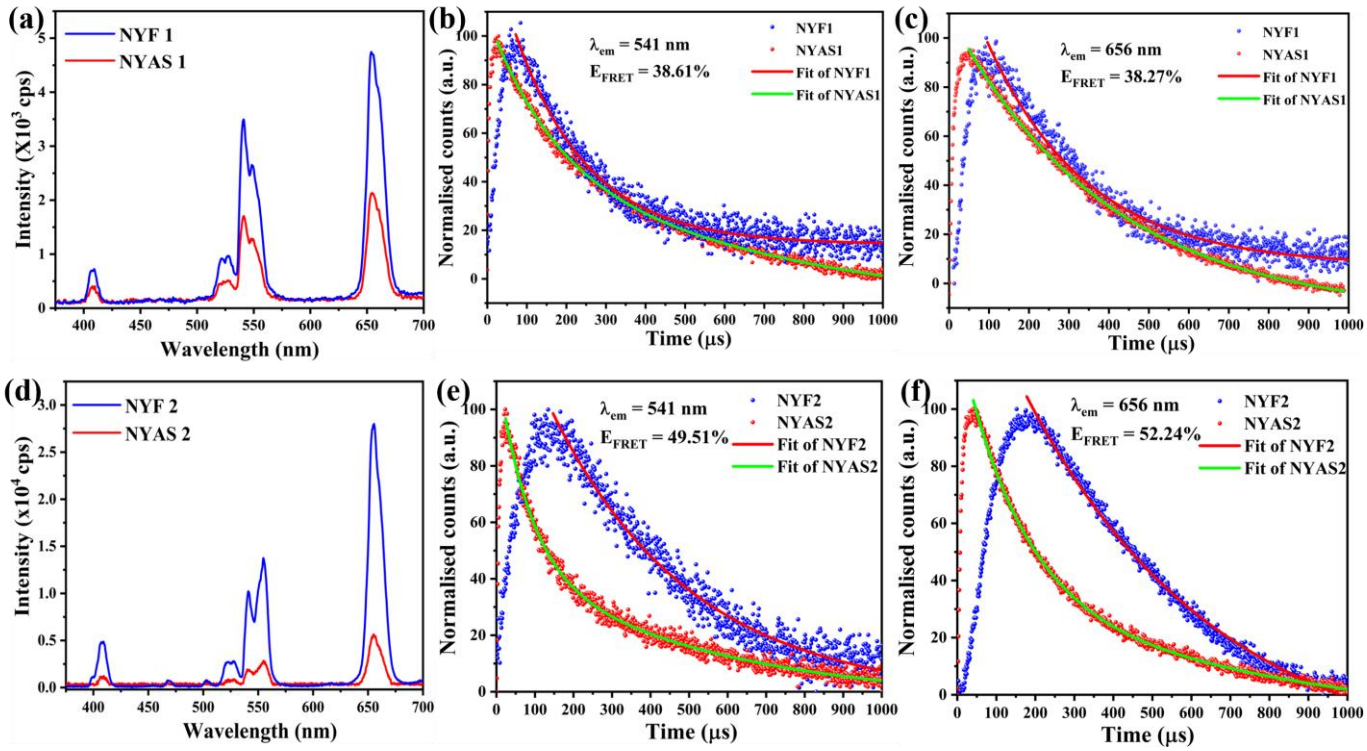

Fig. S5:(a) Comparative upconversion emission spectrum of NYF1 and NYAS1;

(b & c) its lifetime curve showing FRET efficiency at 541 and 656 nm.

(d) Comparative upconversion emission spectrum of NYF2 and NYAS2

(e & f) its lifetime curve showing FRET efficiency at 541 and 656 nm.

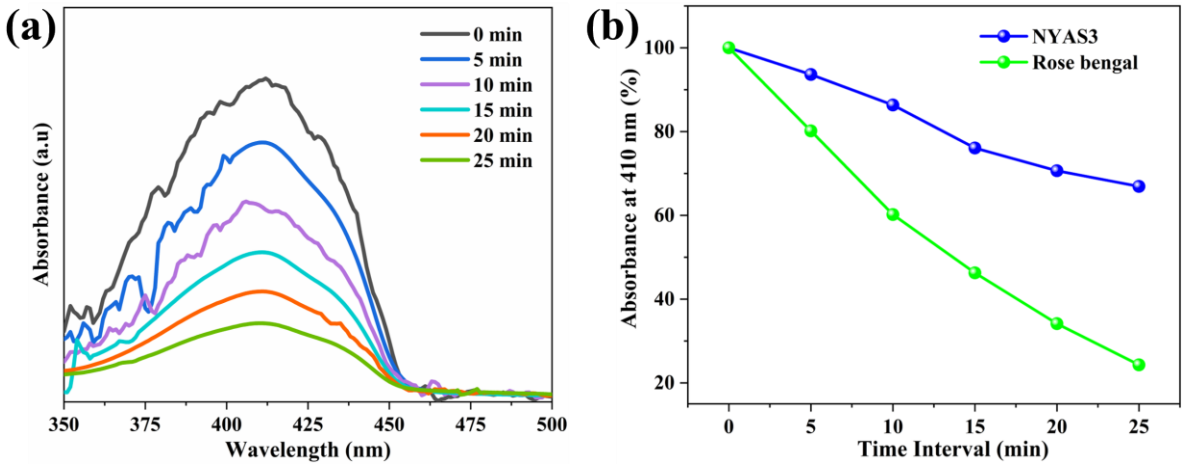

Fig. S6:(a) ROS generation of rose bengal monitored using DPBF ROS sensor. (b) Change in the absorption of DPBF as a function of time with NYAS3 and rose bengal.

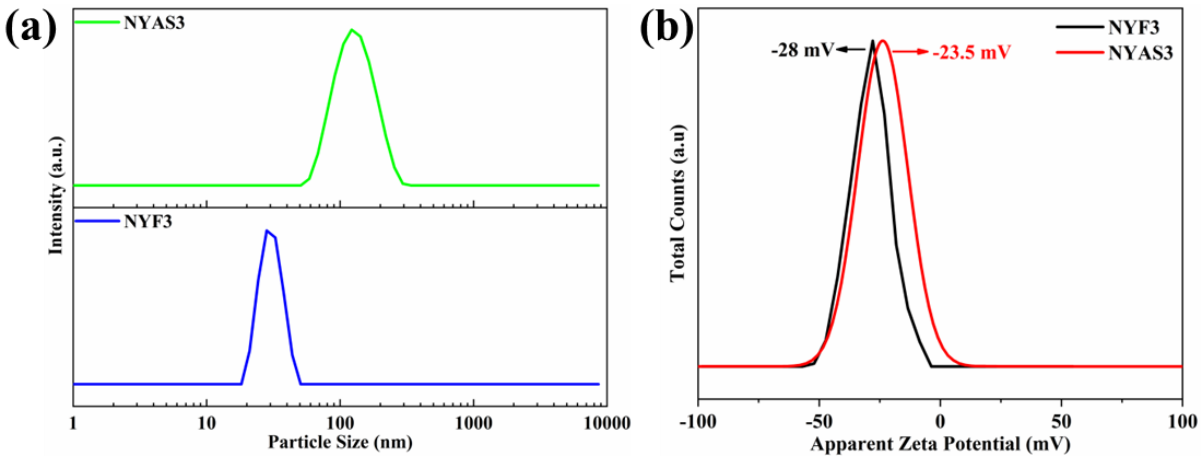

Fig. S7:(a) Hydrodynamic particle size distribution of NYF3 and NYAS3. (b) Zeta potential of NYF3 and NYAS3.