

Supporting information

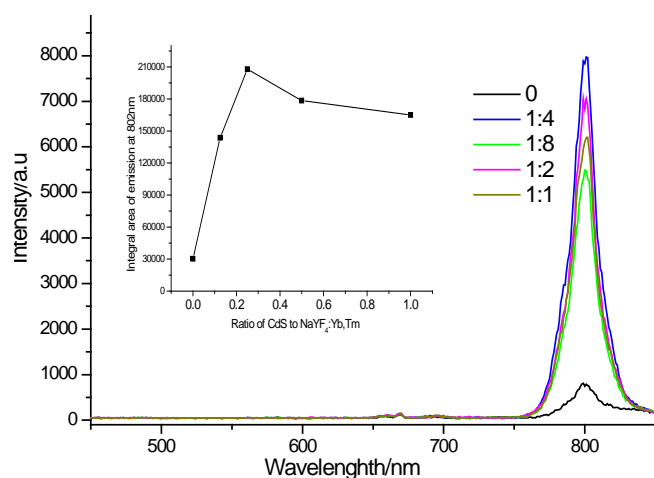


Figure S1. Upconverted fluorescence spectra of NaYF₄: Yb³⁺, Tm³⁺ /CdS nanoheterostructure with different ratio of CdS to NaYF₄: Yb³⁺, Tm³⁺ (excited by 980nm laser with same power). The inset figure was the integral area of 802nm emission with different ratio of CdS to NaYF₄: Yb³⁺, Tm³⁺

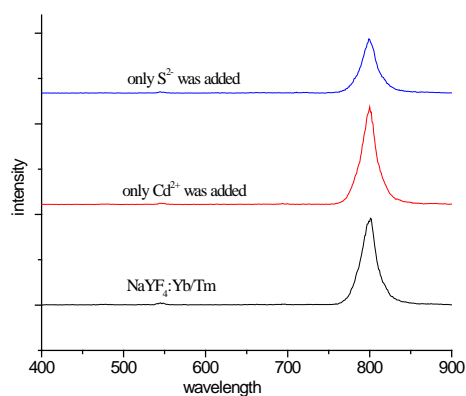


Figure S2. The effect of Cd²⁺ and S²⁻ on the upconverted fluorescence spectrum of NaYF₄ : Yb,Tm

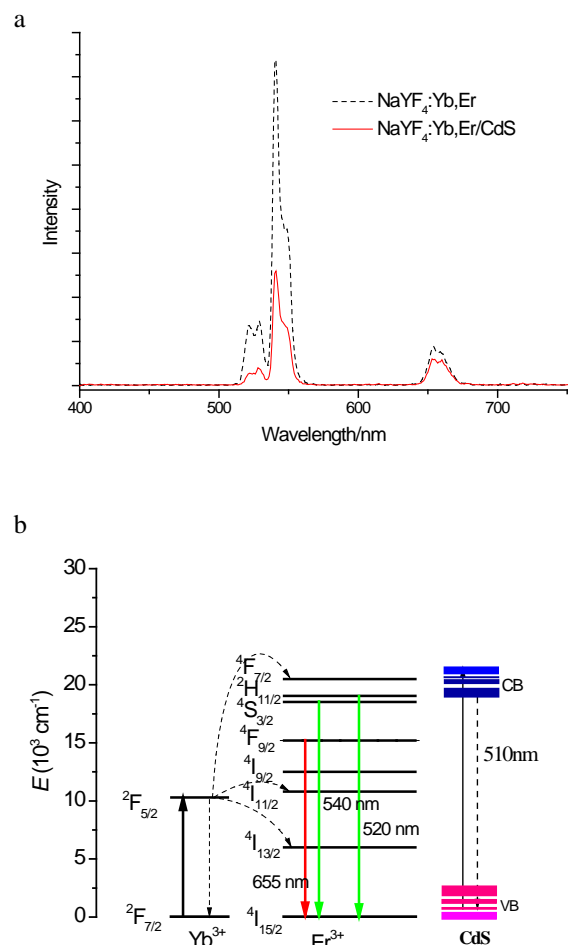


Figure S3. a. Upconverted fluorescence spectra of NaYF₄: Yb³⁺, Er³⁺ nanocrystals and NaYF₄: Yb³⁺, Er³⁺/CdS nanoheterostructure excited with same power laser (980nm), b. Schematic of the excitation of NaYF₄: Yb³⁺, Er³⁺ and energy level of NaYF₄: Yb³⁺, Er³⁺ and CdS

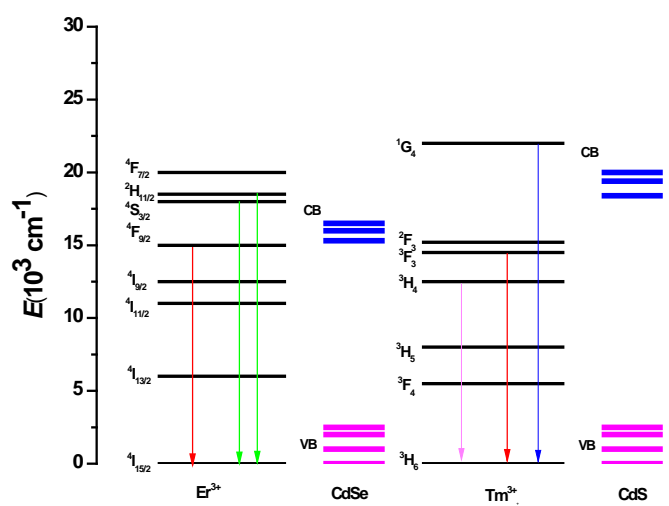


Figure S4. Schematic diagram of the energy level of Er³⁺, Tm³⁺, CdS and CdSe

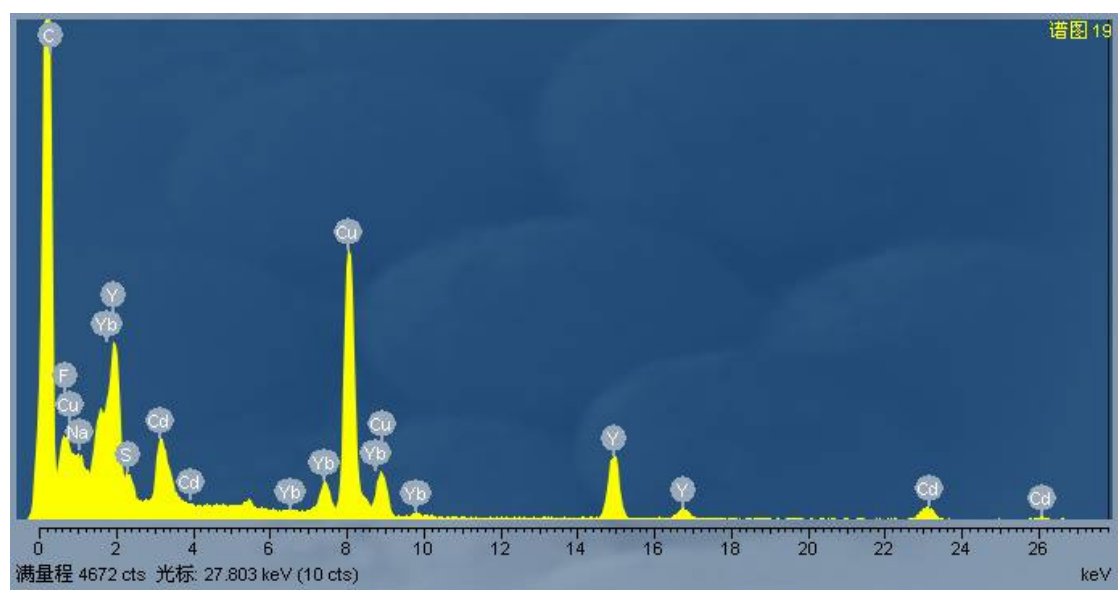


Figure S5. EDX spectrum of NaYF₄:Yb,Tm/CdS hnanoeterostructures, indicating the presence of elements of Na, Y, F, Yb, Cd, S.