

† **Electronic Supplementary Information**

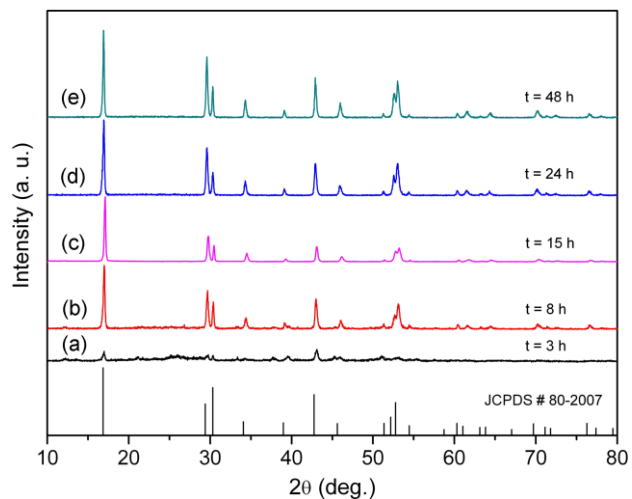


Figure S1 XRD patterns of $Y(OH)_{1.63}F_{1.37}$ prepared by using CTAB as additive.

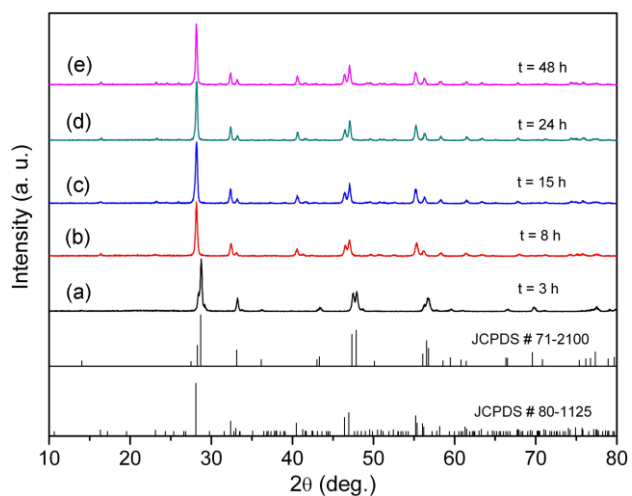


Figure S2 XRD patterns of $Y_6O_5F_8$ prepared by using CTAB as additive.

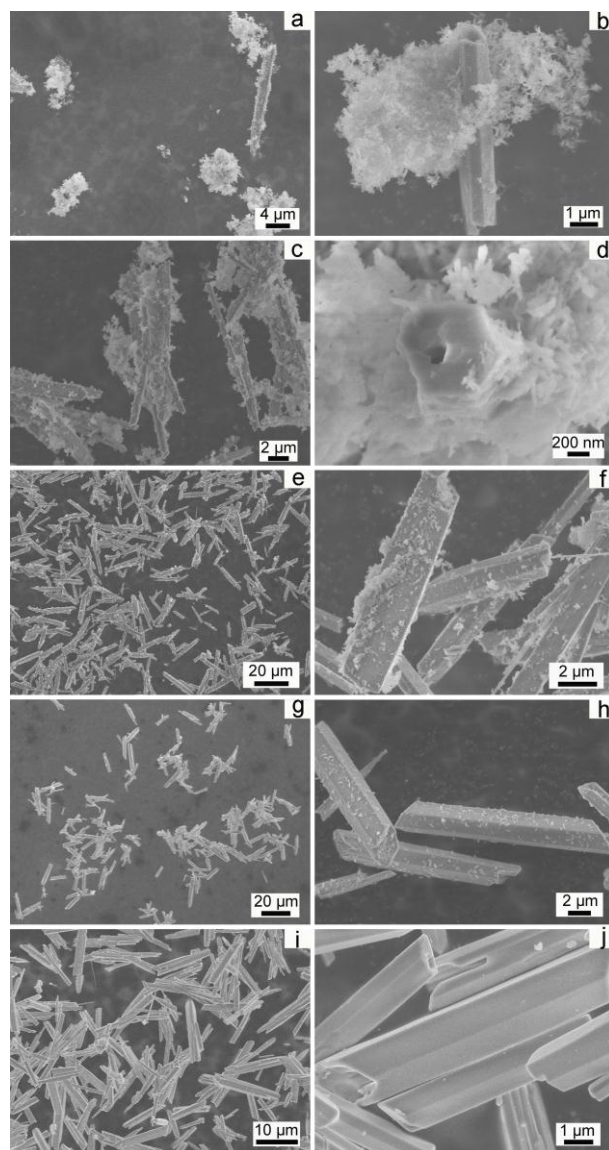


Figure S3 SEM images of evolution for $Y(OH)_{1.63}F_{1.37}$ at different hydrothermal times: (a, b) 3 h, (c, d) 8 h, (e, f) 15 h, (g, h) 24 h, and (i, j) 48 h.

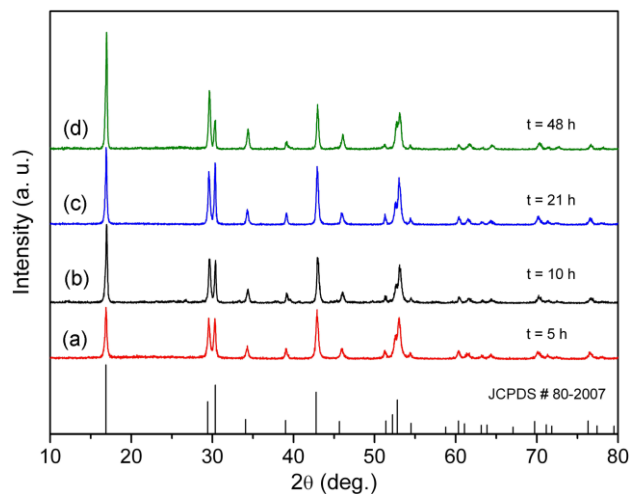


Figure S4 XRD patterns of $Y(OH)_{1.63}F_{1.37}$ prepared by using PVP as additive.

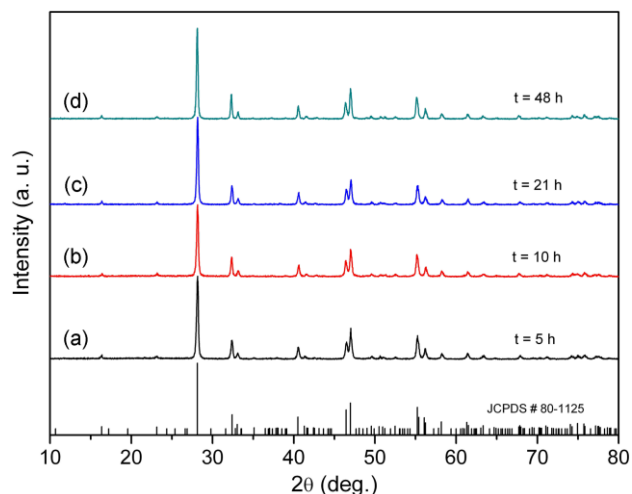


Figure S5 XRD patterns of $Y_6O_5F_8$ prepared by using PVP as additive.

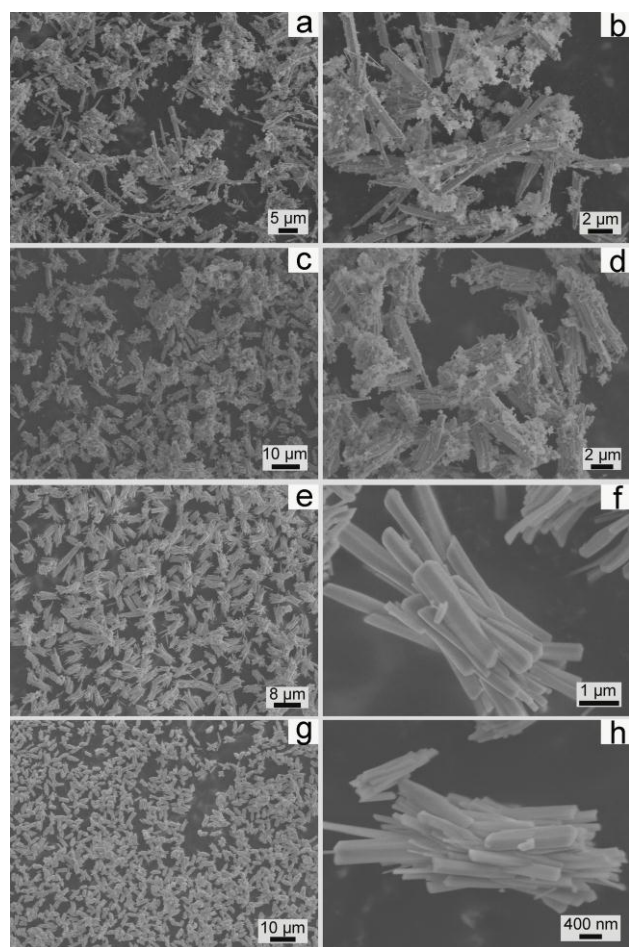


Figure S6 SEM images of evolution for $Y(OH)_{1.63}F_{1.37}$ at different hydrothermal times (using PVP as additive): (a, b) 5 h, (c, d) 10 h, (e, f) 21 h, and (g, h) 48 h.

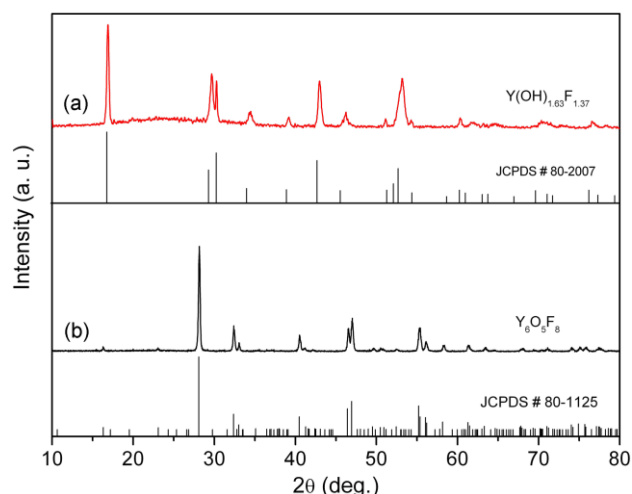


Figure S7 XRD patterns of both $Y(OH)_{1.63}F_{1.37}$ and $Y_6O_5F_8$ prepared by using EDTA as additive.

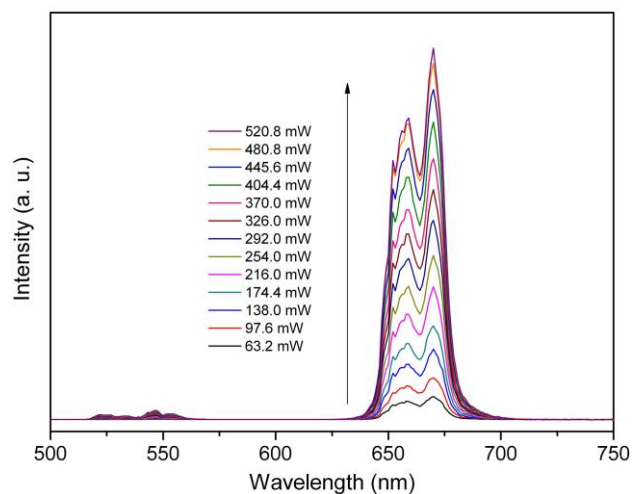


Figure S8 UC emission spectra of $Y_{5.34}O_5F_8:0.6Yb^{3+}, 0.06Er^{3+}$ using PVP as additive under DL excitation of 980 nm.

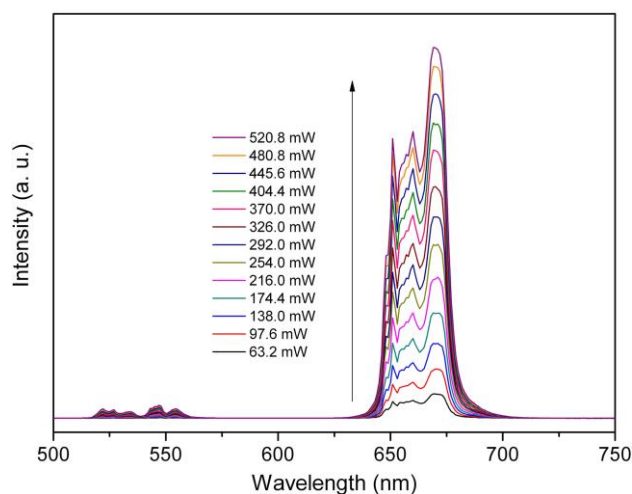


Figure S9 UC emission spectra of $Y_{5.34}O_5F_8:0.6Yb^{3+}, 0.06Er^{3+}$ using EDTA as additive under DL excitation of 980 nm.

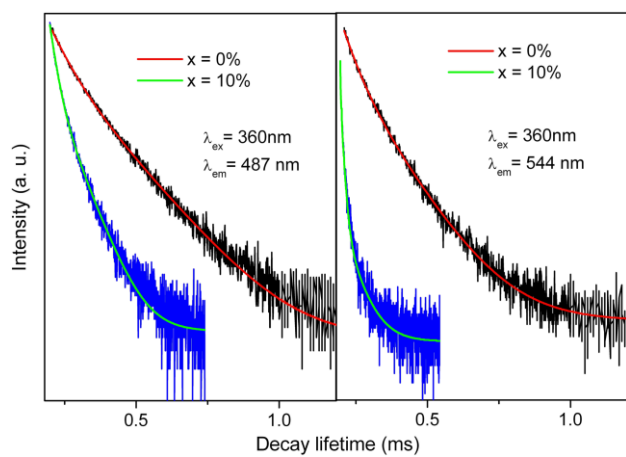


Figure S10 Decay curves of both YOF: 1%Ho³⁺ and YOF:10%Yb³⁺, 1%Ho³⁺.