Supporting Information

Enhanced Thermal Stable Performance in Pr^{3+}-doped Vanadate Phosphor by Inhibiting Intervalence Charge Transfer Quenching Channel

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Figure S1

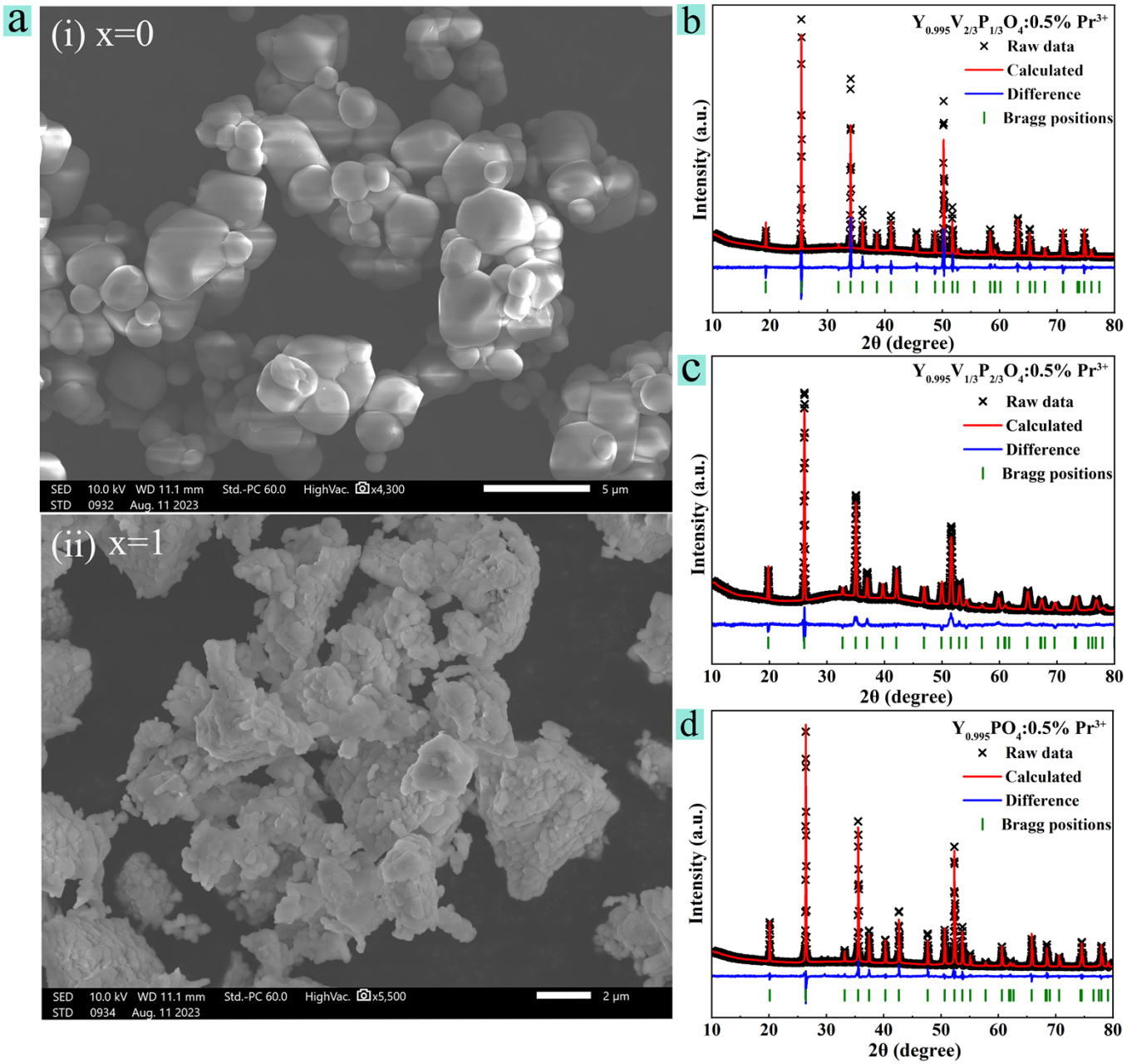

Figure S1. (a) (i)SEM of of $Y_{0.995}VO_4$:0.5% Pr^{3+}. (ii) SEM of of $Y_{0.995}PO_4$:0.5% Pr^{3+}. XRD Rietveld refinement patterns of (b) the $Y_{0.995}V_{2/3}P_{1/3}O_4$:0.5% Pr^{3+} , (c) the $Y_{0.995}V_{1/3}P_{2/3}O_4$:0.5% Pr^{3+} and (d) the $Y_{0.995}PO_4$:0.5% Pr^{3+}.

Figure S2

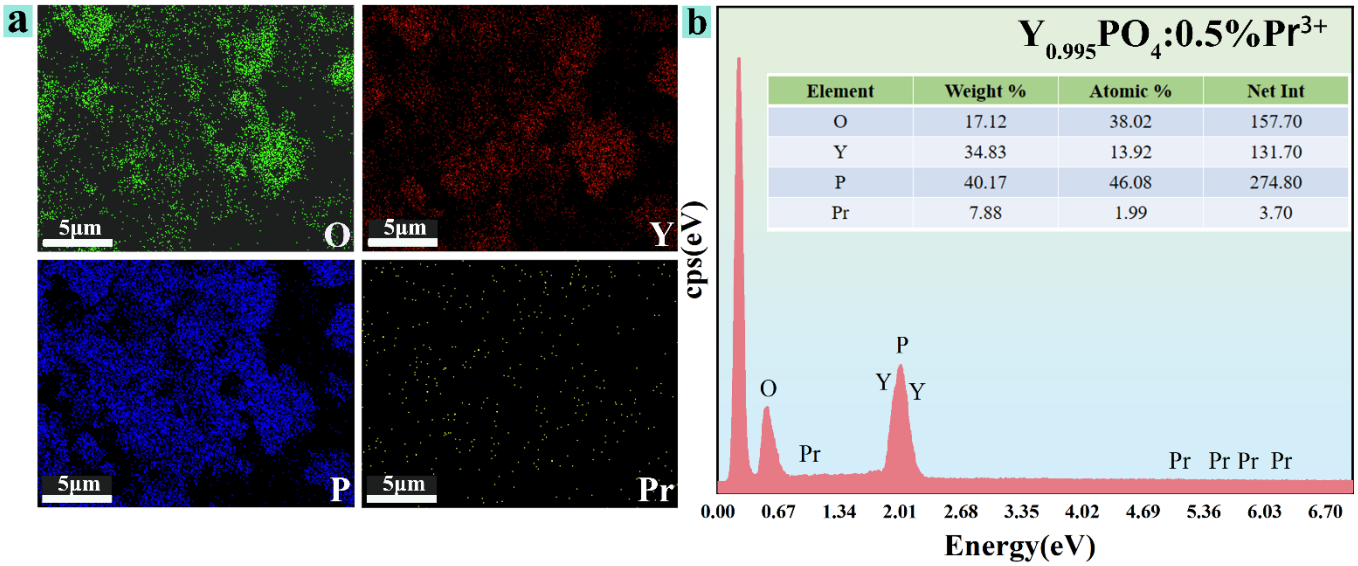

Figure S2. (a) The elemental mapping analysis images of O, Y, P, and Pr. (b) The EDS spectrum of $Y_{0.995}PO_4$:0.5% Pr^{3+}.

Figure S3

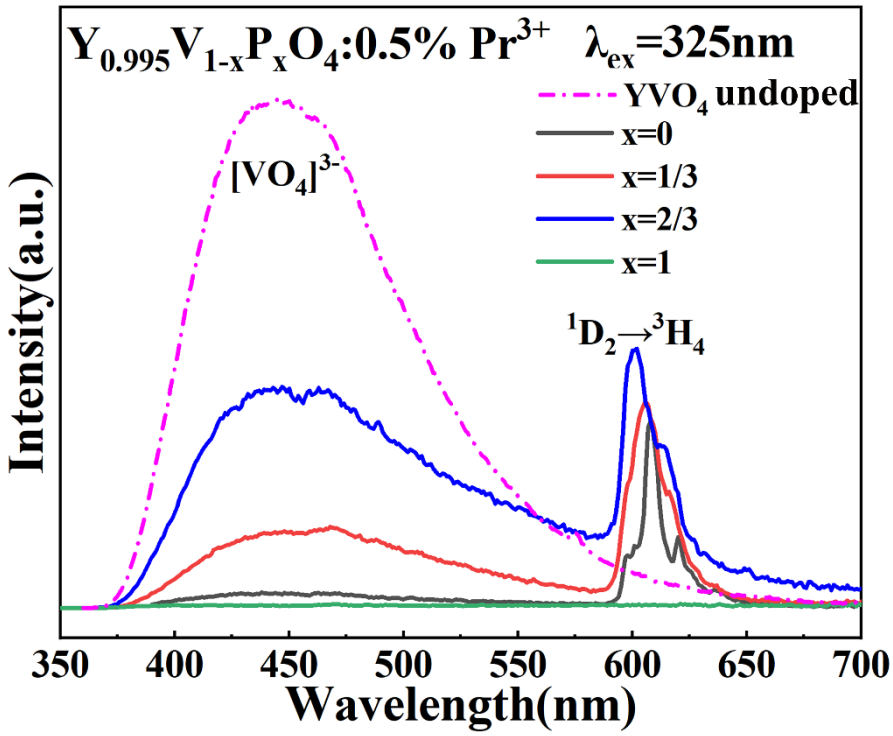

Figure S3. PL spectra of YVO_4 and $Y_{0.995}V_{1-x}P_xO_4$:0.5%Pr^{3+} (x = 0, 1/3, 2/3, 1) (λ_{ex} = 325 nm).

Figure S4

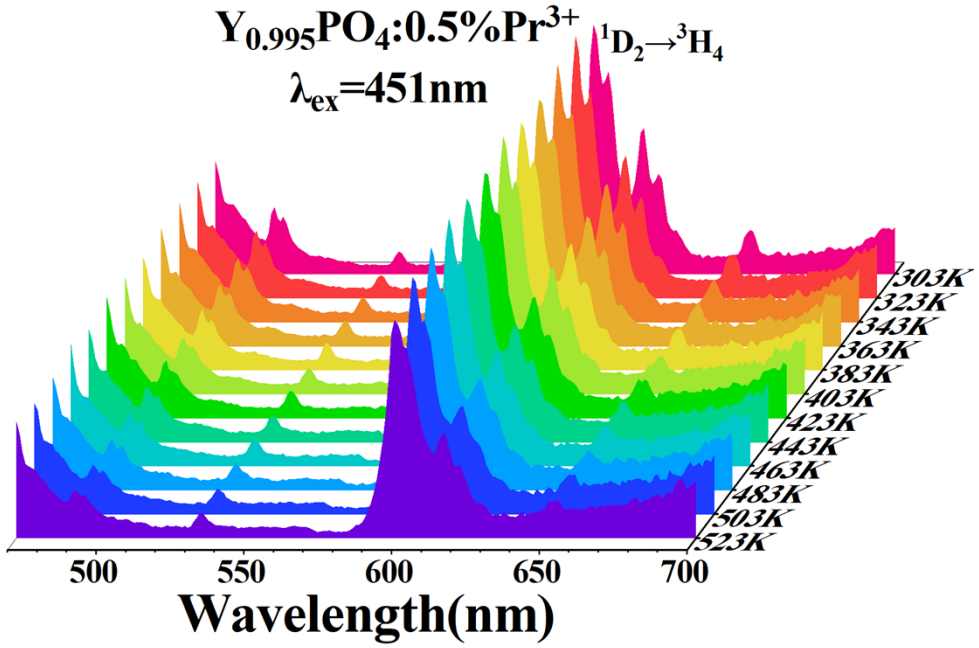

Figure S4. Temperature-dependent PL spectra of $Y_{0.995}PO_4$:0.5% Pr^{3+} under excitation at 451 nm.

Figure S5

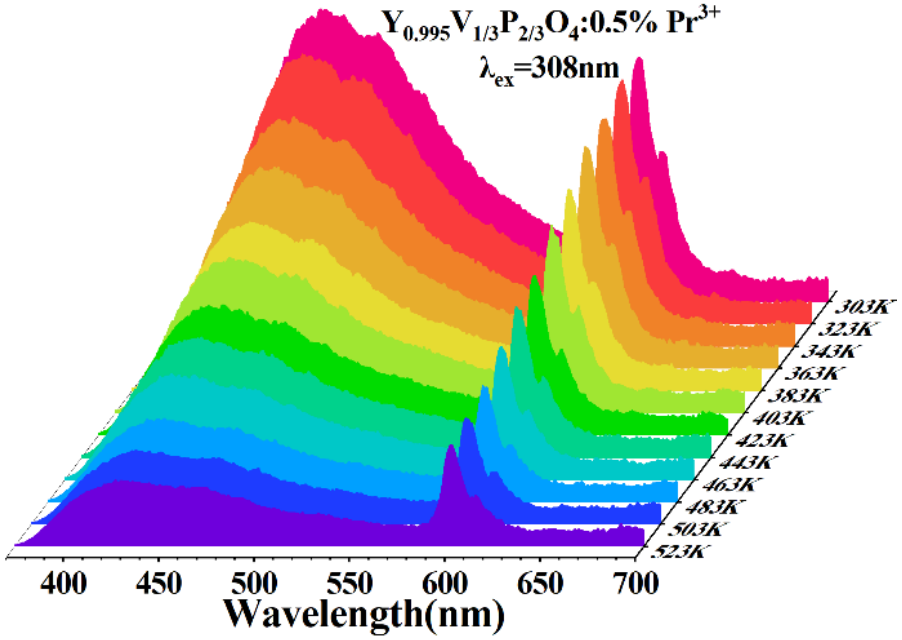

Figure S5. Temperature-dependent PL spectra of $Y_{0.995}V_{1/3}P_{2/3}O_4$:0.5%$Pr^{3+}$ under excitation at 308 nm.

Figure S6

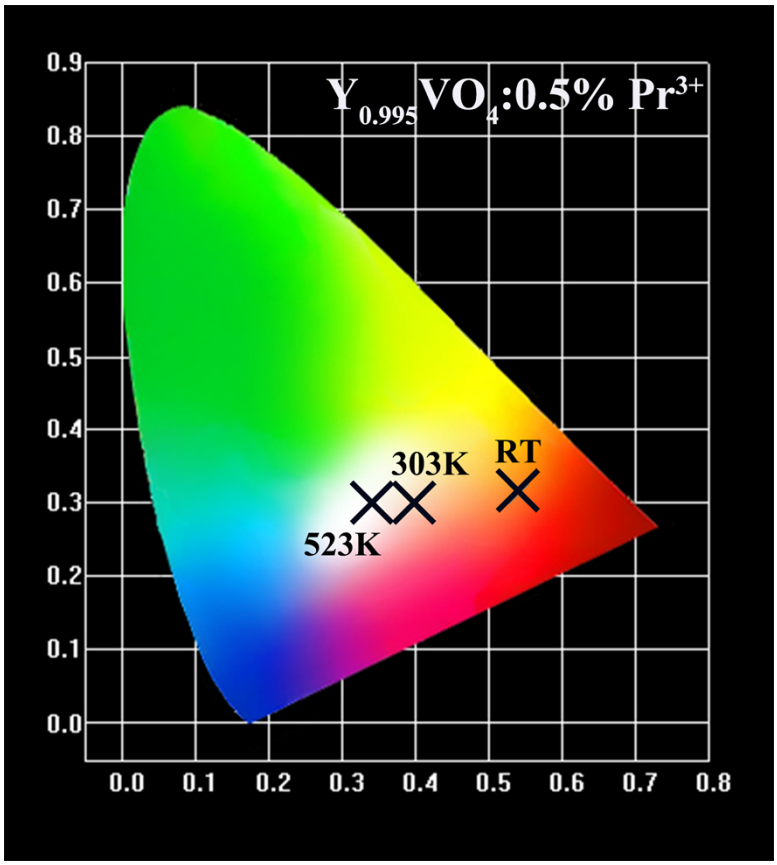

Figure S6. CIE chromaticity diagram of $Y_{0.995}VO_4$:0.5% Pr^{3+} at various temperatures (T = RT, 303K, 523K).

Figure S7

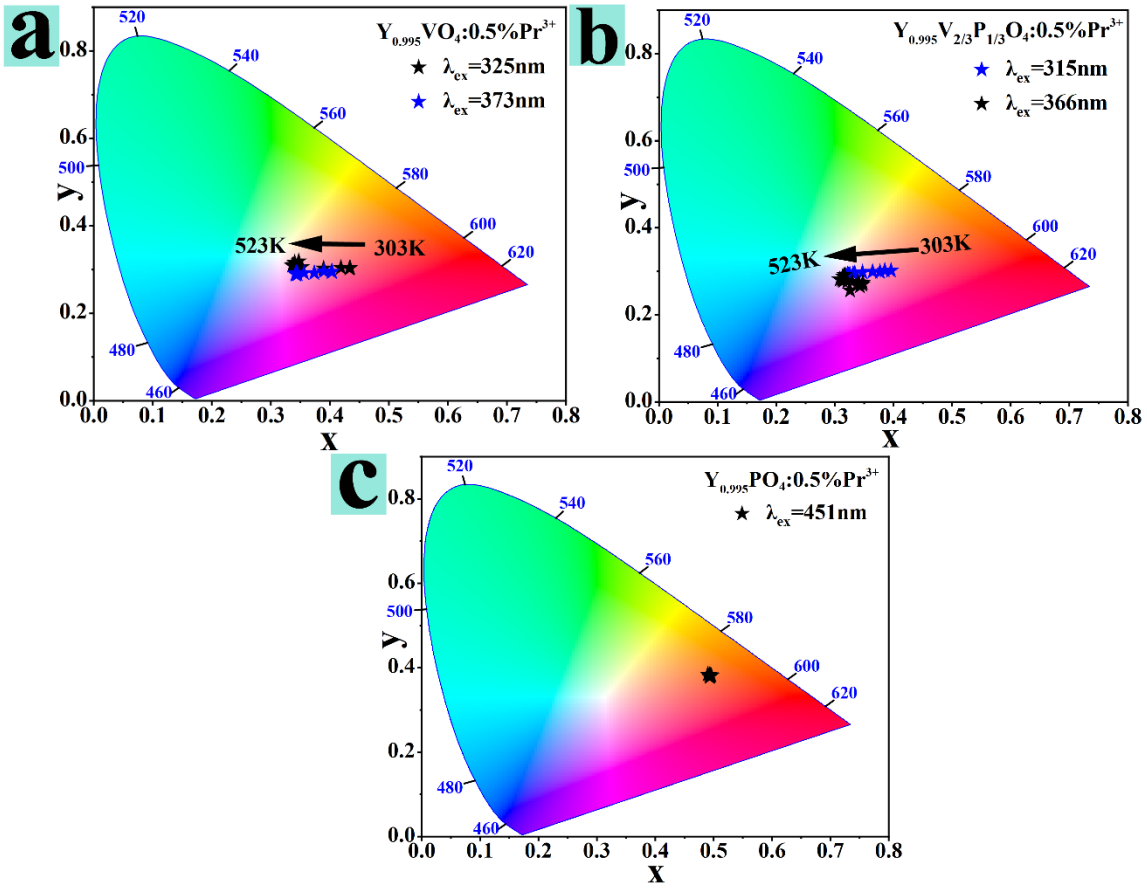

Figure S7. CIE chromaticity diagram of $Y_{0.995}V_{1-x}P_xO_4$:0.5%Pr^{3+} at various temperatures (T = 303K-523K). (a) x = 0. (b) x = 1/3. (c) x = 1.

Figure S8

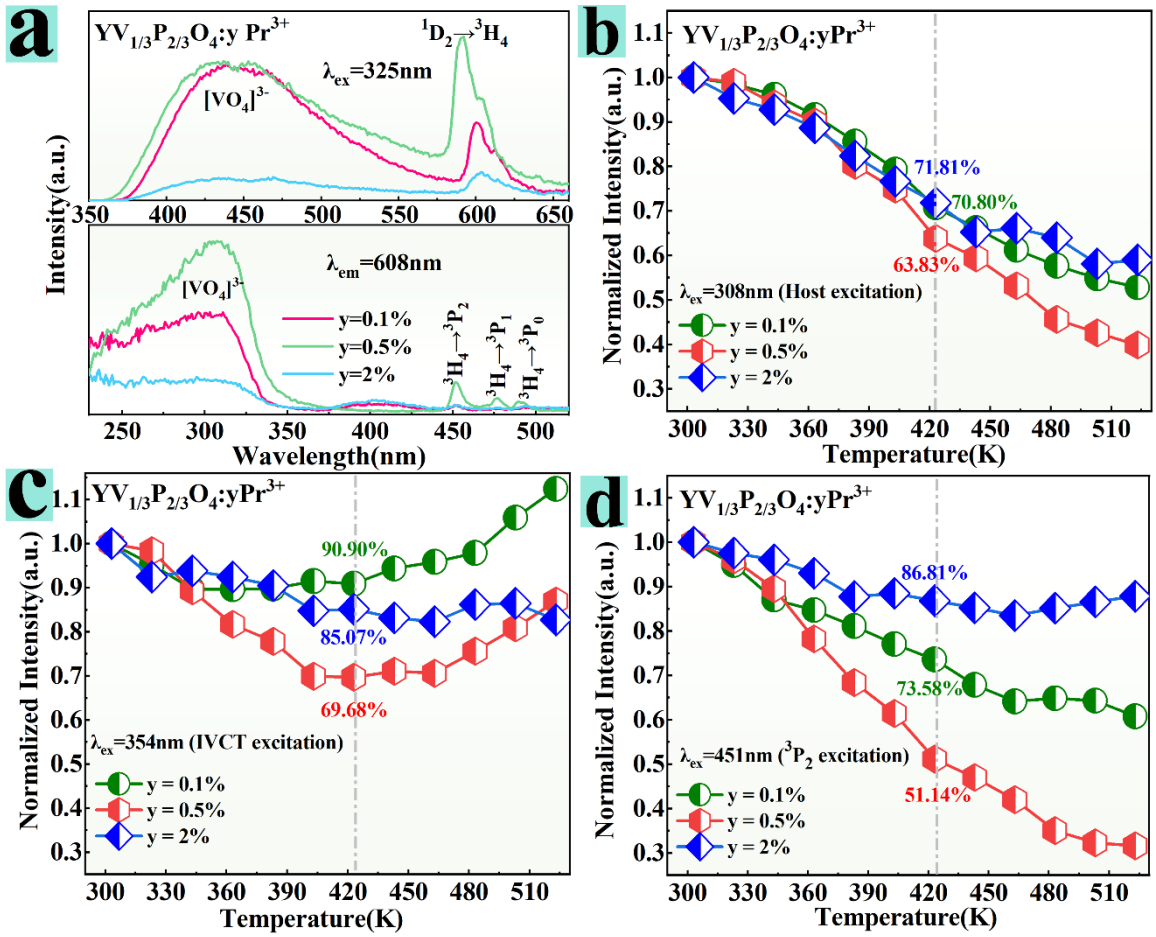

Figure S8. (a) PL and PLE spectra of $YV_{1/3}P_{2/3}O_4$:yPr^{3+} (y = 0.1%, 0.5%, 2%) (λ_{ex} = 325 nm, λ_{em} = 608 nm). Temperature behavior of the integrated intensity of $^1D_2$ emission of $YV_{1/3}P_{2/3}O_4$:yPr^{3+} (y = 0.1%, 0.5%, 2%) under excitation of (b) the host excitation , (c) the IVCT and (d) the $^3P_2$ excitation.

Figure S9

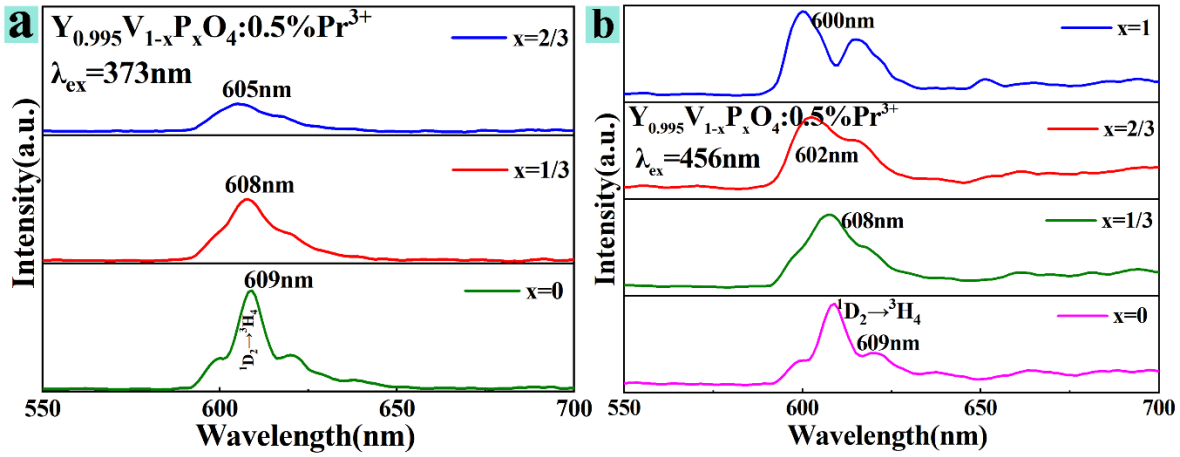

Figure S9. (a) PL spectra of $Y_{0.995}V_{1-x}P_xO_4$:0.5%Pr^{3+} (x = 0, 1/3, 2/3) (λ_{ex} = 373 nm). (b) PL spectra of $Y_{0.995}V_{1-x}P_xO_4$:0.5%Pr^{3+} (x = 0, 1/3, 2/3,1) (λ_{ex} = 456 nm).

Table S1. Relevant Rietveld Refinement Parameters and Crystallographic Data.

Parameter	X=0	X=1/3	X=2/3	X=1
Space group	I41/amd	I41/amd	I41/amd	I41/amd
a (Å)	7.115	7.114	6.967	6.880
b (Å)	7.115	7.114	6.967	6.880
c (Å)	6.286	6.286	6.115	6.018
α (deg)	90	90	90	90
β (deg)	90	90	90	90
γ (deg)	90	90	90	90
V (Å3)	318.185	318.116	296.796	284.873
units, z	4	4	4	4
Rp (%)	4.07	4.99	4.06	4.62
Rwp (%)	6.92	8.32	5.67	6.62
χ^2	3.03	3.66	2.71	3.04