

Electronic supplementary information (ESI)

Morphological Control and Luminescence Properties of Lanthanide Orthovanadate LnVO_4 (Ln = La to Lu) Nano-/Microcrystals via Hydrothermal Process

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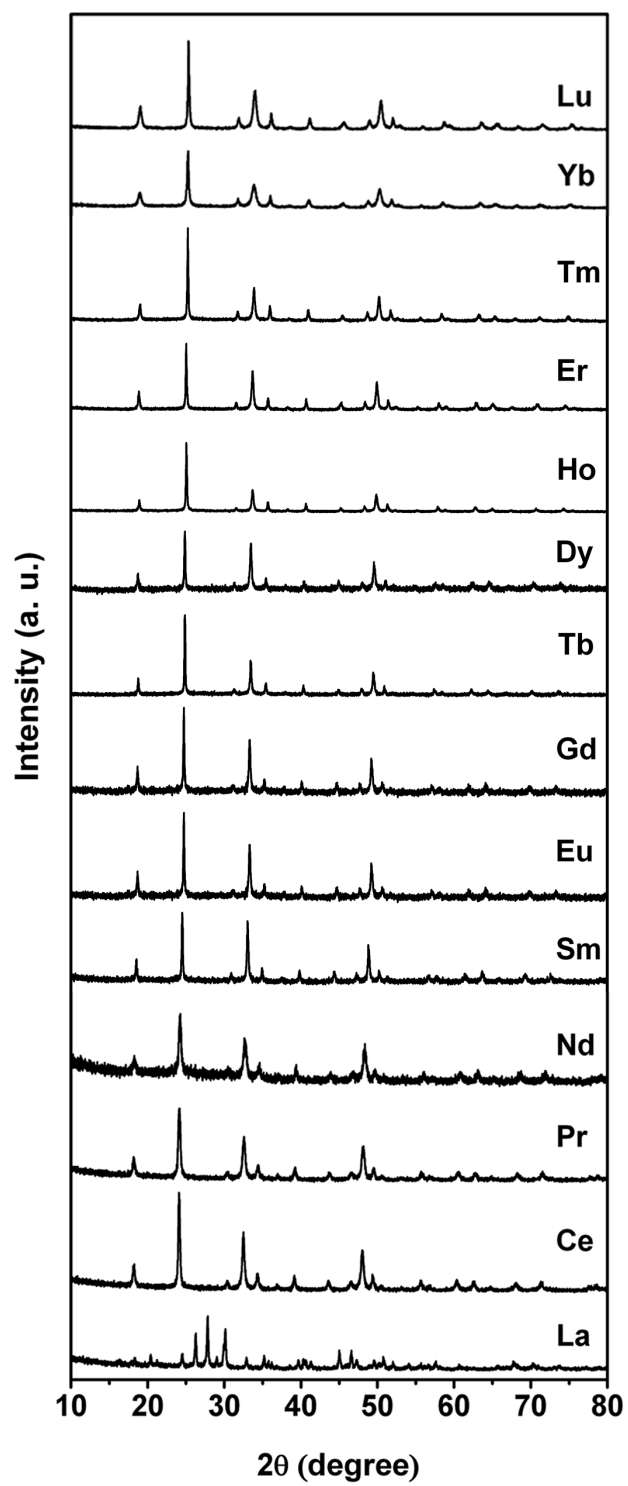


Fig. S1. The XRD patterns of the as-prepared lanthanide vanadates.

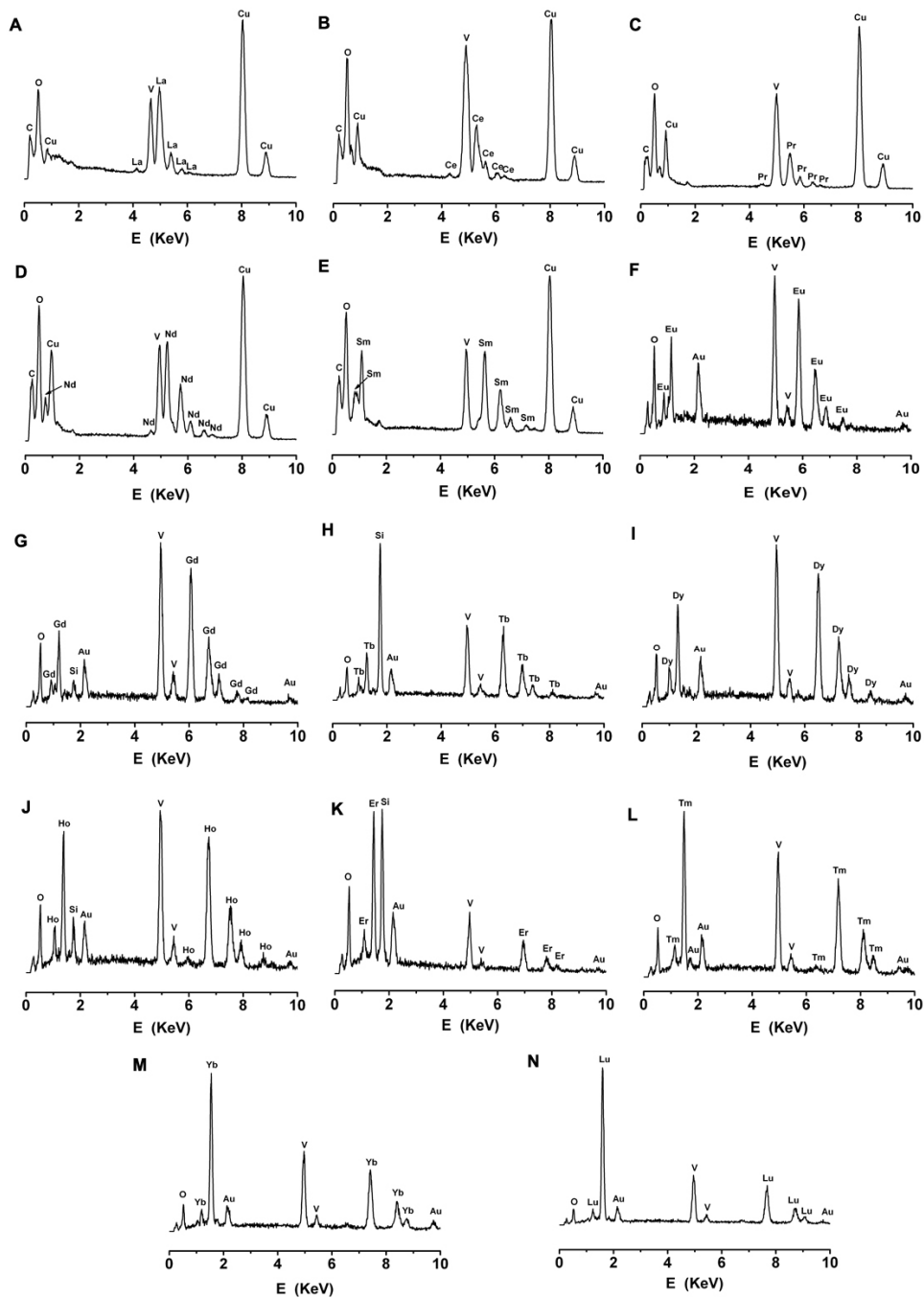


Fig. S2. The energy-dispersive X-ray (EDX) spectroscopic analysis of the as-prepared LnVO_4 products (A) LaVO_4 , (B) CeVO_4 , (C) PrVO_4 , (D) NdVO_4 , (E) SmVO_4 , (F) EuVO_4 , (G) GdVO_4 , (H) TbVO_4 , (I) DyVO_4 , (J) HoVO_4 , (K) ErVO_4 , (L) TmVO_4 , (M) YbVO_4 , and (N) LuVO_4 . (The C, Cu, Au and Si peaks arising from measurement).

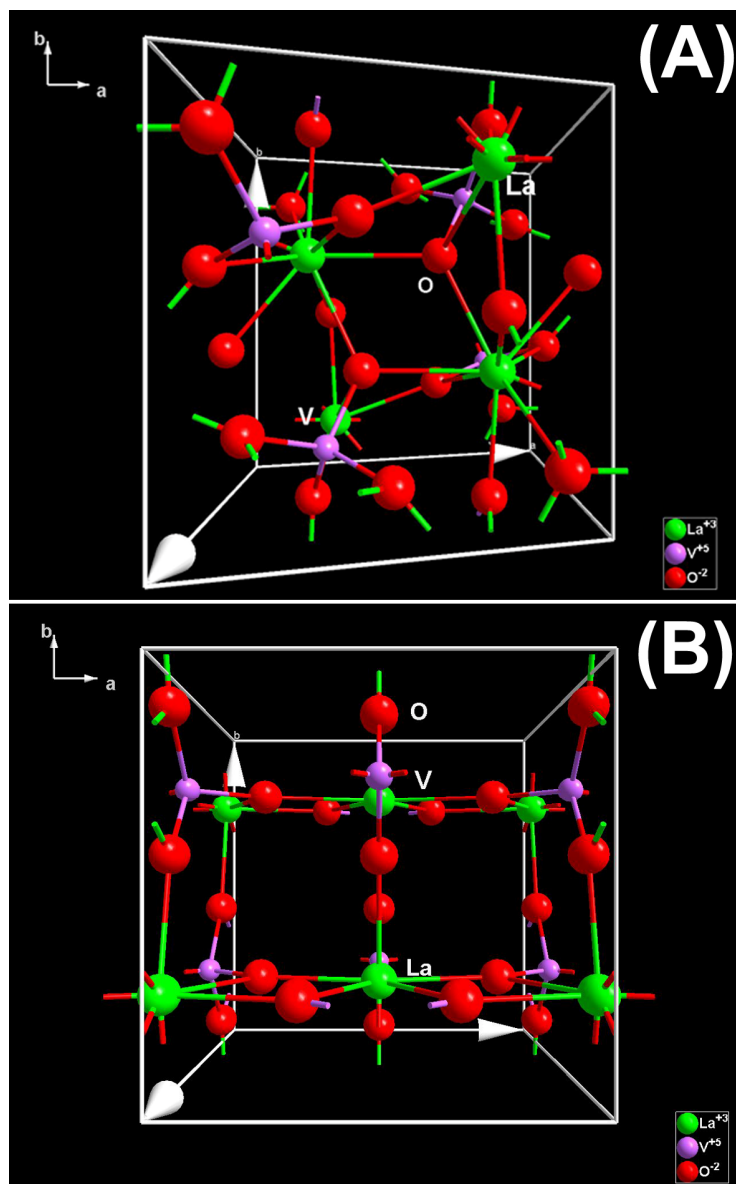


Fig. S3. Simulated crystal structures of (A) m-LaVO₄ and (B) t-LaVO₄.

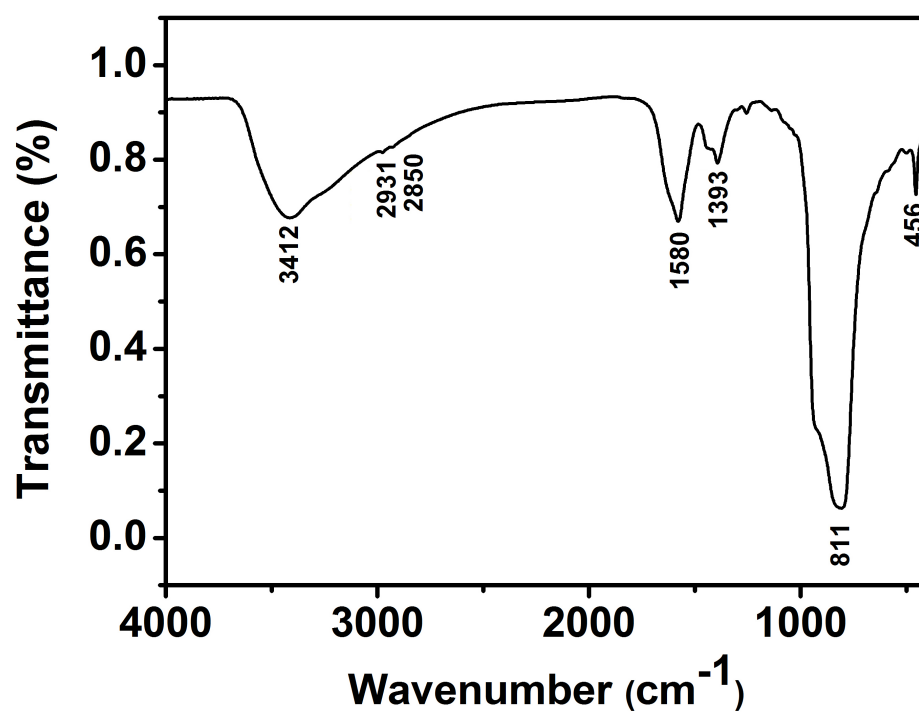


Fig. S4. The FT-IR spectrum of LuVO₄ sample.

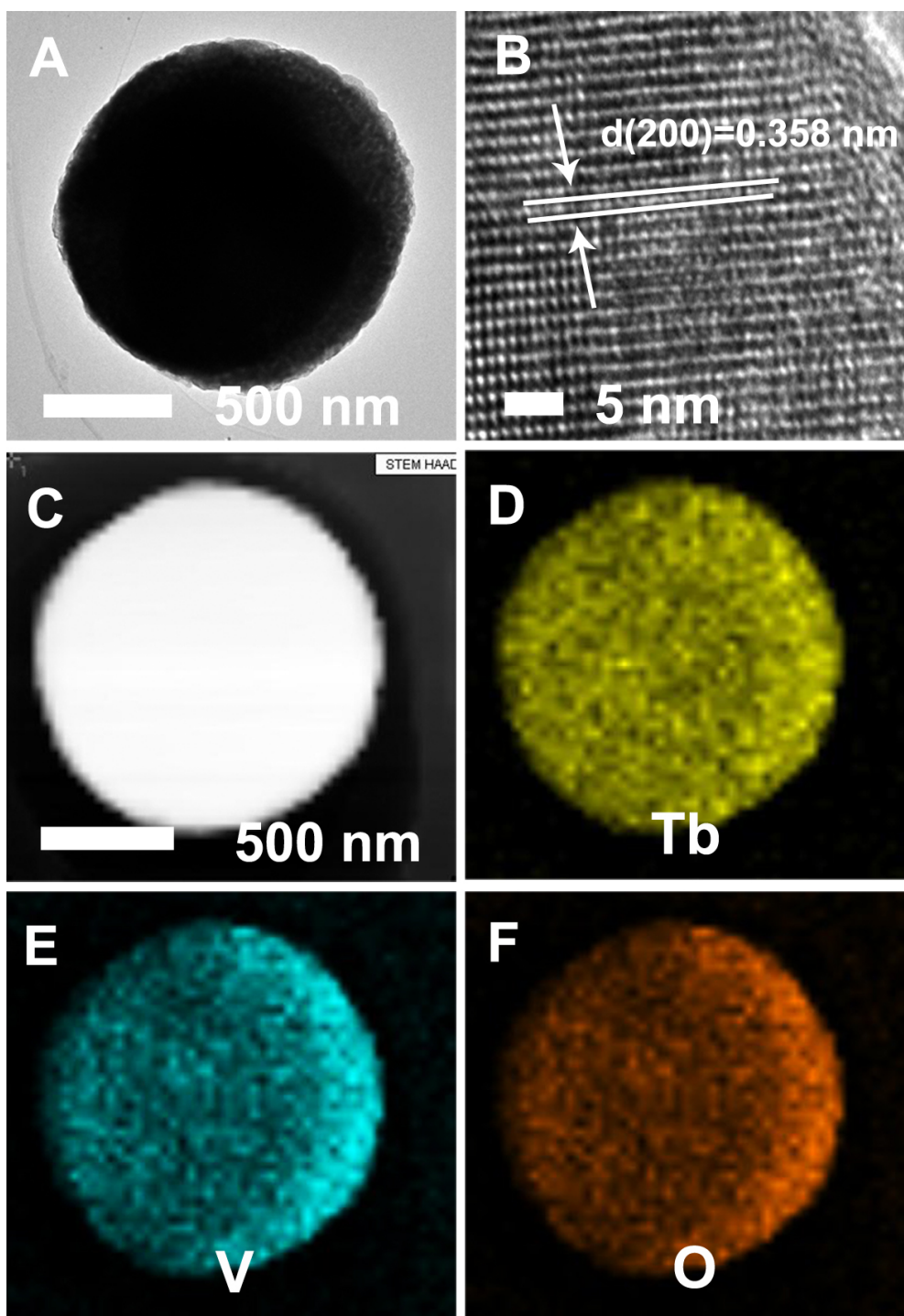


Fig. S5. (A) TEM, (B) HRTEM, and (C) STEM images of TbVO₄ sample, and the corresponding elemental maps for (D) Tb, (E) V, and (F) O.

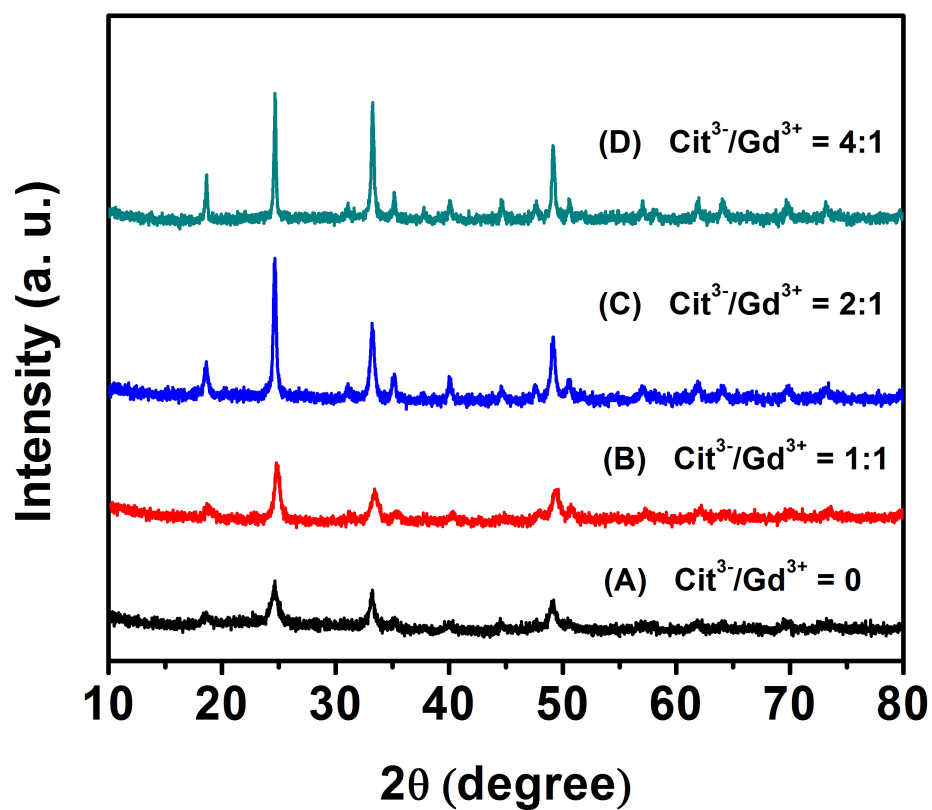


Fig. S6. XRD patterns of as-prepared GdVO₄ samples obtained with different molar ratio of Cit³⁻/Gd³⁺ under otherwise equal reaction conditions.

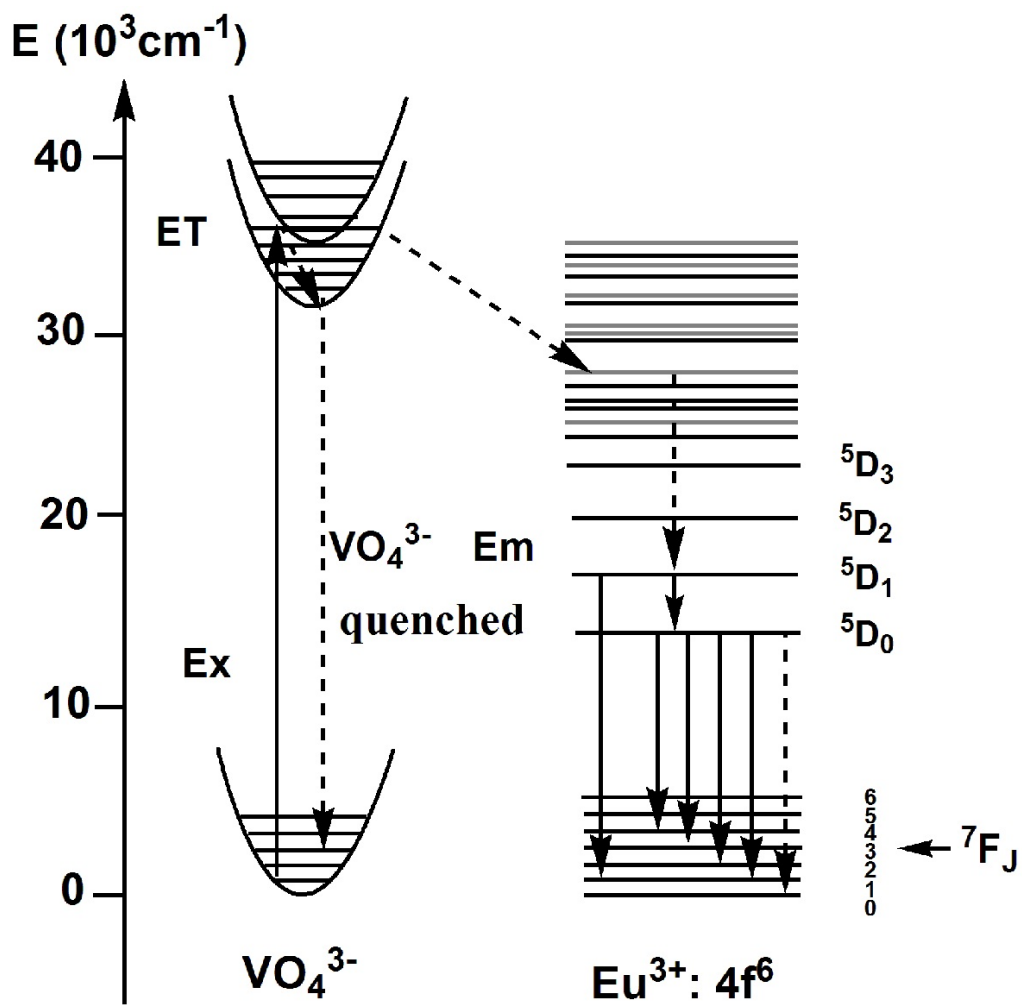


Fig. S7. The scheme for VO_4^{3-} - Eu^{3+} energy transfer and Eu^{3+} emission process.

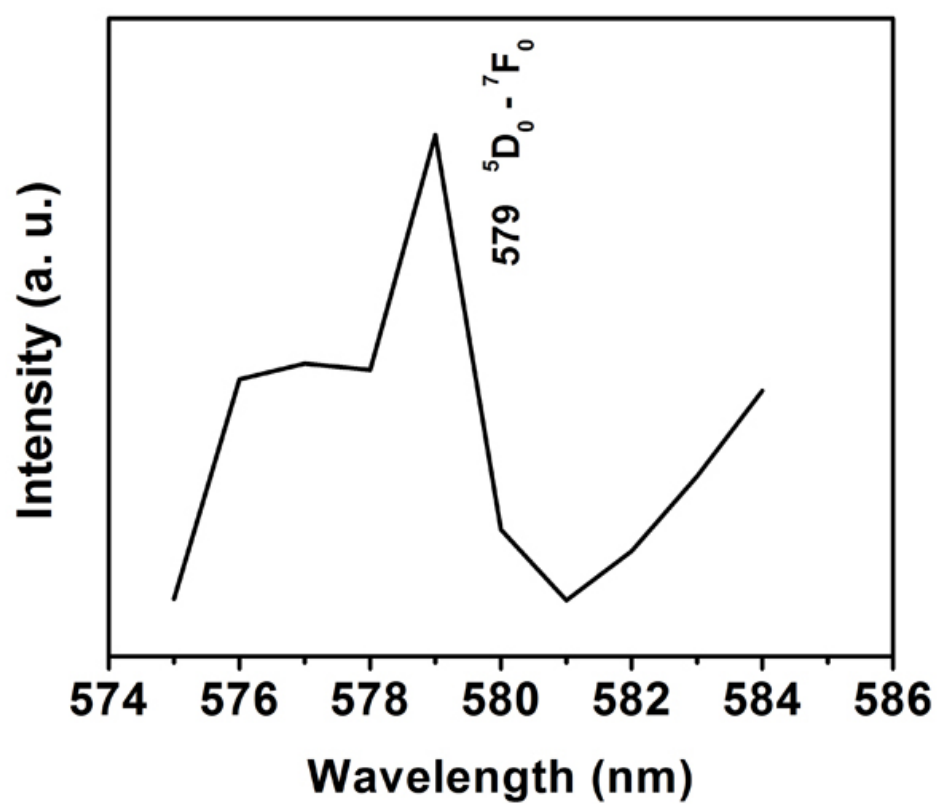


Fig. S8. Enlarged luminescence spectrum of LuVO₄:Eu³⁺ showing ${}^5D_0 \rightarrow {}^7F_0$ transition.

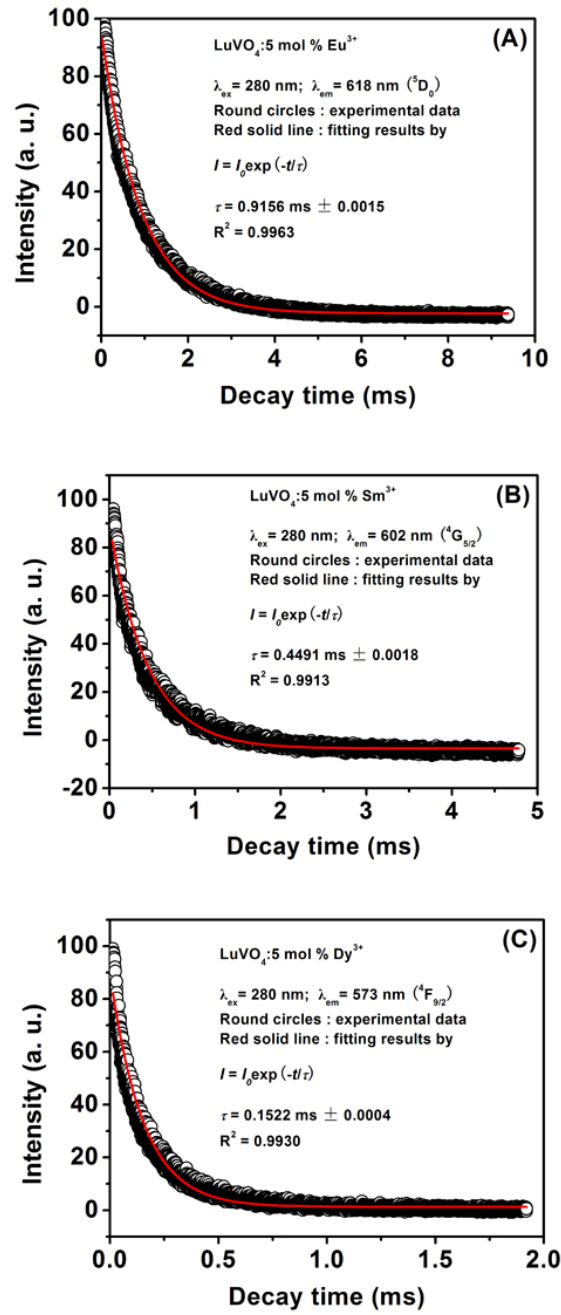


Fig. S9. Fluorescence decay curves of the samples: (A) LuVO₄: 5 mol % Eu³⁺, (B) LuVO₄: 5 mol % Sm³⁺, (C) LuVO₄: 5 mol % Dy³⁺.

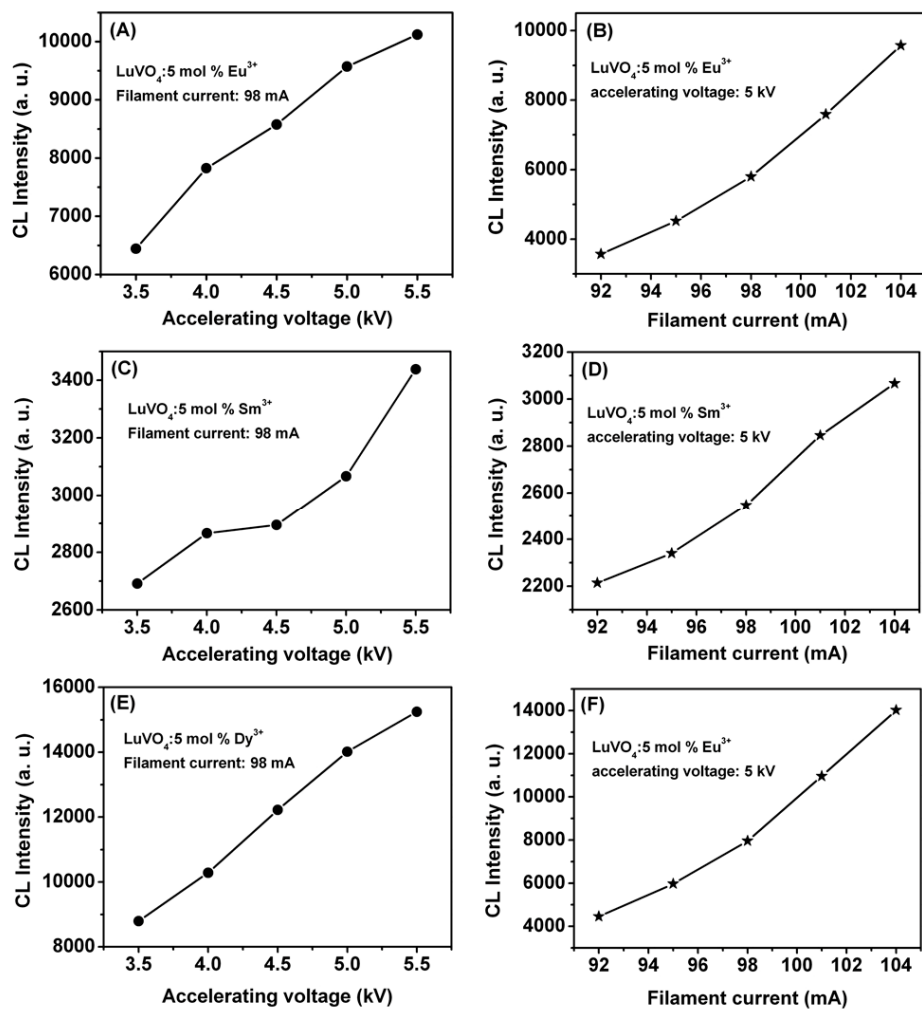


Fig. S10. Cathodoluminescence intensity of $\text{LuVO}_4:5 \text{ mol \% Ln}^{3+}$ ($\text{Ln} = \text{Eu, Sm, Dy}$) samples as a function of accelerating voltage (A, C, E) and filament current (B, D, F).

TABLE S1. The Summary of the PL quantum efficiency and CIE Chromaticity Coordinates of Samples (a-n).

Sample	PL quantum efficiency	CIE Chromaticity (x)	Coordinates (y)
a.	6.0%	0.1512	0.1315
b.	37.0%	0.1734	0.1452
c.	57.5%	0.3285	0.1752
d.	62.8%	0.4211	0.2236
e.	65.8%	0.5687	0.3024
f.	72.1%	0.6164	0.3210
g.	40.3%	0.3603	0.1924
h.	45.5%	0.4136	0.2010
i.	58.0%	0.5103	0.2532
j.	68.5%	0.6572	0.3123
k.	39.4%	0.2029	0.1902
l.	43.1%	0.2082	0.2028
m.	48.6%	0.2319	0.2503
n.	55.0%	0.2411	0.2645

Table S2. A comparison of Energy, Fwhm, and Stark Splitting of LuVO₄:Ln³⁺ (Ln = Eu, Sm, and Dy) in PL spectra and CL spectra.

		PL spectra			CL spectra		
		energy	fwhm	stark splitting	energy	fwhm	stark splitting
LuVO ₄ :Eu ³⁺	⁵ D ₁ → ⁷ F ₁	538 nm	2 nm	1	538 nm	7 nm	1
	⁵ D ₀ → ⁷ F ₁	589, 593 nm	3 nm	2	594 nm	7 nm	1
	⁵ D ₀ → ⁷ F ₂	619 nm	6 nm	3	617 nm	8 nm	1
	⁵ D ₀ → ⁷ F ₃	651 nm	7 nm	1	651 nm	15 nm	1
	⁵ D ₀ → ⁷ F ₄	703 nm	3 nm	2	698 nm	13 nm	1
LuVO ₄ :Sm ³⁺	⁴ G _{5/2} → ⁶ H _{5/2}	565 nm	9 nm	2	564 nm	13 nm	2
	⁴ G _{5/2} → ⁶ H _{7/2}	603 nm	7 nm	2	603 nm	13 nm	3
	⁴ G _{5/2} → ⁶ H _{9/2}	647 nm	7 nm	2	646 nm	10 nm	2
	⁴ G _{5/2} → ⁶ H _{11/2}	707 nm	30 nm	1	706 nm	27 nm	1
LuVO ₄ :Dy ³⁺	⁴ F _{9/2} → ⁶ H _{15/2}	482 nm	14 nm	1	482 nm	13 nm	1
	⁴ F _{9/2} → ⁶ H _{13/2}	573 nm	9 nm	1	574 nm	9 nm	1
	⁴ F _{9/2} → ⁶ H _{11/2}	662 nm	13 nm	1	662 nm	31 nm	1