

Supporting information

Size-induced variations in bulk/surface structures and their impacts on photoluminescence properties of $\text{GdVO}_4:\text{Eu}^{3+}$ nanoparticles

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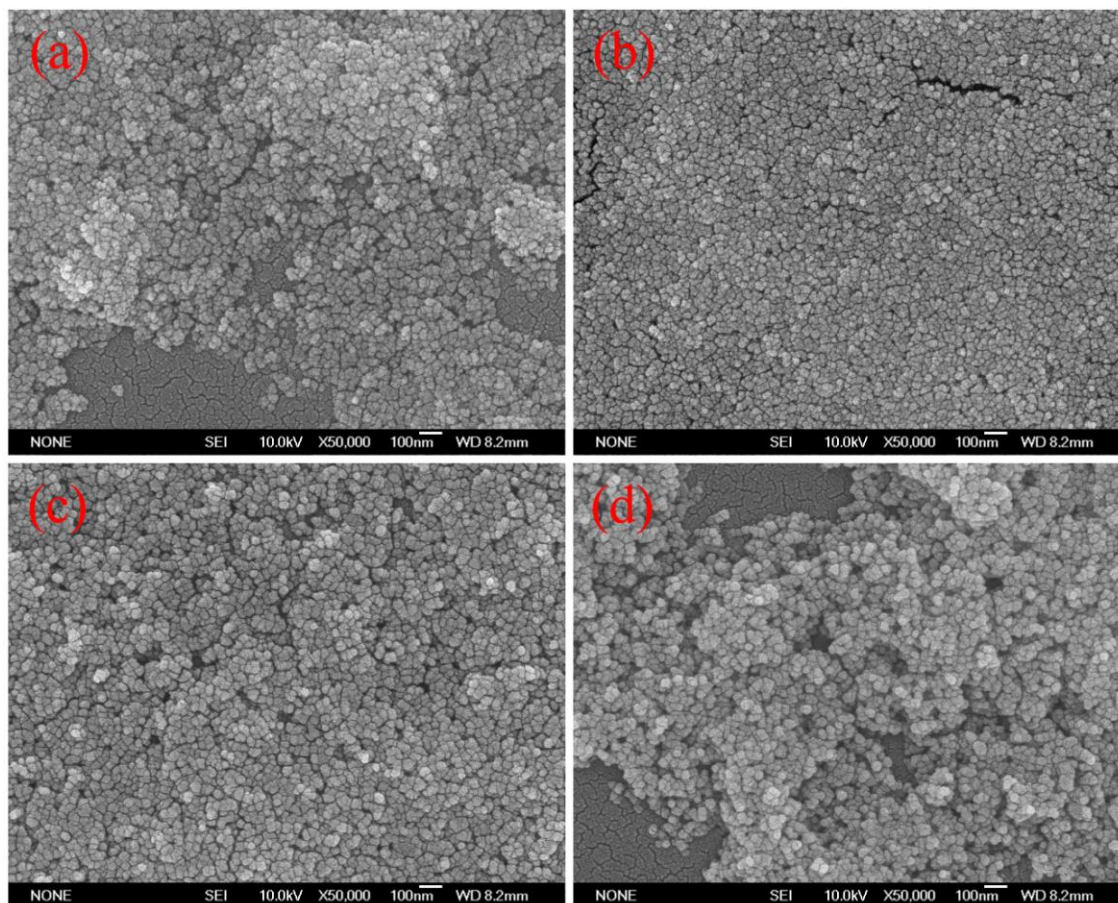


Figure S1. SEM images of the $\text{GdVO}_4:\text{Eu}^{3+}$ ellipsoidal-like nanoparticles prepared at different hydrothermal temperatures: (a) 120, (b) 160, (c) 180, and (d) 220 °C for 12 h.

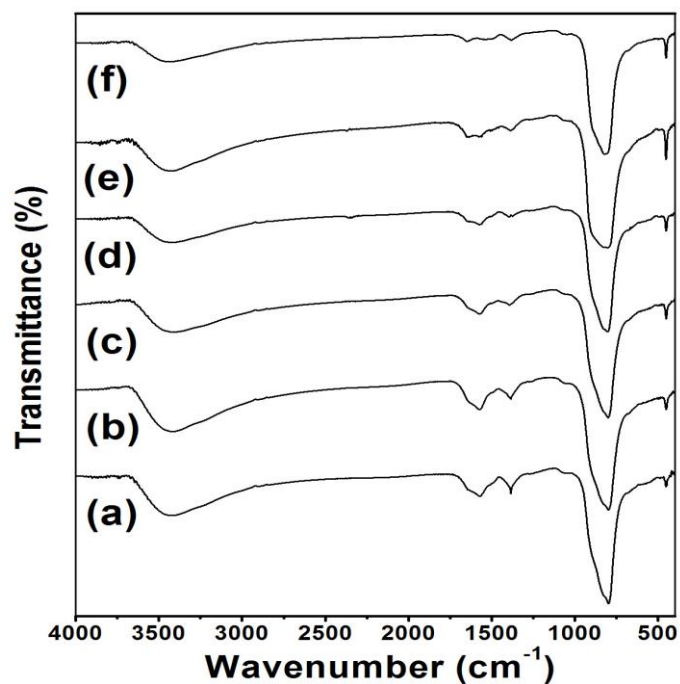


Figure S2. FT-IR spectra of the GdVO₄:Eu³⁺ samples prepared at different hydrothermal temperatures: (a) 120, (b) 140, (c) 160, (d) 180, (e) 200, and (f) 220 °C.

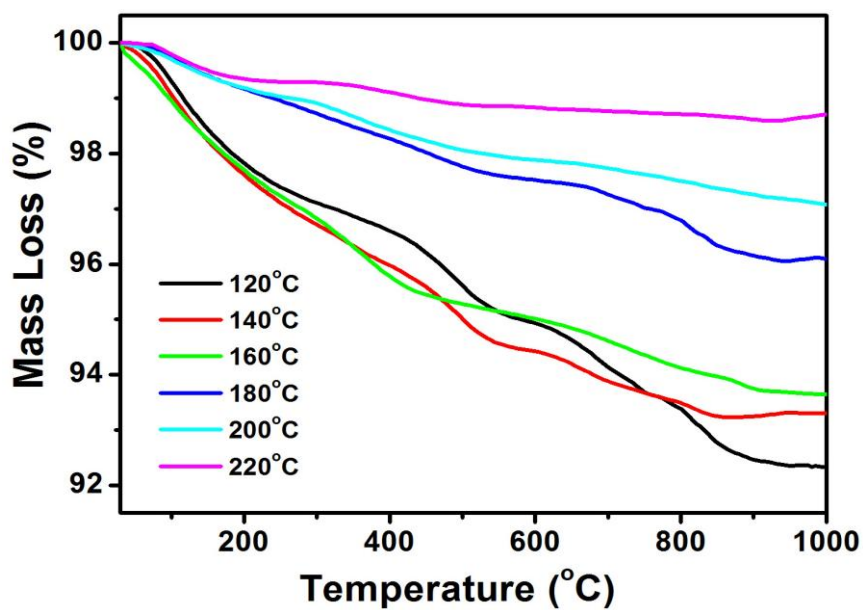


Figure S3. TG curves of the GdVO₄:Eu³⁺ samples prepared at different hydrothermal temperatures.

Table S1. The fit parameters are by Rietveld refinement.

Temp. (°C)	R _p (%)	R _{wp} (%)	χ^2	Slope (%)	Errors (±%)	Weight Loss (%)
120	8.358	11.059	1.158	0.634	0.13	7.59
140	8.494	11.183	1.178	0.568	0.12	6.76
160	8.625	11.377	1.165	0.447	0.09	6.23
180	8.255	11.059	1.125	0.389	0.014	3.93
200	8.532	11.487	1.203	0.307	0.02	2.89
220	8.743	11.760	1.273	0.288	0.021	1.41

Table S2. Colour coordinates (CIE), Judd-Ofelt (J-O) parameters (Ω_2) lifetime (τ), asymmetric ratio (I_{02}/I_{01}), integrated emission intensity (5D_0 - 7F_2), underlying quantum efficiency ($\eta\%$) and band energy (E_g) of different crystallite sizes.

Crystallite Size (nm)	I ₀₂ /I ₀₁	Ω_2 ($\times 10^{-20} \text{ cm}^2$)	CIE		τ (ms)	5D_0 - 7F_2	$\eta(\%)$	E _g /eV
			x	y				
14.4	3.844	8.32	0.458	0.355	1.097	0.280	31.43	3.74
14.9	3.854	8.34	0.465	0.357	1.121	0.362	32.91	3.71
15.2	3.898	8.44	0.480	0.359	1.177	0.481	34.30	3.67
17.0	4.020	8.70	0.495	0.359	1.221	0.689	36.11	3.64
22.2	4.052	8.77	0.510	0.356	1.324	0.974	38.81	3.60
24.7	4.157	9.00	0.512	0.352	1.458	1	43.11	3.56

Table S3. Lifetime values obtained after the double-exponential fitting and the single-exponential fitting to the data of GdVO₄:Eu³⁺ ellipsoidal-like nanoparticles of different crystallite sizes.

Crystallite Size (nm)	Double-exponential fitting						Single-exponential	
	τ_1 (ms)	A ₁	τ_2 (ms)	A ₂	τ (ms)	R ²	τ' (ms)	R' ²
14.4	1.362	136	0.598	71	1.097	0.9965	1.028	0.9950
14.9	1.201	208	0.457	66	1.121	0.9981	1.037	0.9957
15.2	1.271	295	0.513	104	1.177	0.9987	1.082	0.9973
17.0	1.317	453	0.608	154	1.221	0.9991	1.136	0.9981
22.2	1.515	534	0.896	402	1.324	0.9995	1.232	0.9987
24.7	2.164	785	1.114	197	1.458	0.9995	1.278	0.9993