Electronic Supplementary Material (ESI) for Inorganic Chemistry Frontiers.

Supporting Information

Utilizing diametrically reverse thermal quenching luminescence to achieve highly sensitive temperature measurement and anti-counterfeiting

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Table S1 The lattice parameters and the refinement results of $CaYGaO_4$.

$CaYGaO_4$	
Crystal system	orthorhombic phase
Space group	Pnma (62)
Lattice parameters (Å)	a= 11.34193(3) Å b= 6.5871(2) Å c= 5.2865(2) Å $\alpha = \beta = \gamma = 90^o$
Unit cell volume ($Å^3$)	V = 394.9626(2) $Å^3$
R_p	4.19%
R_{wp}	3.22%
χ^2	2.13

Table S2 Ionic radii of different ligands in the host cations

Ion	**Coordination number**	**r(Å)**	**D_r**
Ca^{2+}	8	1.12	11.6%(Eu^{2+}) 4.46%(Eu^{3+}) 7.14%(Tb^{3+})
Y^{3+}	8	1.019	22.67%(Eu^{2+}) 5.00%(Eu^{3+}) 2.06%(Tb^{3+})
Ga^{3+}	6	0.62	--
Eu^{2+}	8	1.25	--
Eu^{3+}	8	1.07	--
Tb^{3+}	8	1.04	--

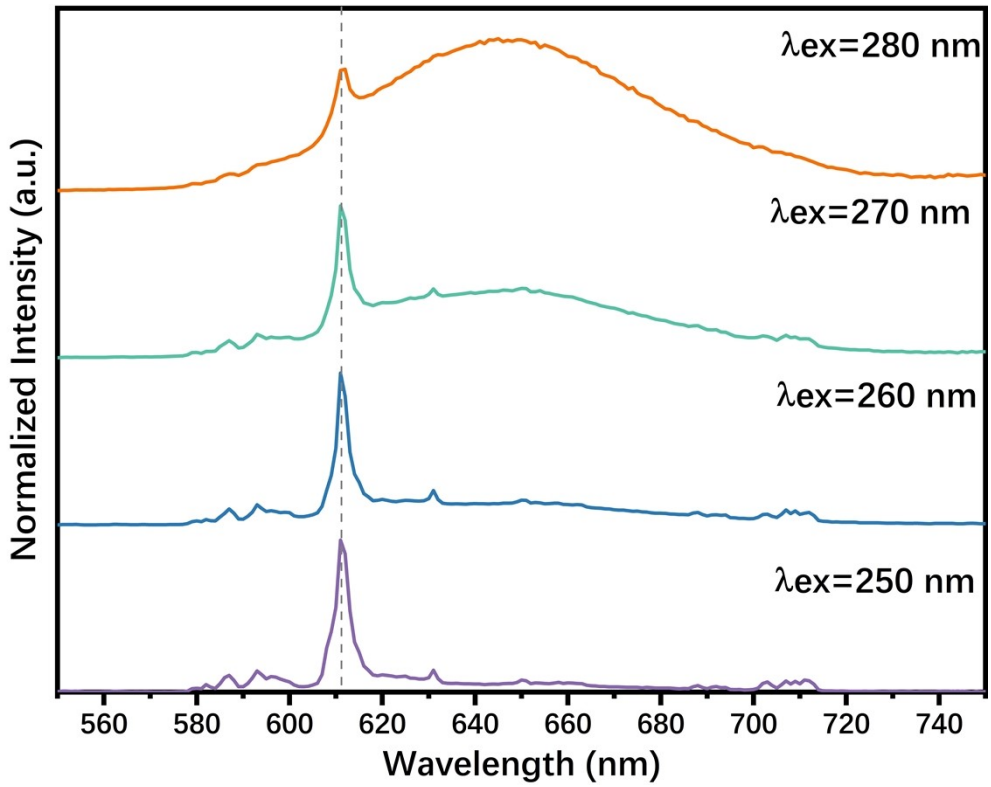

Fig. S1 PL spectra of CYGO:Eu^{2+}/Eu^{3+} under 250, 260, 270 and 280 nm wavelength excitation.

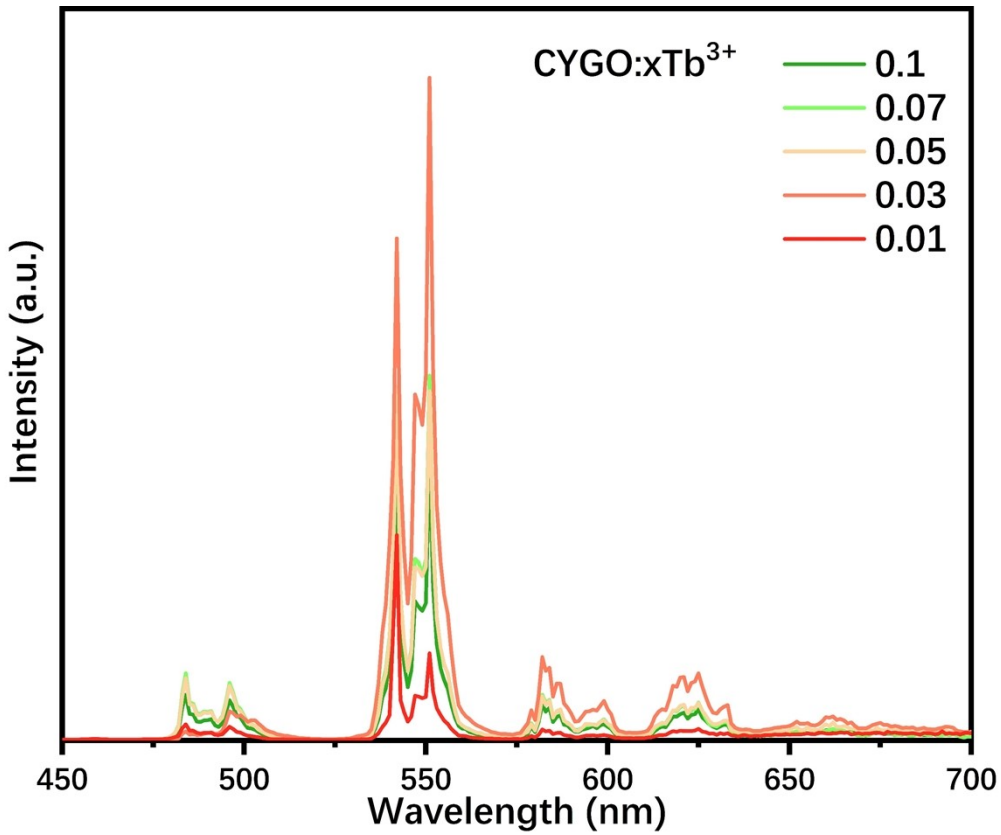

Fig. S2 PL spectra of CYGO:xTb^{3+} (x = 0.01, 0.02, 0.05, 0.07 and 0.1) under 270 nm wavelength excitation.

Table S3 The calculated CIE(x,y) values for CYGO:Eu^{2+}/Eu^{3+} and CYGO:Eu^{3+}/Tb^{3+} under different temperatures

Temperature	CIE (CYGO:Eu^{2+}/Eu^{3+})	CIE (CYGO:Eu^{3+}/Tb^{3+})
300 K	(0.6675,0.3322)	(0.3972,0.5236)
330 K	(0.665,0.3348)	(0.4056,0.5167)
360 K	(0.6616,0.3381)	(0.4178,0.506)
390 K	(0.6578,0.3419)	(0.4324,0.4937)
420 K	(0.6547,0.3449)	(0.449,0.4801)
450 K	(0.6508,0.3488)	(0.4723,0.4604)
480 K	(0.6476,0.3521)	(0.4887,0.447)
510 K	(0.6449,0.3547)	(0.5042,0.434)
540 K	(0.6423,0.3573)	(0.5182,0.4223)
570 K	(0.6403,0.3593)	(0.529,0.4137)

Table S4 The calculated CIE(x,y) values for CYGO:Eu^{2+}/Eu^{3+} and CYGO:Eu^{3+}/Tb^{3+} under different excitation wavelengths

Excitation wavelength	CIE (CYGO:Eu^{2+}/Eu^{3+})	CIE (CYGO:Eu^{3+}/Tb^{3+})
240 nm	(0.6522,0.3475)	(0.5318,0.4553)
250 nm	(0.6556,0.3441)	(0.5344,0.4562)
260 nm	(0.663,0.3368)	(0.48,0.5072)
270 nm	(0.6741,0.3256)	(0.4208,0.5632)
280 nm	(0.6809,0.3189)	(0.4036,0.58)
290 nm	(0.6824,0.3174)	(0.4024,0.5818)