Electronic Supplementary Information (ESI)

Utilizing energy transfer mechanism to realize color tunable luminescence

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1. Measurements and Characterization

The XRD analysis was carried out by Rigaku SmartLab 9 KW (40 KV, 150 mA) diffractometer with graphite-monochromated CuK$_\alpha$ characteristic radiation (λ = 1.54059 A), the range of 2θ is 5−75° (0.02° per step). Structural refinement follows the Riet Vary approach with Common Structural Analysis System (GSAS) procedures. A field emission scanning electron microscope (SEM, Carl Zeiss AG) was used to perform shoot the element mappings. Solid-state ultraviolet−visible absorption spectra (UV-Vis) was measured using a spectrophotometer of Hitachi UH4150 in the range of 200−600 nm. Photoluminescence (PL) spectra and photoluminescence excitation (PLE) spectra were recorded by a FLS1000 Edinburgh Analytical Instrument apparatus. The steady−state measurements were carried out by using the standard 450 W xenon lamps as the excitation source. The PL and PLE spectra were measured by step width 1 nm and integration time 0.2 s. An Edinburgh FLS1000 fluorescence spectrometer equipped with a 365 nm diode laser was used to record the luminescence decay curves at room temperature and the temperature dependent decay curves of phosphors. The internal quantum yield (IQY) was determined by barium sulfate coated integration sphere as a reflectance standard on the same instrument. The temperature dependent emission spectra were measured by high temperature samples detection attachment, which was combined with the FLS1000 Edinburgh.

Table S1. Rietveld refinement of $SrLaGa_3O_7$:$x$$Bi^{3+}$ (x = 0−0.10)

Formula	SLG	SLG:0.02Bi^{3+}	SLG:0.04Bi^{3+}	SLG:0.06Bi^{3+}	SLG:0.08Bi^{3+}	SLG:0.10Bi^{3+}
Crystal	tetragonal	tetragonal	tetragonal	tetragonal	tetragonal	tetragonal
Space group	$P42_1m$	$P42_1m$	$P42_1m$	$P42_1m$	$P42_1m$	$P42_1m$
$a = b$ (Å)	8.056660	8.056698	8.056033	8.055627	8.055602	8.055500
c (Å)	5.333886	5.333712	5.332926	5.332333	5.332517	5.332979
V (Å^3)	346.221	346.213	346.105	346.032	346.042	346.063
2θ-interval	5−75°	5−75°	5−75°	5−75°	5−75°	5−75°
Z	2	2	2	2	2	2
R_{wp}	7.67%	8.09%	10.25%	10.79%	11.24%	12.82%
R_p	5.21%	5.25%	6.50	6.46%	6.83%	7.34%

Table S2. LED lighting parameters of WLED3

Formula	CIE	CCT (K)	Ra
SLG:0.06Bi^{3+},0.07Eu^{3+}	(0.3199, 0.3083)	6200	82

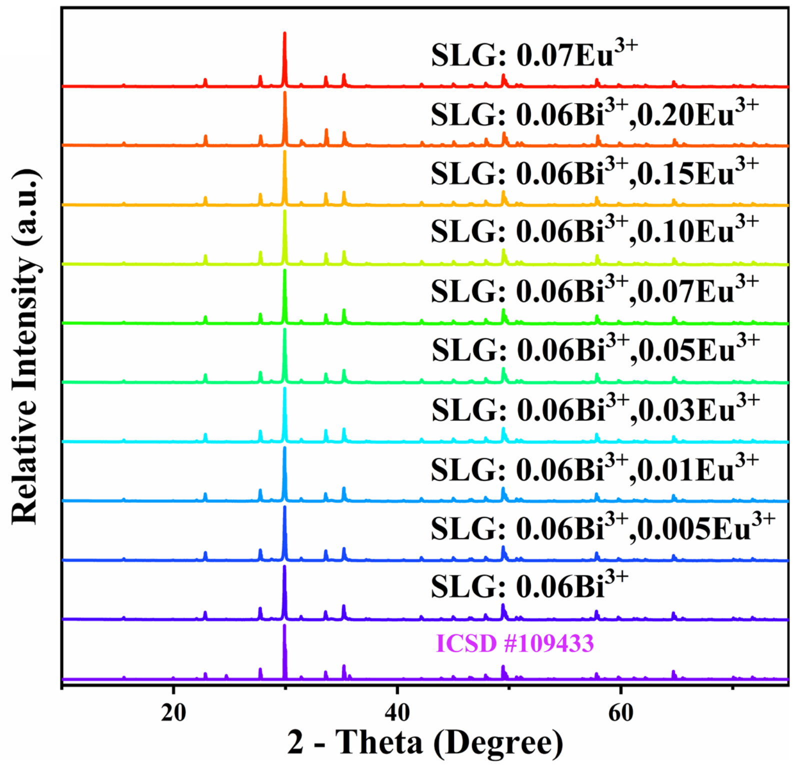

Figure S1. XRD patterns of SLG:xBi^{3+},yEu^{3+} (x = 0/0.06, y = 0–0.20) phosphors.

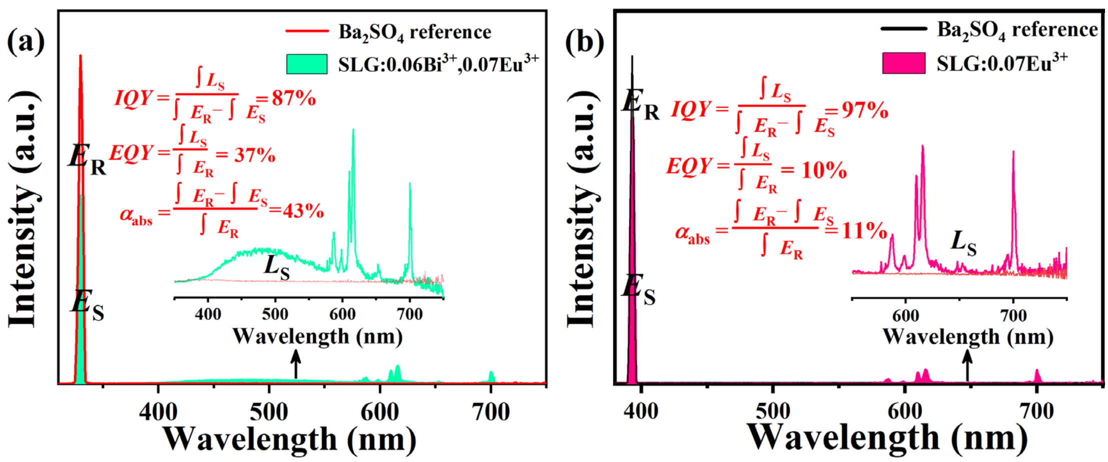

Figure S2. Excitation line of BaSO4 and emission spectrum of SLG:0.06Bi^{3+},0.07Eu^{3+} (a) and SLG:0.07Eu^{3+} (b) phosphor collected by using an integrating sphere.

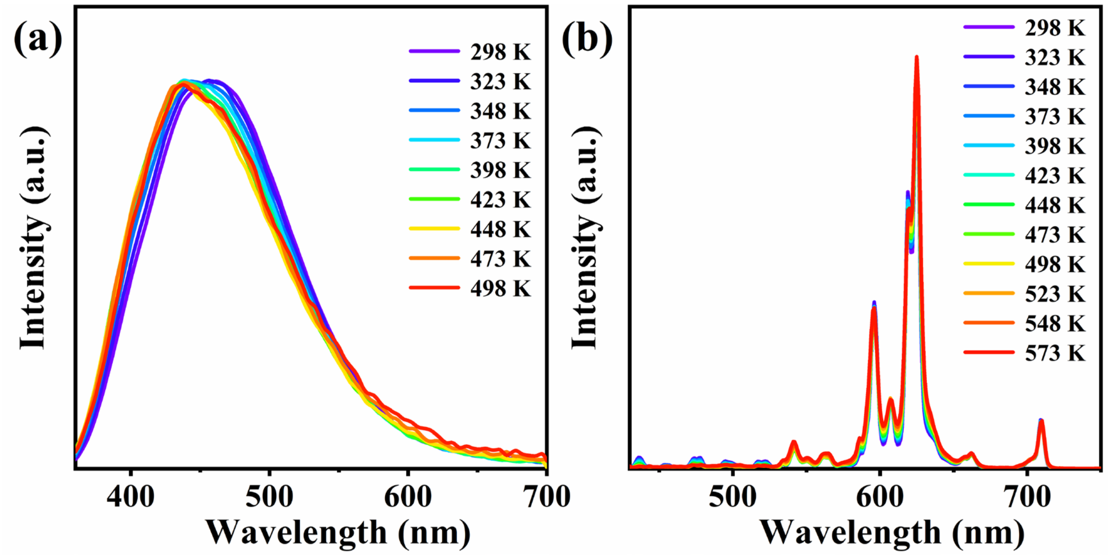

Figure S3. Temperature-dependent normalized fluorescence spectra of SLG:0.06Bi^{3+} (a) and SLG:0.07Eu^{3+} (b) phosphors.

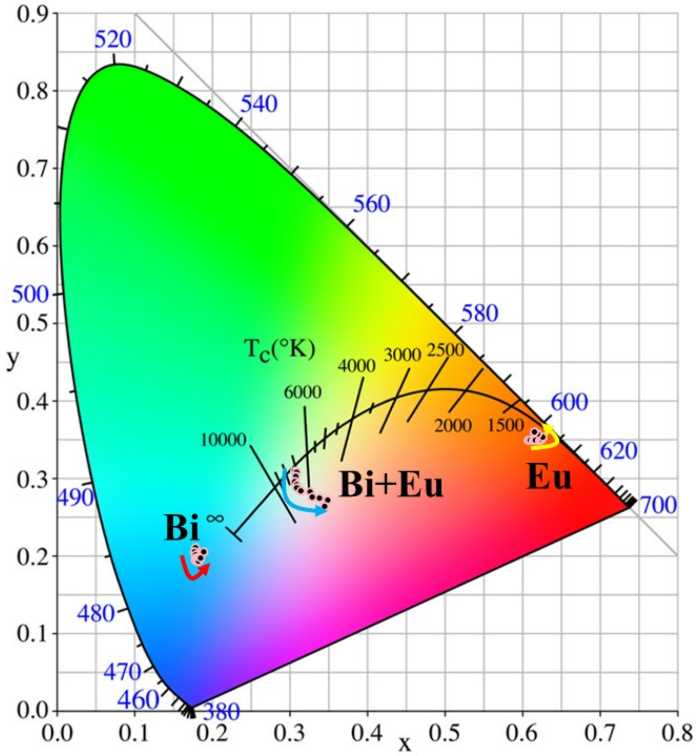

Figure S4. Temperature-dependent CIE chromaticity coordinates of phosphors SLG:0.06Bi^{3+} (λ_{ex} = 332 nm), SLG:0.07Eu^{3+} (λ_{ex} = 395 nm), and SLG:0.06Bi^{3+},0.07Eu^{3+} (λ_{ex} = 332 nm).

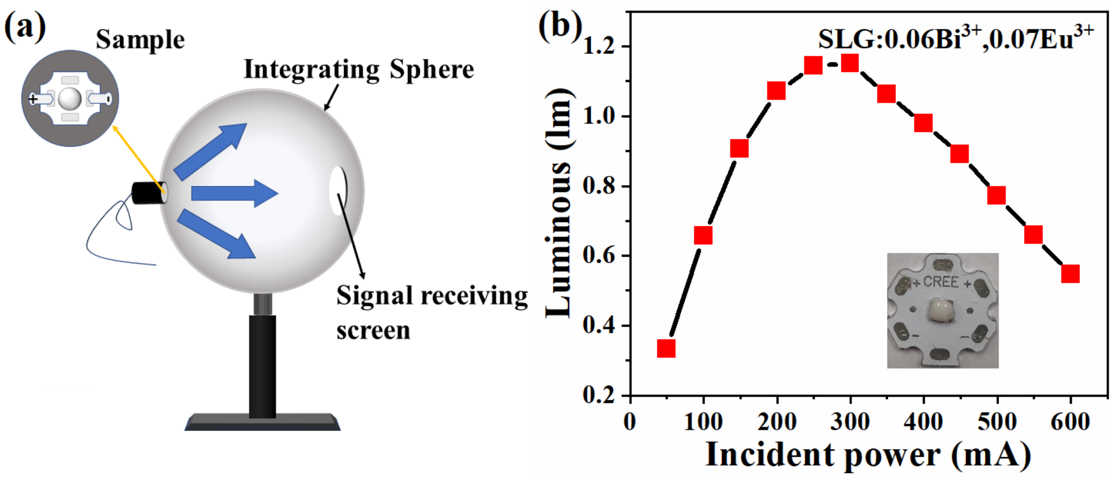

Figure S5. (a) Illustration of the irradiance measurement device of the luminous flux tester; (b) The luminous flux variation curve of WLED3 (320 nm UV chip + SLG:0.06Bi^{3+},0.07Eu^{3+} sample) under different input currents.