Supporting Information

An Efficient and Thermally Stable Cr^{3+}-activated $Y_2GdSc_2Al_2GaO_{12}$ Garnet Phosphor for NIR Spectroscopy Applications

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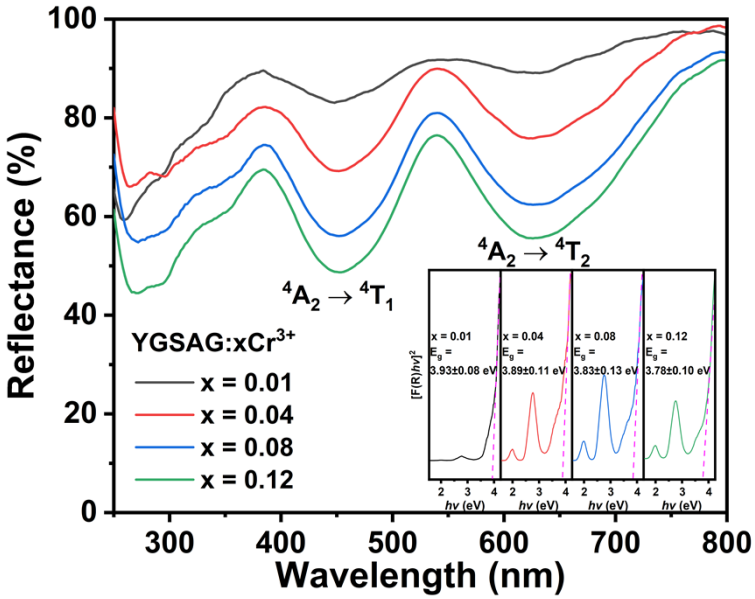

Fig. S1. Diffuse reflection spectra and bandgap values of selected YGSAG:xCr^{3+} (x = 0.01, 0.04, 0.08, 0.12) phosphors.

Table S1. Atomic parameters of YGSAG:0.08Cr^{3+} sample.

Atom	x	y	z	Wyck.	Occ.	Uiso
Y	0.125	0	0.25	24c	0.6667	0.01635
Gd	0.125	0	0.25	24c	0.3333	0.01635
Sc	0	0	0	16a	0.96	0.05978
Cr	0	0	0	16a	0.04	0.05978
Al	0.375	0	0.25	24d	0.6667	0.00246
Ga	0.375	0	0.25	24d	0.3333	0.00246
O	0.972	0.0539	0.1502	96h	1	0.01687

Table S2. Lattice parameters of YGSAG:xCr^{3+} (x = 0.01-0.12) phosphors.

YGSAG: xCr^{3+}	a = b = c (Å)	$\alpha = \beta = \gamma$ (°)	V ($Å^3$)
x = 0.01	13.01	90	2202.07
x = 0.02	12.89	90	2147.70
x = 0.04	12.78	90	2087.34
x = 0.06	12.55	90	1976.66
x = 0.08	12.38	90	1897.41
x = 0.10	12.27	90	1847.28
x = 0.12	12.13	90	1784.77

Calculation of AE and EQE:

The AE is defined as the ratio of the number of photons absorbed by the sample to that of excited photons, which be obtained via the equation below:

$$AE = \frac{\int E_R - \int E_S}{\int E_R} \times 100\%$$

where E_R and E_S represent the number of excitation photons and reflected photons from the $BaSO_4$ reference sample, respectively.

The IQE is defined as the ratio of the number of emitted photons to that of photons absorbed by the sample:

$$IQE = \frac{\int L_S}{\int E_R - \int E_S} \times 100\%$$

where L_S refers to the the number of emitted photons from the sample. The EQE is defined as the ratio of the number of emitted photons from the sample to that of excitation photons:

$$EQE = \frac{\int L_S}{\int E_R} \times 100\%$$

Therefore, the EQE can be also determined according to the following equation:

$$EQE = AE \times IQE \times 100\%$$