Supporting information 1

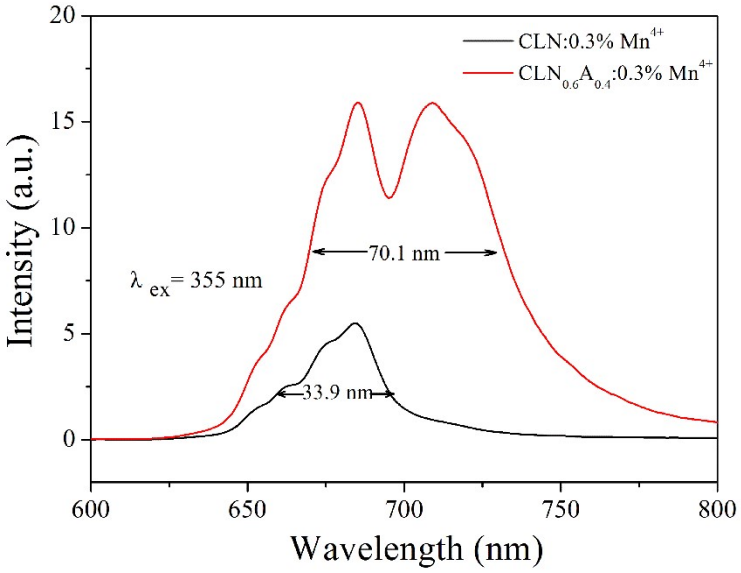

Fig. 1. The FWHM variation of emission spectra for the typical CLN phosphor samples.

After the incorporation of Al^{3+} in CLN, not only the deep-red and far-red emission intensities are dramatically enhanced, but also the spectral region is evidently enlarged, as can be seen from the FWHM variation (from 33.9 nm to 70.1 nm) of the emission spectra.

Supporting information 2

Table 1 The fluorescent lifetime of $CLN_{1-y}A_y$:0.3%Mn^{4+} samples

Sample composition	Fluorescent lifetime τ (ms)	
	685 nm	710 nm
Ca_2LuNbO_6:0.3%Mn^{4+}	0.36	
$Ca_2LuNb_{0.9}Al_{0.1}O_6$:0.3%$Mn^{4+}$	0.38	0.25
$Ca_2LuNb_{0.8}Al_{0.2}O_6$:0.3%$Mn^{4+}$	0.39	0.28
$Ca_2LuNb_{0.7}Al_{0.3}O_6$:0.3%$Mn^{4+}$	0.46	0.30
$Ca_2LuNb_{0.6}Al_{0.4}O_6$:0.3%$Mn^{4+}$	0.54	0.39
$Ca_2LuNb_{0.5}Al_{0.5}O_6$:0.3%$Mn^{4+}$	0.69	0.46

As can be seen from Table 1, the fluorescent lifetimes (τ) of $CLN_{1-y}A_y$:0.3%Mn^{4+} samples are gradually increased with the increase of Al^{3+} concentration (y), no matter it is monitored with 685 nm or 710 nm emission band. However, the fluorescent time monitored with 710 nm is always smaller than that monitored with 685 nm for the same sample.