**Supporting information**

# Development of a novel $Eu^{2+}$ activated oxonitridosilicate cyan phosphor for enhancing the color quality of violet-chip-based white LED

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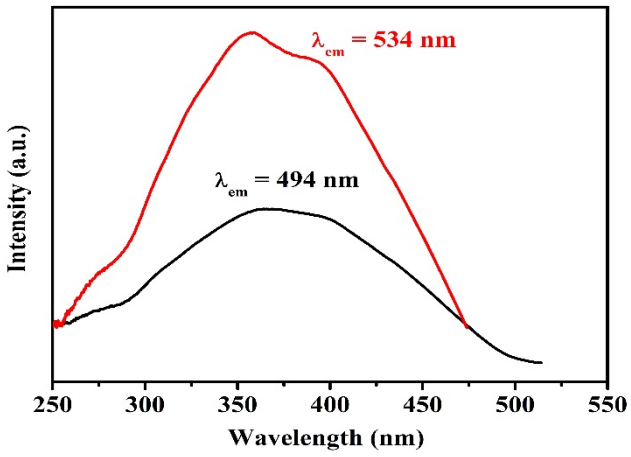


**Figure S1** Excitation spectra monitored at 494 and 534 nm of LSANO:0.01$Eu^{2+}$ sample.

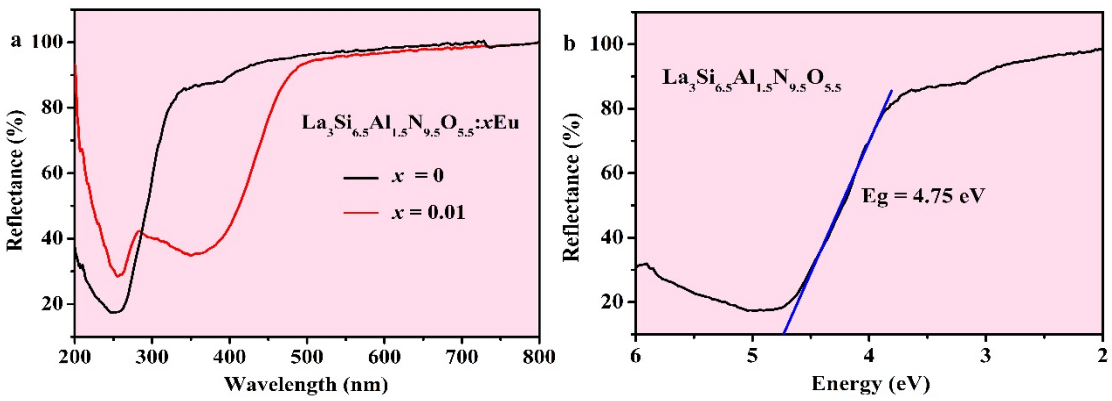


**Figure S2** (a) Diffuse reflectance spectra of Eu-doped and non-doped LSANO samples; (b) optical absorption edge of the LSANO.

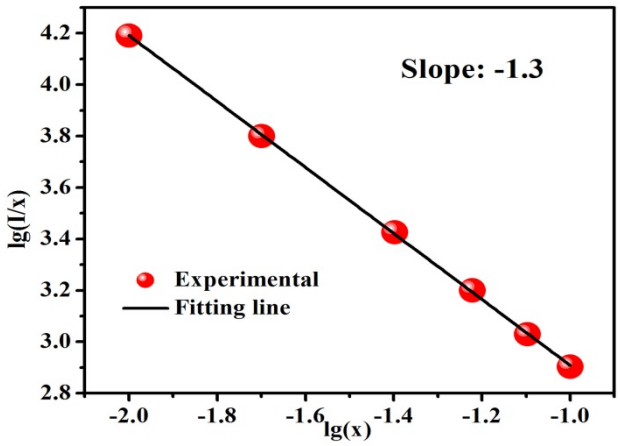


**Figure S3** Dependence of Log(*I*/*x*) versus Log(*x*) and the linear fitting (Here, the luminescence intensity *I* is integral intensity).

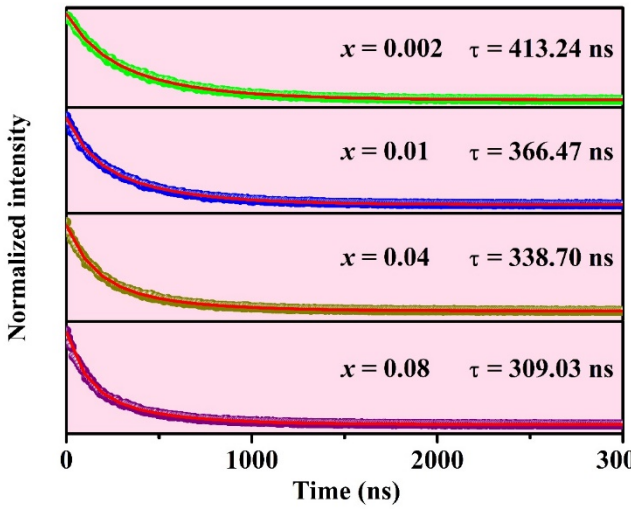


**Figure S4** PL decay curves of LSANO:$x$Eu$^{2+}$ ($x$ = 0.002, 0.01, 0.04 and 0.08) phosphors.

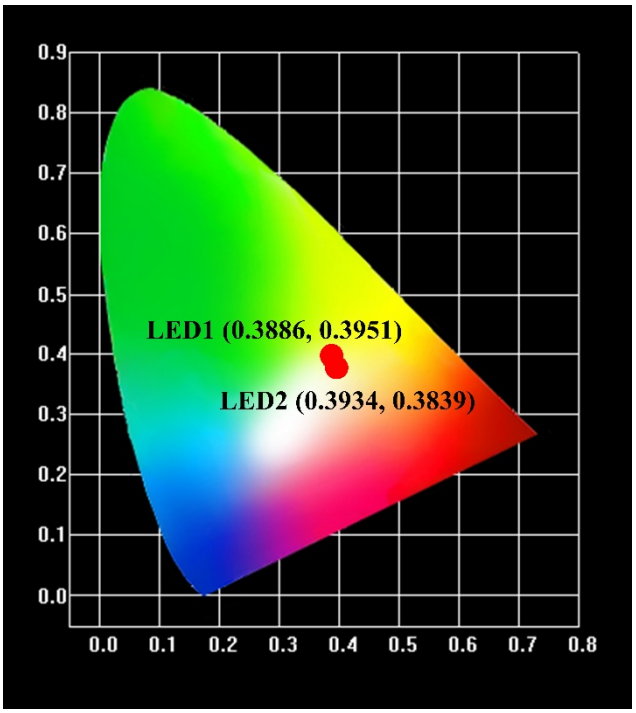


**Figure S5** Chromaticity coordinates of the white LEDs in the CIE chromaticity diagram.

**Tables**

**Table S1** Significant parameters of LSANO:0.01$Eu^{2+}$

| Crystallographic data of LSANO:0.01$Eu^{2+}$ | |
|---|---|
| $2\theta$ range/deg. | 10 – 80 |
| $T$/K | 298 |
| symmetry | monoclinic |
| space group | I2/a |
| $a$/Å | 15.862 |
| $b$/Å | 4.914 |
| $c$/Å | 18.074 |
| $\alpha$/deg. | 90° |
| $\beta$/deg. | 115.043° |
| $\gamma$/deg. | 90° |
| Volume/$Å^3$ | 1276.391 |
| $R_p$/% | 4.32 |
| $R_{wp}$/% | 5.26 |
| $\chi^2$ | 2.332 |

**Measurements and characterization:** The phases of samples were identified using powder X-ray diffraction (XRD) analysis (Bruker AXS D8), with graphite monochromatized Cu Kα radiation (λ = 0.15405 nm) operating at 40 kV and 40 mA. The scanning rate was $10^{\circ}min^{-1}$ with a step size of 0.02°. The morphology and chemical composition of the powders was investigated by field emission scanning electron microscopy (SEM) equipped with an energy-dispersive (EDS) spectrometer (S-4800, Hitachi, Japan). Transmission electron microscopy (TEM) was taken on a FEI Tecnai G2S-Twin with a field-emission gun operating at 200 kV. X-ray photoelectron spectroscopy (XPS) spectra were obtained from a VG ESCALABMK II electron spectrometer. PLE and PL spectra were measured at room temperature by a Hitachi F7000 spectrophotometer equipped with a 150 W xenon lamp under a working voltage of 400 V, with a spectral slit width of 2.5 nm. The diffuse-reflectance spectra were measured by a Hitachi U-4100 spectrophotometer. The PL decay curves were detected by a Lecroy Wave Runner 6100 digital oscilloscope (1 GHz) using a tunable laser (pulse width = 4 ns, gate = 50 ns) as the excitation source (Continuum Sunlite OPO). The temperature-dependent luminescence spectra were measured in the range of 7 − 475 K with a fluorescence spectrophotometer, using a 450 W Xe lamp as an excitation source (Edinburgh Instruments FLSP-920) with a temperature controller.