

## Electronic Supplementary Information (ESI)

Electronic and optical properties of a novel fluoroaluminate  
red phosphor  $\text{Cs}_2\text{NaAl}_3\text{F}_{12}:\text{Mn}^{4+}$  with high color purity for  
white light-emitting diodes

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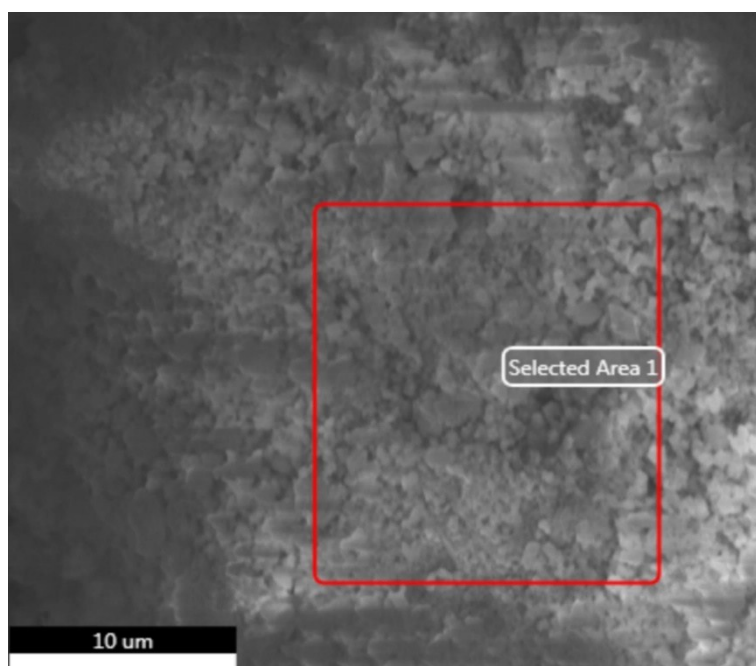
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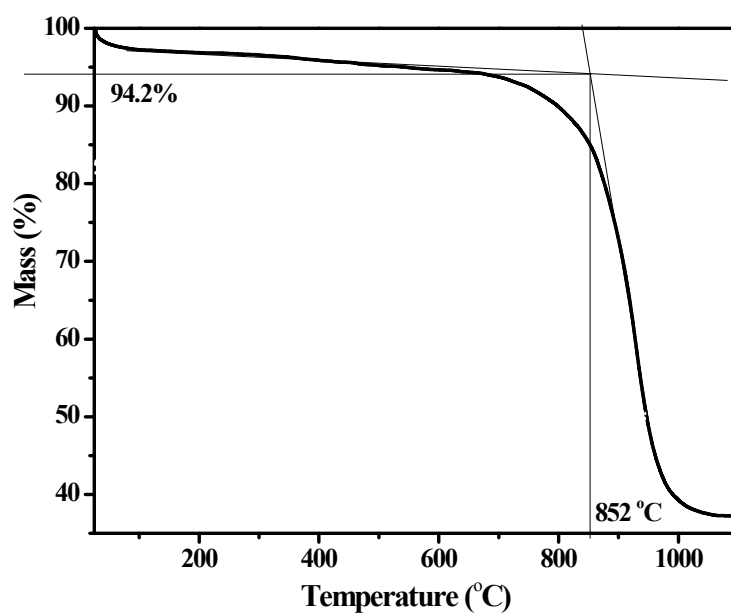
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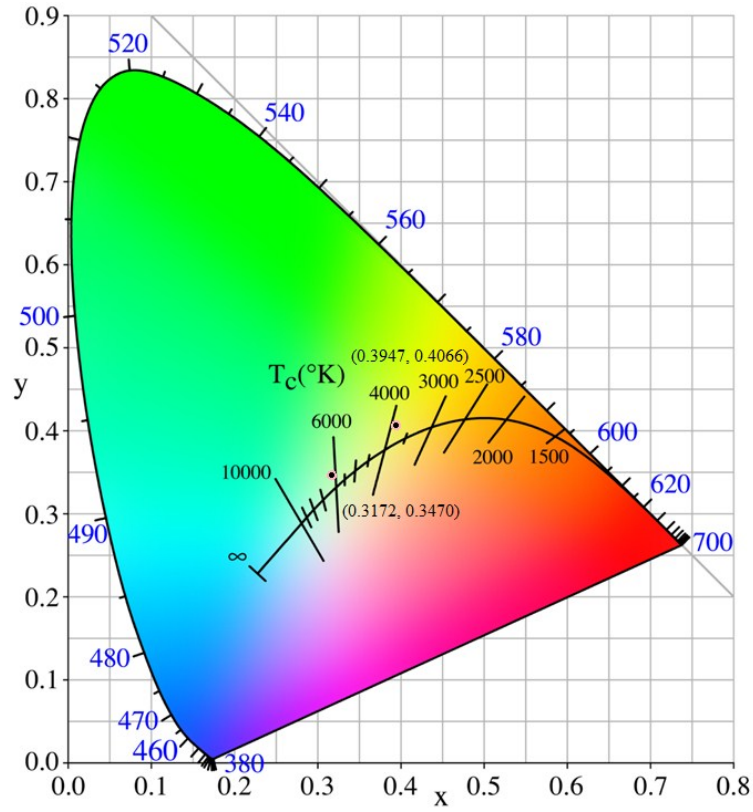
**[ceswmm@mail.sysu.edu.cn](mailto:ceswmm@mail.sysu.edu.cn).**



**Figure S1.** The corresponding selected area for EDS measurement from Cs<sub>2</sub>NaAl<sub>3</sub>F<sub>12</sub>:2.33%Mn<sup>4+</sup> product.



**Figure S2.** TG curve of the prepared Cs<sub>2</sub>NaAl<sub>3</sub>F<sub>12</sub>:2.33%Mn<sup>4+</sup> product.



**Figure S3.** CIE chromaticity diagram for the WLEDs made of (c) YAG and (d) YAG-Cs<sub>2</sub>NaAl<sub>3</sub>F<sub>12</sub>:2.33%Mn<sup>4+</sup> mixture on GaN chip.

**Table S1.** Performance of the GaN-based WLEDs fabricated from (c) YAG and (d) YAG-Cs<sub>2</sub>NaAl<sub>3</sub>F<sub>12</sub>:2.33%Mn<sup>4+</sup> mixture at 20 mA drive current.

No. of devices	CIE (x, y)	CCT (K)	CRI (K)	LE (lm/W)
c	0.3172, 0.3470	6177	77.3	176.11
d	0.3947, 0.4066	3856	88.7	78.91