

Supporting information

Sr/Ba Substitute -Induced Higher Thermal Stability far Red-Emitting

Ba_{1-y}Sr_yLaLiWO₆:Mn⁴⁺ Phosphor for Plant Growth Applications

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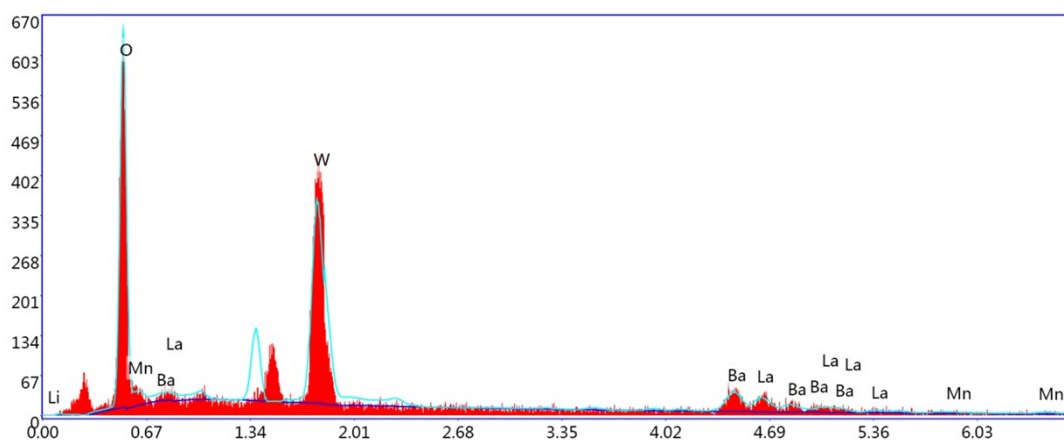


Fig. S1 Show the EDX composition analysis of the sample.

Table S1 The Rietveld refinement result of BLLW:1.2%Mn⁴⁺ phosphor.

| compound | x = 0 | x = 1.2% |
|---------------------------------|----------|----------|
| Sp.gr | F m -3 m | F m -3 m |
| $a=b=c(\text{\AA})$ | 8.0975 | 8.0975 |
| $\alpha=\beta=\gamma(^{\circ})$ | 90 | 90 |
| $V(\text{\AA}^3)$ | 519.24 | 514.555 |
| W-O bond length | 1.9231 | 1.9234 |
| $R_{wp}(\%)$ | | 8.93 |
| $R_p(\%)$ | | 6.37 |
| $R_B(\%)$ | | 8.75 |

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Table. S2 The crystal field strength parameters of BLLW:1.2%Mn⁴⁺.

| Sample | BLLW:1.2%Mn ⁴⁺ |
|-------------------------------------|--|
| ${}^4A_{2g} \rightarrow {}^4T_{1g}$ | 28819 cm ⁻¹ |
| ${}^4A_{2g} \rightarrow {}^4T_{2g}$ | 21053 cm ⁻¹ |
| ${}^2E_g \rightarrow {}^4A_{2g}$ | 13947 cm ⁻¹ |
| Dq/B | 2.78 |
| B,C | 757 cm ⁻¹ , 2773 cm ⁻¹ |
| θ_1 | 0.92 |

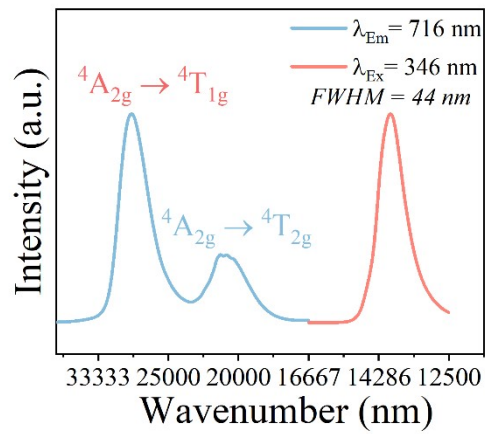


Fig. S2 The PLE and PL spectra with wavenumber of BLLW:1.2%Mn⁴⁺ phosphors

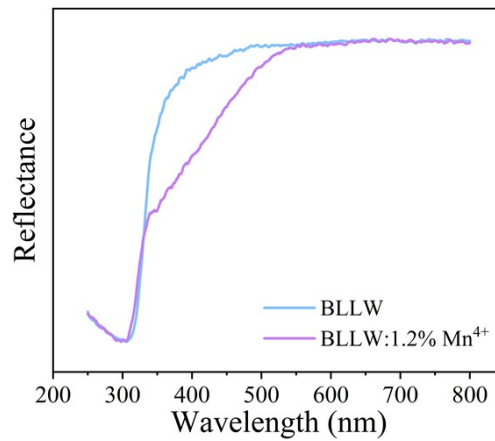


Fig. S3 Diffuse reflection spectrum of BLLW:Mn⁴⁺ and BLLW.

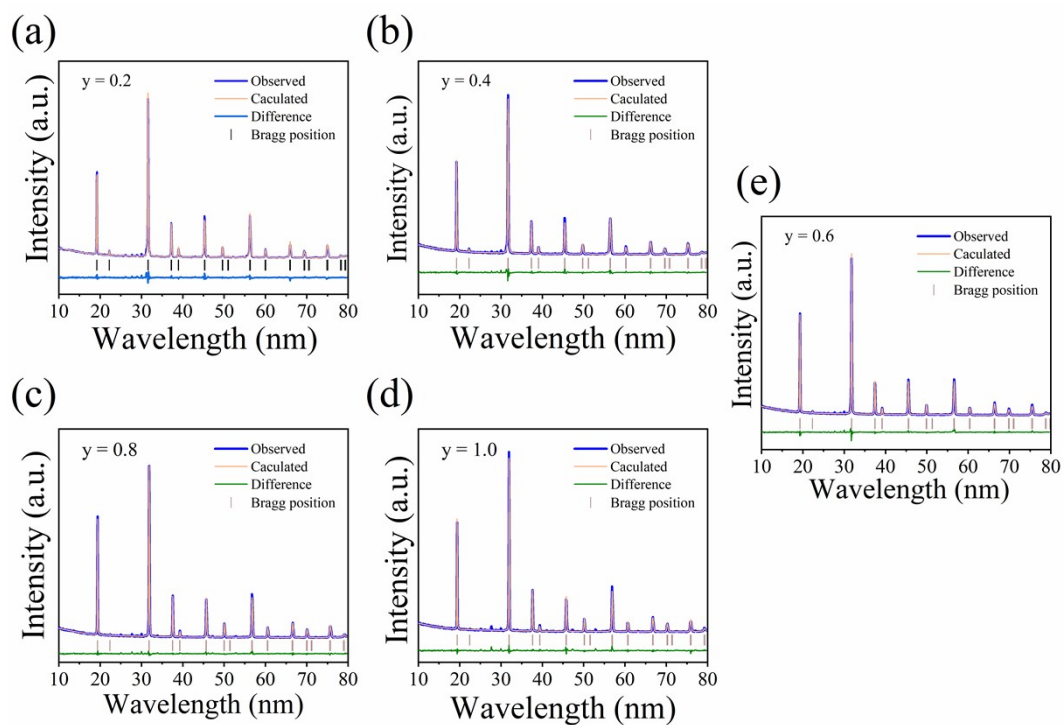


Fig. S4 Rietveld refinements of XRD profiles: (a)~(e) $\text{Ba}_{1-y}\text{Sr}_y\text{LaLiWO}_6:\text{Mn}^{4+}$

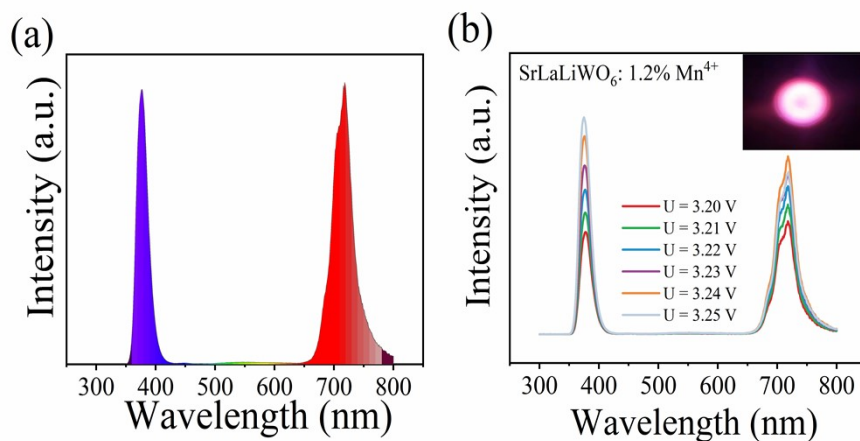


Fig. S5 (a) Electroluminescence spectra of $\text{SrLaLiWO}_6:\text{Mn}^{4+}$ coated a 365 nm NUV chip. (b) Spectra of $\text{SrLaLiWO}_6:\text{Mn}^{4+}$ phosphors coated with a 365 nm NUV chip at different voltages.