Electronic Supplementary Information

Novel Sm$^{3+}$ singly doped LiCa$_3$ZnV$_3$O$_{12}$ phosphor: a potential luminescent material for multifunctional applications

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Figure S1. XRD patterns of LCZV:xEuSm$^{3+}$ ($x = 0, 0.002, 0.010$ and $0.040$) phosphors. The standard PDF card (LCZV; JCPDS 24-1212) and (SmVO$_4$; JCPDS 17-0876) were also shown as references.

Figure S2. Temperature-dependent PL emission intensities of (a) VO$_4^{3-}$ group and (b) Eu$^{3+}$ ions.
Table S1. Refined Crystallographic parameters of LCZV:0.01Sm\(^{3+}\) phosphor.

| Parameter                  | LCZV:0.01Sm\(^{3+}\) |
|----------------------------|------------------------|
| Radiation type             | Cu Kα radiation with \(\lambda = 1.5405\) Å |
| 2θ range                  | 10-80°                 |
| Crystal symmetry           | Cubic                  |
| Space group                | 1a\(^d\)               |
| Cell parameters            | \(a = b = c = 12.4437(1)\) Å \(V = 1926.86(3)\) Å\(^3\) |
| Reliability factors        | \(R_{wp} = 4.53\%, \ R_p = 6.26\% \ \chi^2 = 2.13\) |

Table S2. Atomic coordinates of LCZV host lattices.

\[
\text{LiCa}_3\text{ZnV}_3\text{O}_{12}
\]

| atom  | \(x\) | \(y\) | \(z\) | Occ. | \(U_{iso}(\text{nm}^2)\) | Wyckoff |
|-------|-------|-------|-------|-----|--------------------------|---------|
| Ca1   | 0.875 | 0.0   | 0.75  | 1   | 0.0156                   | 24c     |
| Zn1   | 0.5   | 0.5   | 0.0   | 0.5 | 0.0088                   | 16a     |
| Li1   | 0.5   | 0.5   | 0.0   | 0.5 | 0.00878                  | 16a     |
| V1    | 0.125 | 0.0   | 0.75  | 1   | 0.0035                   | 24d     |
| O1    | 0.03605 | 0.05492 | 0.6562 | 1   | 0.00626                  | 96h     |
Table S3. CIE coordinates and CCT of the LCZV:xEu<sup>3+</sup> phosphors.

| Sample | CIE coordinates (x, y) | CCT (K) |
|--------|------------------------|---------|
| x = 0  | (0.265, 0.361)         | 8690    |
| x = 0.002 | (0.321, 0.380)     | 5937    |
| x = 0.005 | (0.358, 0.380)     | 4663    |
| x = 0.01 | (0.364, 0.388)     | 4211    |
| x = 0.02 | (0.389, 0.393)     | 3890    |
| x = 0.03 | (0.399, 0.394)     | 3684    |
| x = 0.04 | (0.397, 0.395)     | 3738    |