

## Electronic Supporting Information

### Synthesis of Sm<sup>3+</sup>-doped YGa<sub>1.5</sub>Al<sub>1.5</sub>(BO<sub>3</sub>)<sub>4</sub> phosphor via mechanical activation-assisted solid-state reaction

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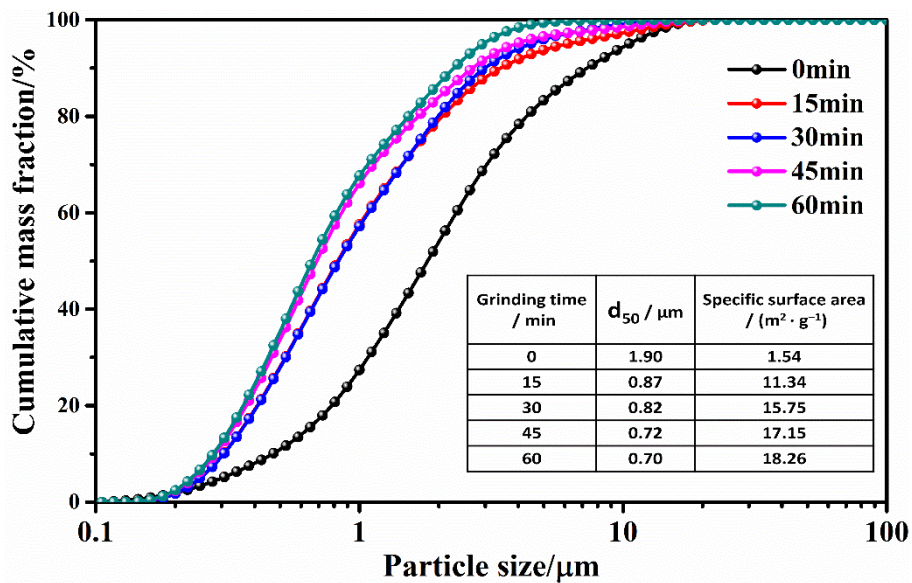
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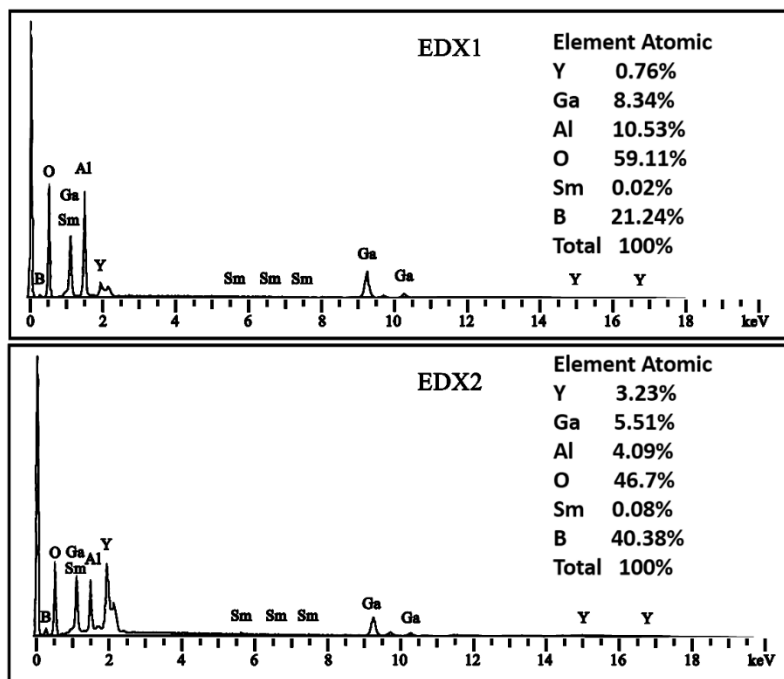
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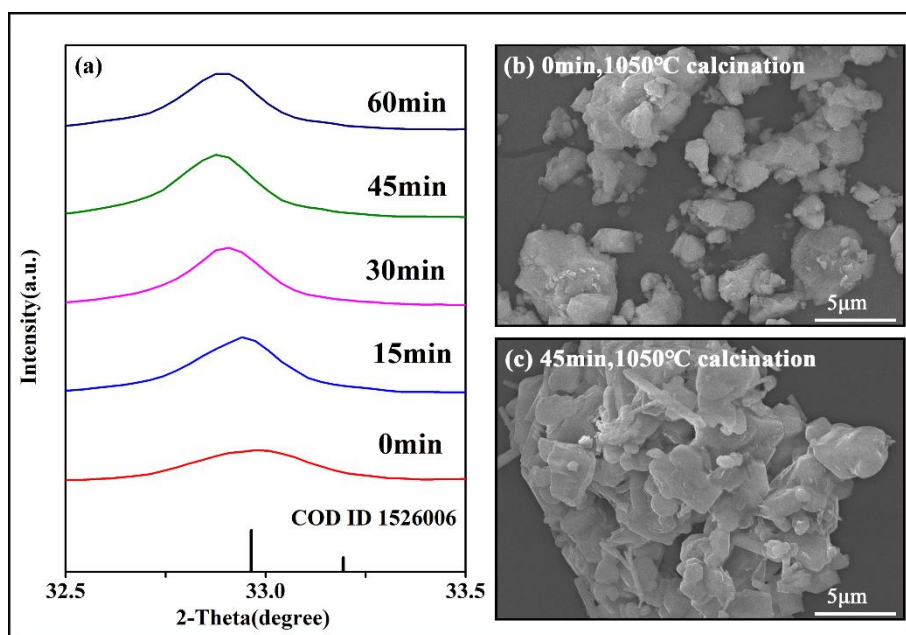
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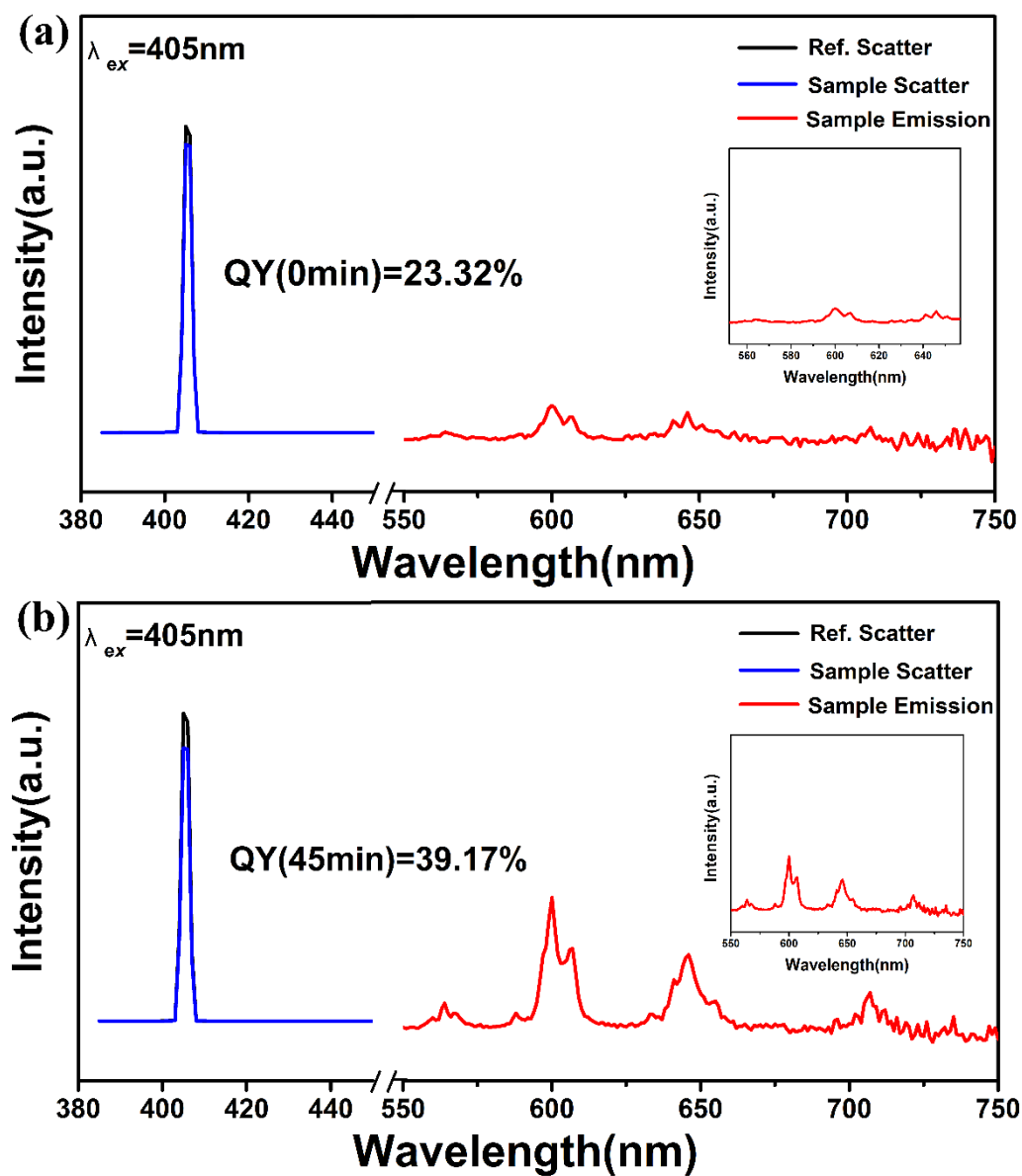
**Fig. S1** The median sizes, particle size distributions and specific surface areas of YGAB:0.03Sm<sup>3+</sup> precursor mixtures ground for different time.



**Fig. S2** (a) EDX analysis of YGAB:0.03Sm<sup>3+</sup> precursor mixtures unground and (b) ground for 45min.



**Fig. S3** (a) Amplified XRD details of YGAB:0.03Sm<sup>3+</sup> phosphors synthesized from precursor mixtures ground for different time and then calcined at 1000 °C (32.5°-33.5°), and (b-c) SEM images of YGAB:0.03Sm<sup>3+</sup> phosphors synthesized with precursor mixtures unground and ground for 45 min and then calcined at 1050 °C.



**Fig. S4** The quantum yield (QY) of YGAB:0.03Sm<sup>3+</sup> phosphor synthesized by calcination of precursor mixture ground at different time (under 405 nm excitation)

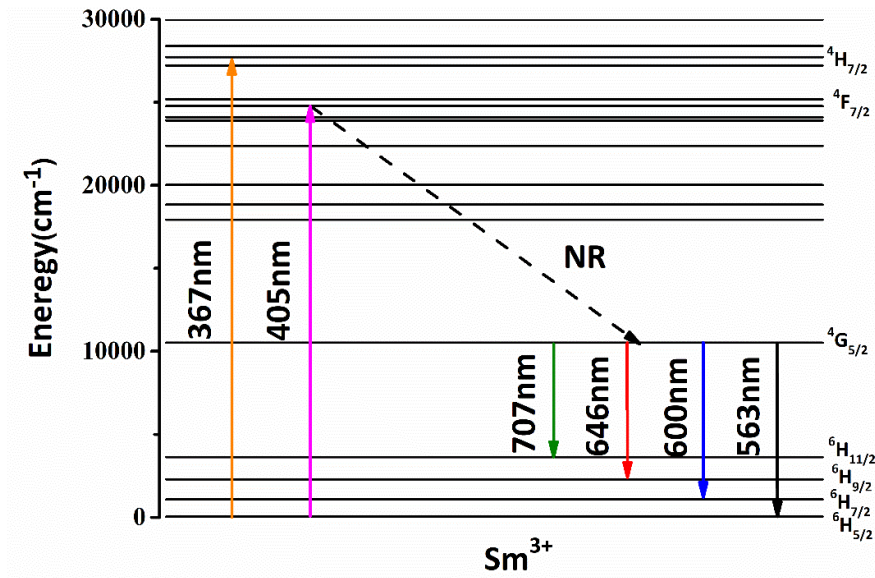


Fig. S5 Energy level transition diagram of  $\text{Sm}^{3+}$

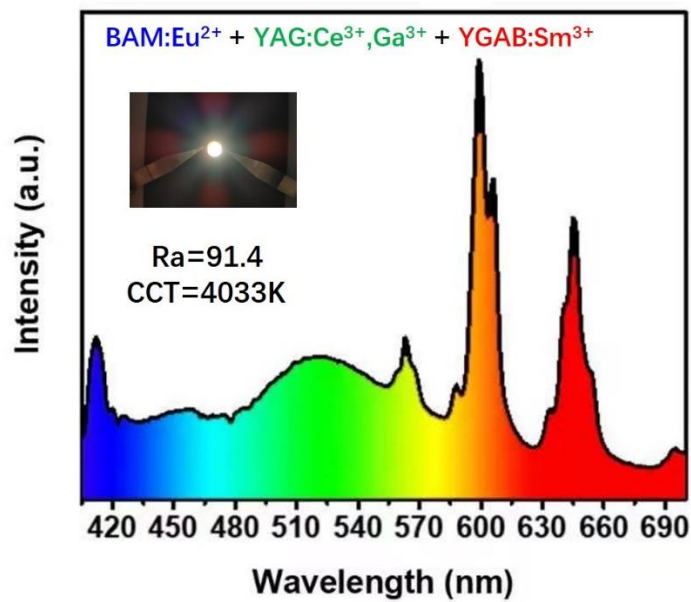


Fig. S6 PL spectra of the white-light phosphor based on the combination of  $\text{BaMgAl}_{10}\text{O}_{17}:\text{Eu}^{2+}$ ,  $\text{Y}_3\text{Al}_5\text{O}_{12}:\text{Ce}^{3+}$ ,  $\text{Ga}^{3+}$  and  $\text{YGa}_{1.5}\text{Al}_{1.5}(\text{BO}_3)_4:\text{Sm}^{3+}$  under near-UV

excitation (inset: the fabricated warm white light with the CIE chromaticity coordinates of (0.3820, 0.3872)).

**Table S1** Concentrations of  $\text{Sm}^{3+}$  in the filtrates of precursor mixtures ground for different time dissolved in nitric acid, measured by ICP-OES.

| Dissolution time<br>/min | Grinding time<br>/min | Concentration of $\text{Sm}^{3+}$<br>/mg·L <sup>-1</sup> |
|--------------------------|-----------------------|--|
| 25                       | 0                     | 2.36   |
|                          | 15                    | 2.27   |
|                          | 30                    | 1.94   |
| 40                       | 0                     | 2.63   |
|                          | 15                    | 2.55   |
|                          | 30                    | 2.12   |
| 60                       | 0                     | 4.43   |
|                          | 15                    | 2.58   |
|                          | 30                    | 2.95   |
|                          | 45                    | 3.02   |

**Table S2** The crystallographic parameters of YGAB:0.03 $\text{Sm}^{3+}$  phosphors synthesized from the precursor mixtures ground for different time and calcined at 1000 °C.

| Grinding Time(min) | $a=b(\text{Å})$ | $c(\text{Å})$ | $V(\text{Å}^3)$ |
|--------------------|-----------------|---------------|-----------------|
| 0                  | 9.3504          | 7.3193        | 554.20          |
| 15                 | 9.3480          | 7.3311        | 554.80          |
| 30                 | 9.3541          | 7.3380        | 556.05          |
| 45                 | 9.3528          | 7.3360        | 555.74          |
| 60                 | 9.3513          | 7.3323        | 555.28          |