# **Supplementary information**

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Figure S1.a) X-ray powder diffraction lines of Ba2MgWO6: 5% Eu3+ synthesized by co-precipitation (red line), mechanochemical method (blue line) and b) Enlargement of the highest diffraction peak.

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Figure S2. Crystallite size distribution of some representative samples of Ba2MgWO6: 5% Eu3+ synthesized by co-precipitation (red), mechanochemical method (blue).



Figure S3. SEM images of BMW:5%Eu3+ synthesized by CP (a, b, c, d, e, f) and MC method (g, h, i, j, k, l) with different magnifications



Figure S4. Emission spectra of Ba2MgWO6: 5% Eu3+ synthesized by CP (red), MC (blue) recorded under 266 nm excitation at 300 K (a) and 77 K (b).



Figure S5. Excitation spectra of Ba2MgWO6: 5% Eu3+ synthesized by CP (a), MC (b) monitored at 425 nm at 77 K (grey line) and 525 nm at 300 K (black line). The dashed lines represent the Gaussian fitting peaks.

Table S1. The ratio of emission intensity between regular and irregular [WO6]6- groups of undoped Ba2MgWO6 synthesized by the co-precipitation and mechanochemical method at 77 K and 300 K.

|  |  |  |
| --- | --- | --- |
| **Temperature (K)** | **CP** | **MC** |
| 77 K | 0.58 | 0.9 |
| 300 K | 0.48 | 0.17 |

Table S2. The energy transfer efficiency 𝜂 (left: at 77 K, right: at 300 K), the concentration quenching Xc and the critical distance Rc of Ba2MgWO6: x% Eu3+ (x = 0; 5 %) synthesized by the co-precipitation and mechanochemical method.

|  |  |  |  |
| --- | --- | --- | --- |
| **Sample** | **𝜂 (%)** | **XC** | **RC** |
| **CP** | 91/93 | 5 | 17.22 |
| **MC** | 100/100 | 3 | 20.41 |



Figure S6. Changes of thermometric parameter ∆ with temperature for MC (black) and CP (blue) samples. The dashed line marks the beginning of zone out of operating temperature range.