Support information

Color-Resolved Mechanoluminescence of Eu and Mn Co-doped $SrMg_2(PO_4)_2$

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Experimental section:

Sample preparation: $SrMg_2(PO_4)_2$: Eu^{2+}, $SrMg_2(PO_4)_2$: Mn^{2+}, $SrMg_2(PO_4)_2$: Eu^{2+}, Mn^{2+} phosphors were prepared by using a solid-state reaction method. The raw materials include $SrCO_3$ (99.99%, Macklin Biochemical Co. Ltd.), $Mg(OH)_2 \cdot 4MgCO_3 \cdot 5H_2O$ (99.99%, Macklin Biochemical Co. Ltd.), $(NH_4)_2HPO4$ (99.99%, Macklin Biochemical Co. Ltd.), $MnCO_3$ (99.99%, Macklin Biochemical Co. Ltd.), Eu_2O_3 (99.99%, Macklin Biochemical Co. Ltd.). For a typical synthesis procedure, the stoichiometric weighted raw materials were homogeneously mixed with ethyl alcohol with a complete ground process and the corresponding obtained mixtures were sintered at 1100 ℃ for 8 h under a reductive atmosphere (5% H_2 + 95% N_O). Then, the sintered samples were naturally cooled down to room temperature and subsequently ground into powders for the following characterizations.

Preparation of ML film: Polydimethylsiloxane (PDMS, Sylgard 184, Dow Corning)was used to fabricate the elastic matrix to provide interior stress for ML phosphors. First, 2 g of PDMS base resin and 0.9 g of ML powder was mixed in a paper cup. After stirring for 5 min, the mixtures were poured into a 6x1.5 mm mold. After curing at 65 °C for 2 h, PDMS-based ML films were obtained.

Characteristics: The XRD data were collected in the range of 10° to 80° by a D8ADVANCE/Germany Bruker X-ray diffractometer with Cu Kα Radiation (λ = 0.154056 nm) at a 0.02° scanning step and 0.2 s time interval. The XPS were recorded by using Japan PHI5000 Versaprobe III. The photoluminescence excitation (PLE) and PL spectra were recorded by a Hitachi F-7000 fluorescence spectrophotometer. The ML spectra were tested by ocean optics QE pro optical fiber spectrometer. The morphology of the as-obtained sample was investigated by a scanning electron microscope (SEM, JIB-4700). Temperature-dependent fluorescent spectra were recorded in the range of 298–650 K by a Hitachi F-4600 fluorescence spectrophotometer coupled with a temperature controller (TAP-02, Tianjin Orient-KOJI Instrument).

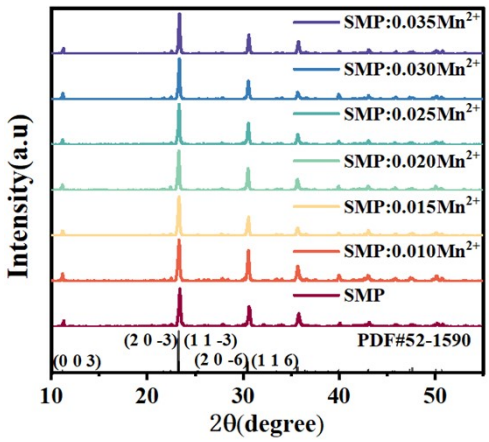

Figure S1. XRD patterns of SMP: xMn^{2+} (x=0.010,0.015,0.020,0.025,0.030, and 0.035) samples.

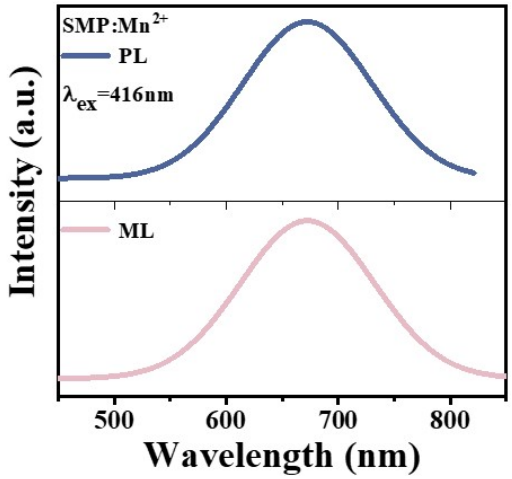

Figure S2. PL and ML spectra of SMP: Mn^{2+} phosphor.

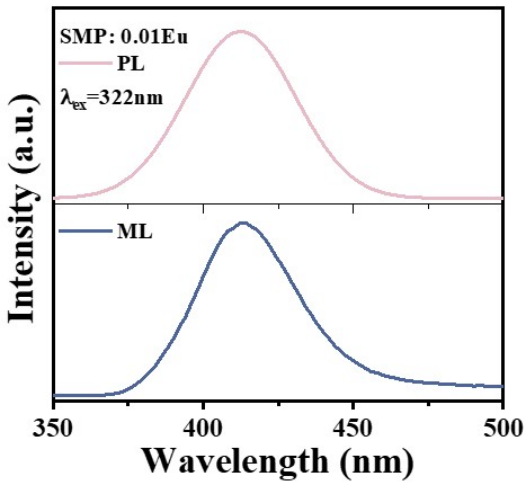

Figure S3. PL and ML spectra of SMP: $0.01Eu^{2+}$ phosphor.