Electronic Supplementary Material (ESI) for Physical Chemistry Chemical Physics.

Supporting Information

Dual spectra band emissive Eu^{2+}/Mn^{2+} co-activated alkaline earth phosphates for *indoor* plant growth novel phosphor converted-LEDs

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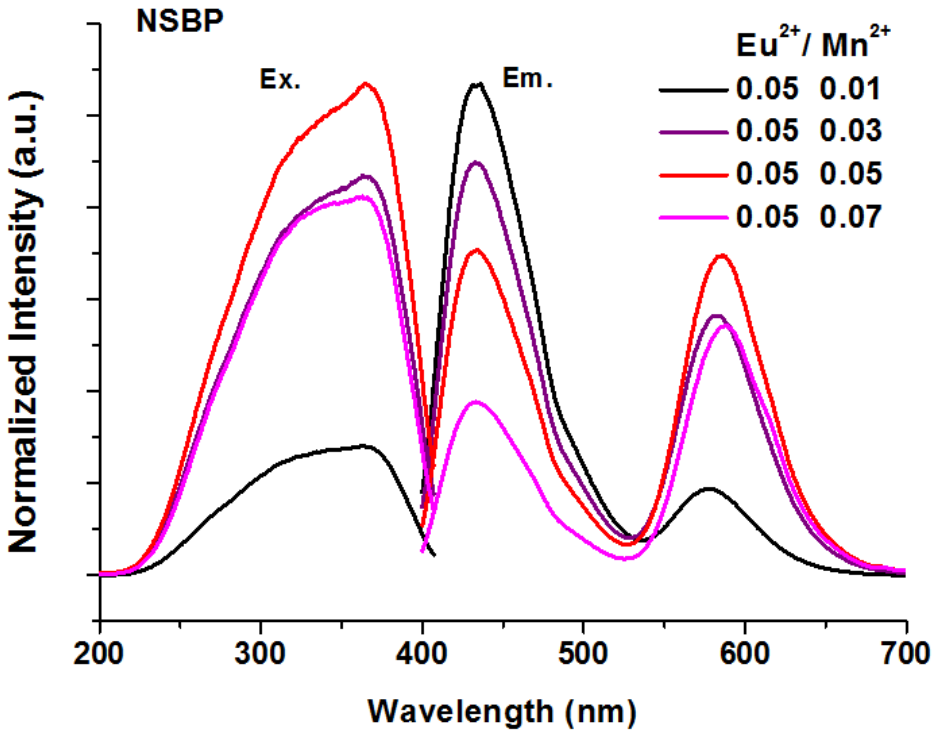
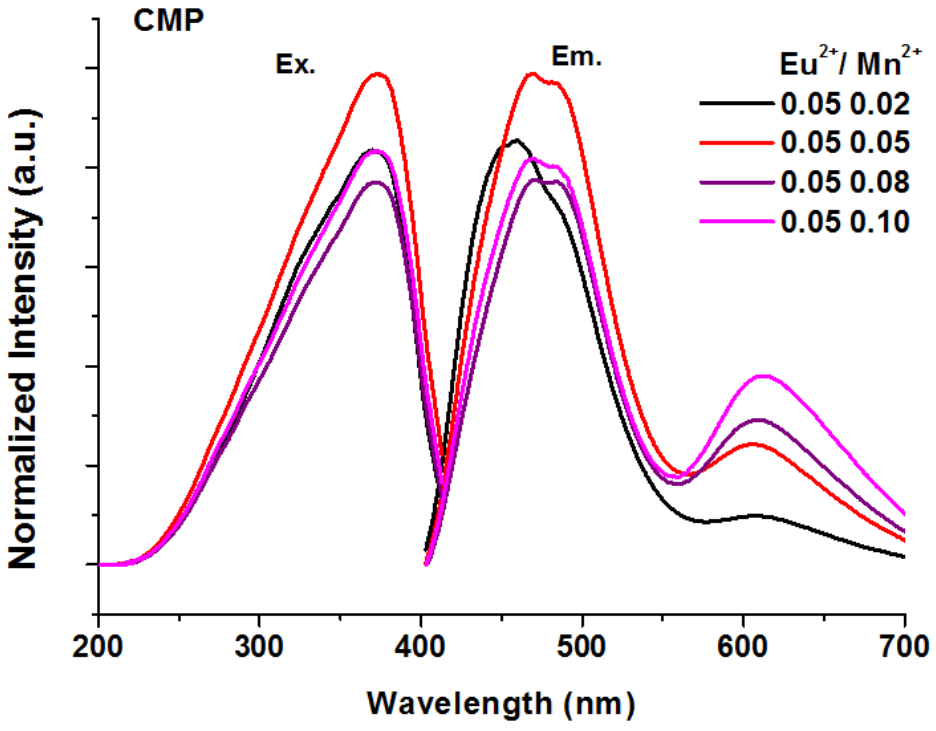
1. Photoluminescence Spectra



(a)



(b)

Figure S1. Excitation and emission spectra of Eu^{2+}/Mn^{2+} doped (a) $Na(Sr_{0.5}Ba_{0.5})PO_4$ and (b) $Ca_3Mg_3(PO_4)_4$ phosphors with varying activators concentration ratio.

2. Crystal structure

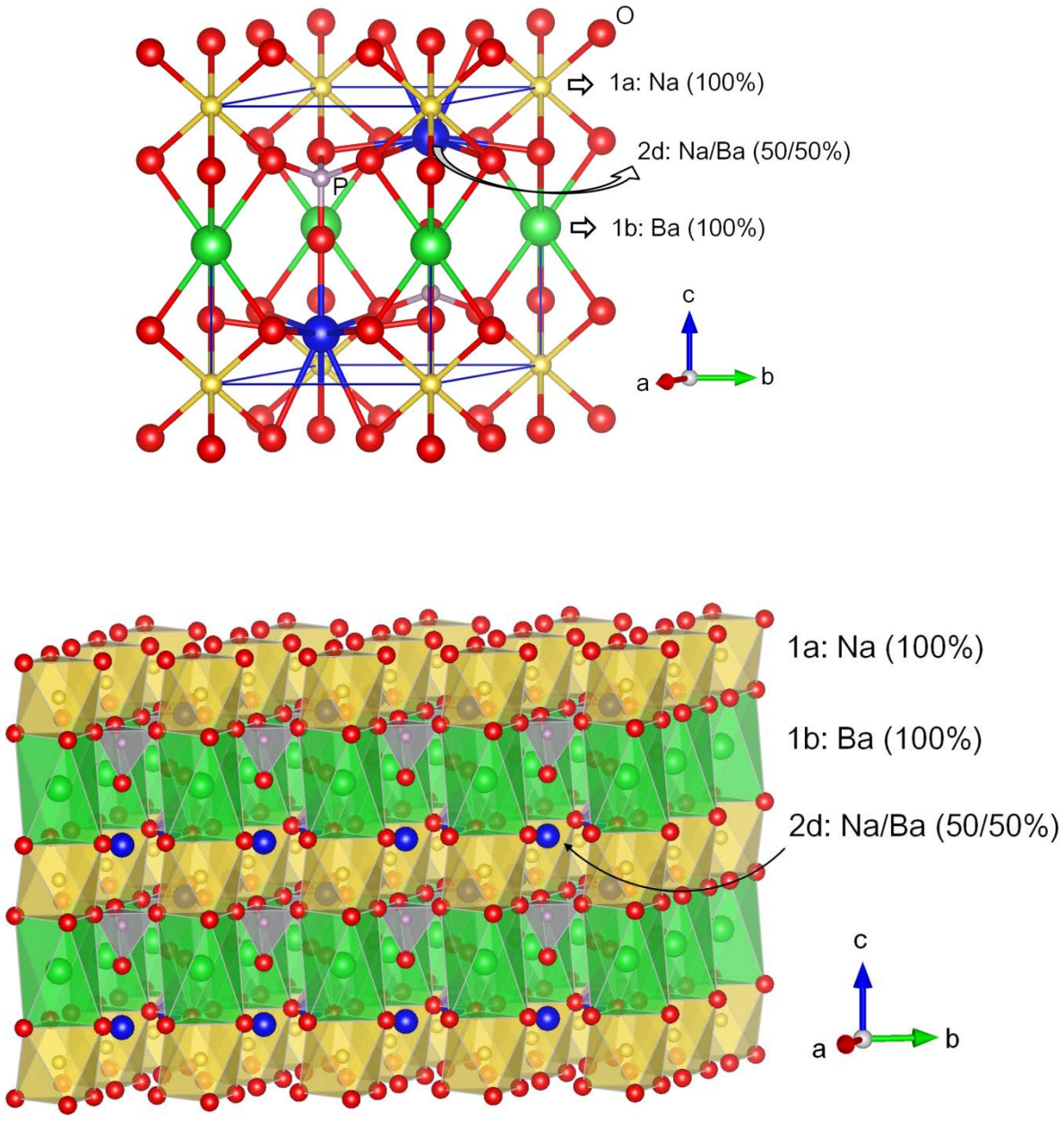
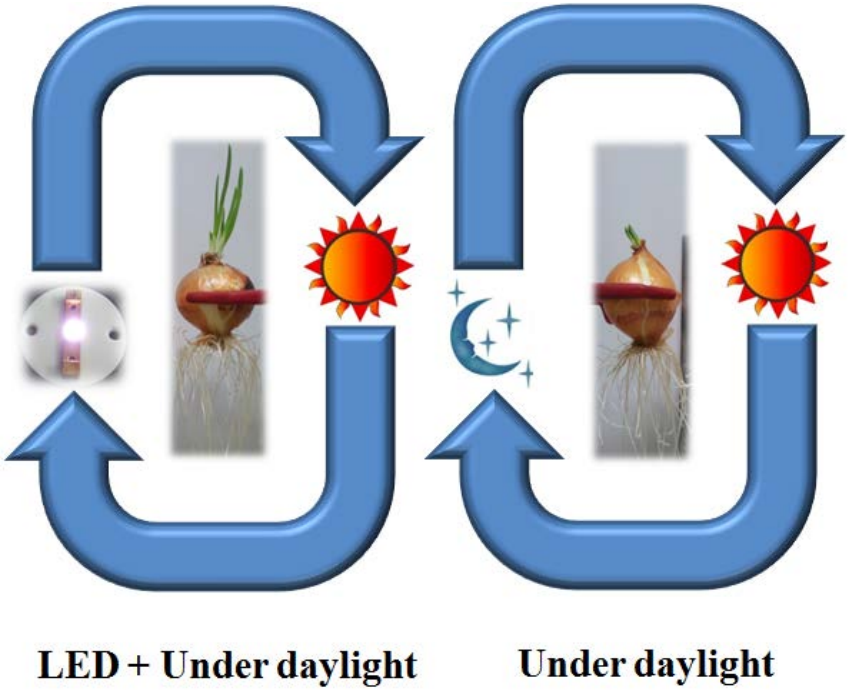
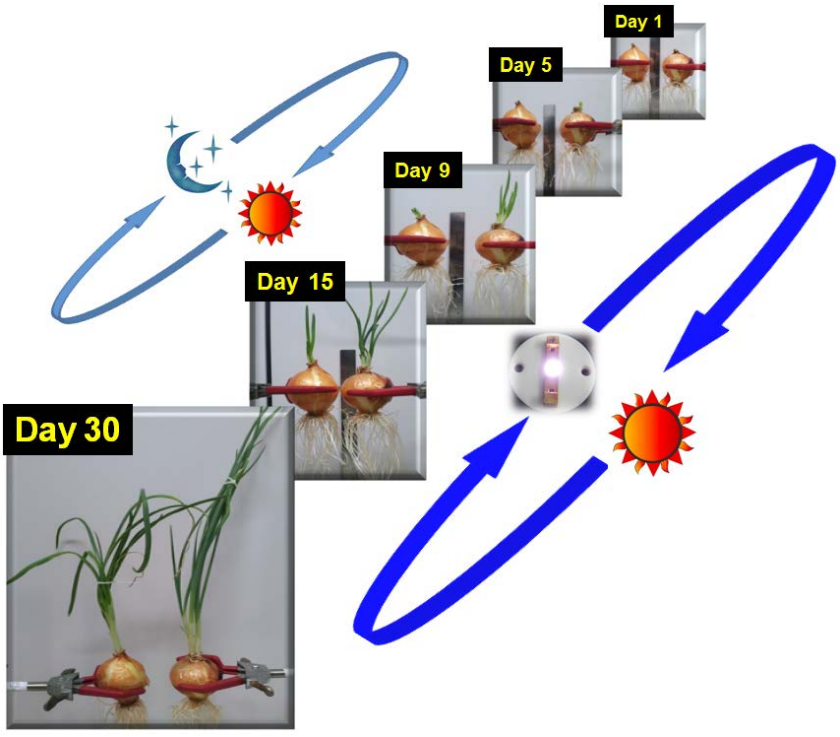


Figure S2. Crystal structure of the $NaBaPO_4$ compound. The available atomic site, 1a, 1b and 2d, with the Na-O and Ba-O subcell.

3. LED-assisted Lighting Effect on Onion Growth



(a)



(b)

Figure S3. (a) Comparison of the grown-up onions under LED-assisted photoperiod and daylight. (b) 30 day panoramic images of shoots of the onions under with (right) and without (left) LED-assisted photoperiod conditions.

4. LED lightings-equipped Plant Factory Apparatus

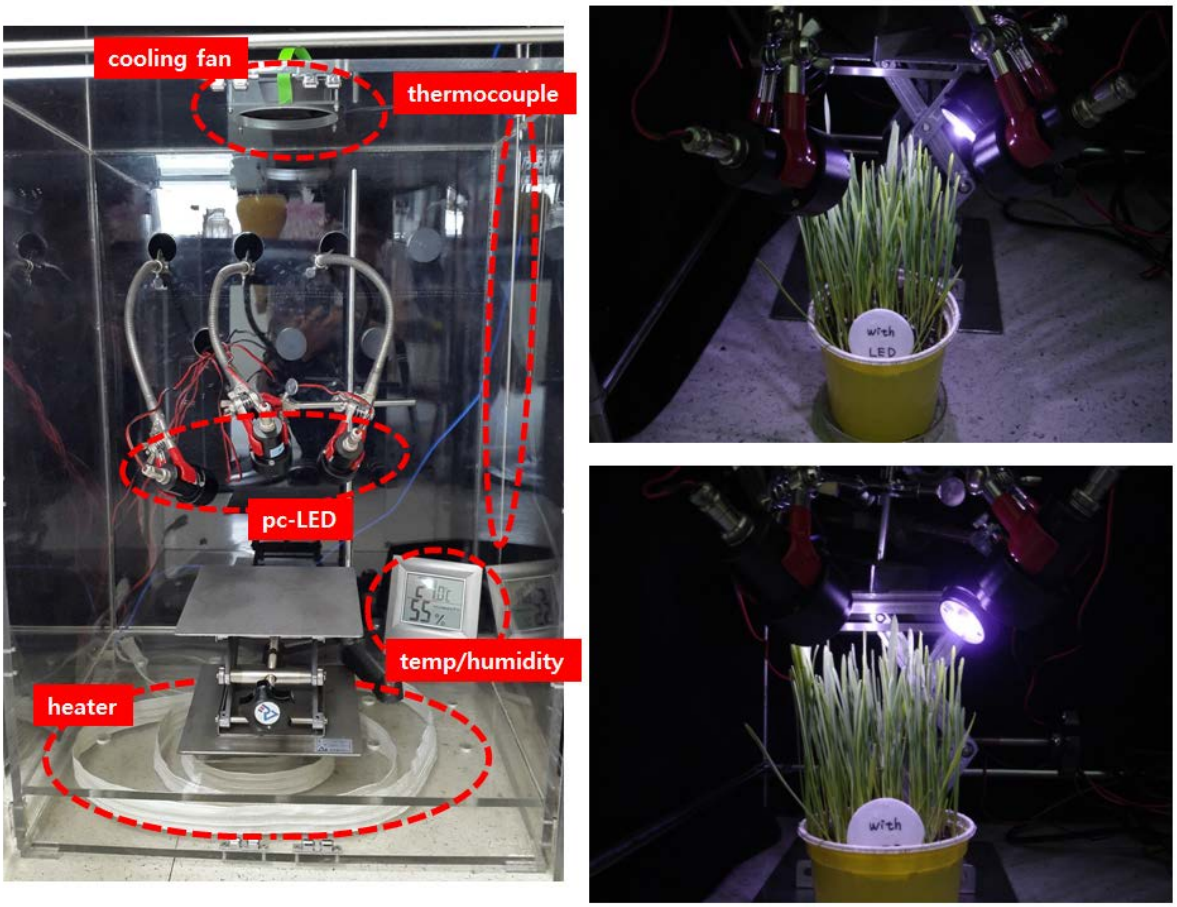


Figure S4. Left) Set-up image of the thermo-hygrostat chamber for LED-supported plant growth. Right) *In-situ* image of oats growing-up under LED illumination.

5. Pure red-emitting LED assisted Lighting Effect on Oats Growth

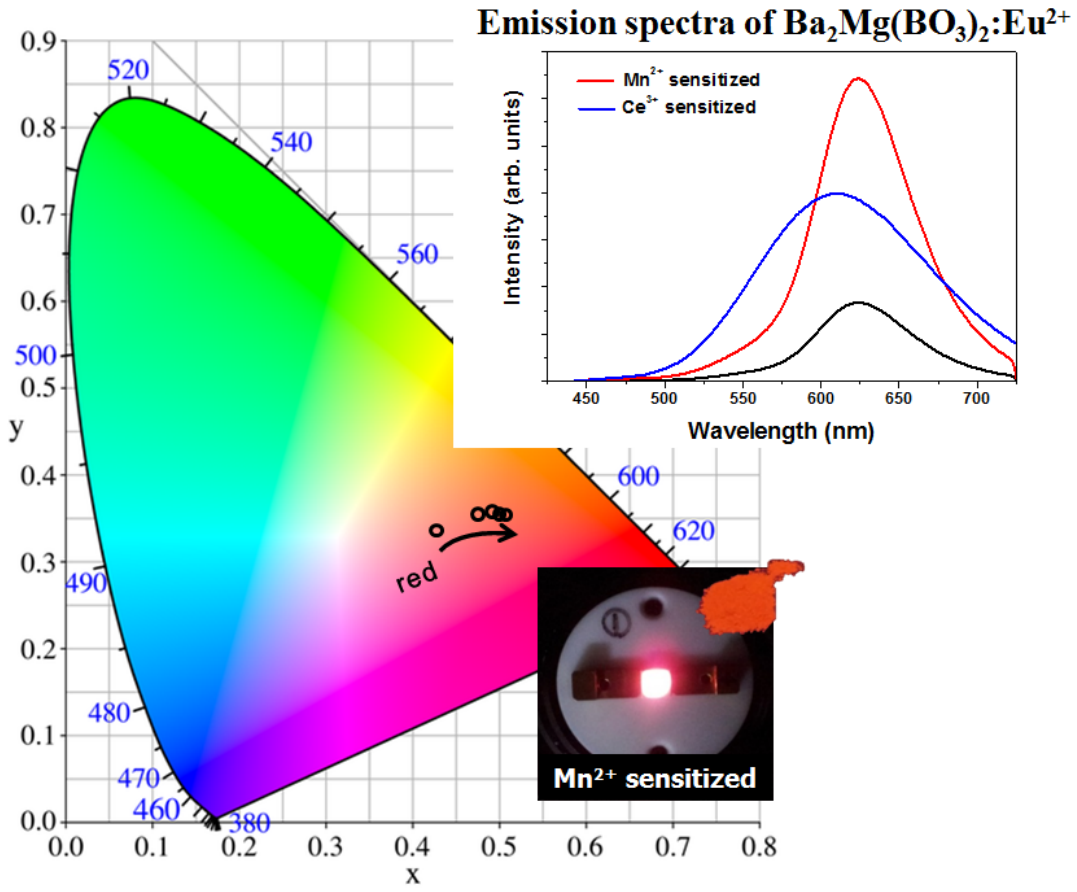


Figure S5. Emission spectra, corresponding CIE diagram, and pc-LED image with power on for the red-emitting $Ba_2Mg(BO_3)_2:Eu^{2+}$ phosphor.