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

Effect of Sr^{2+} ions on the structure, upconversion emission and thermal sensing of Er^{3+}, Yb^{3+} codoped double perovskites $Ba_{(2-x)}Sr_xMgWO_6$ phosphors

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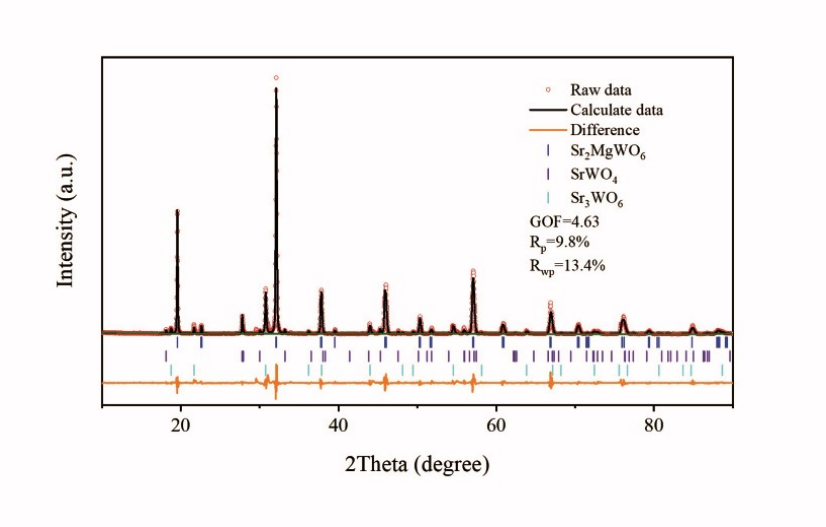

Supplementary Fig. S1. Rietveld refined XRD pattern of the Sr_2MgWO_6:7%Er^{3+}, 2%Yb^{3+},9%K^+

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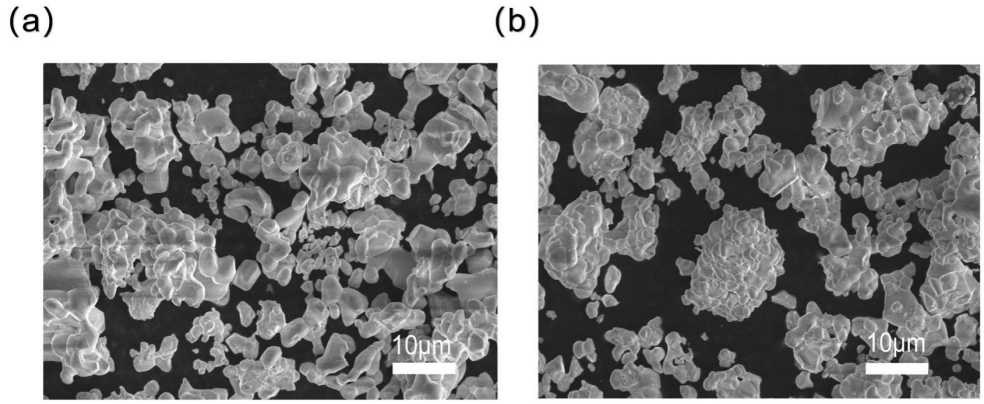
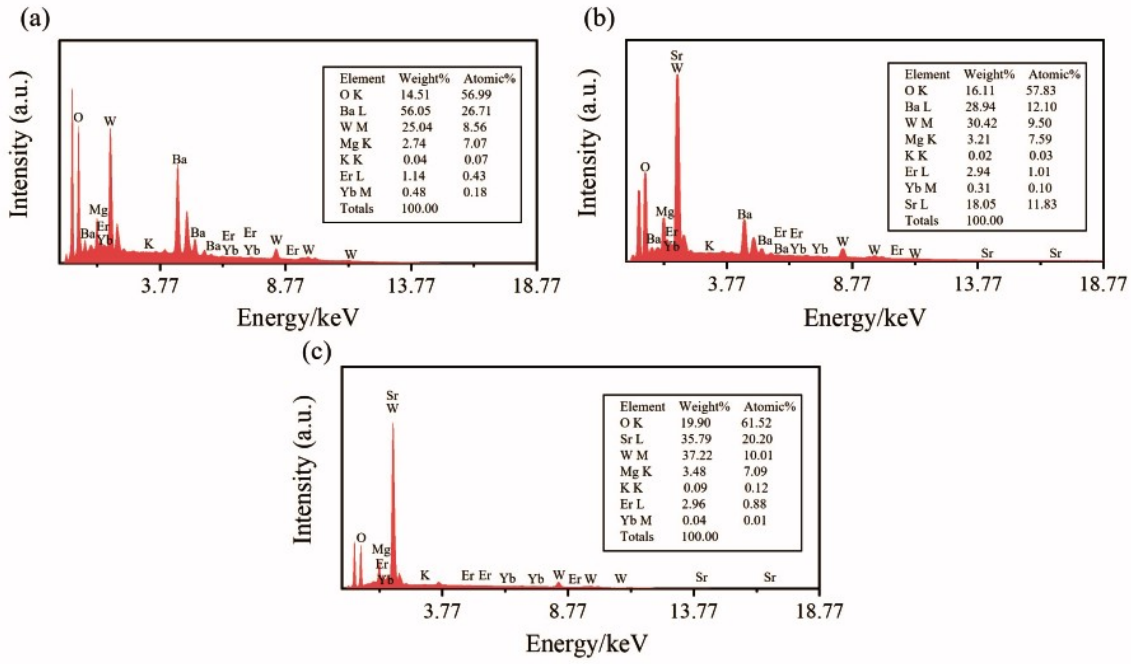
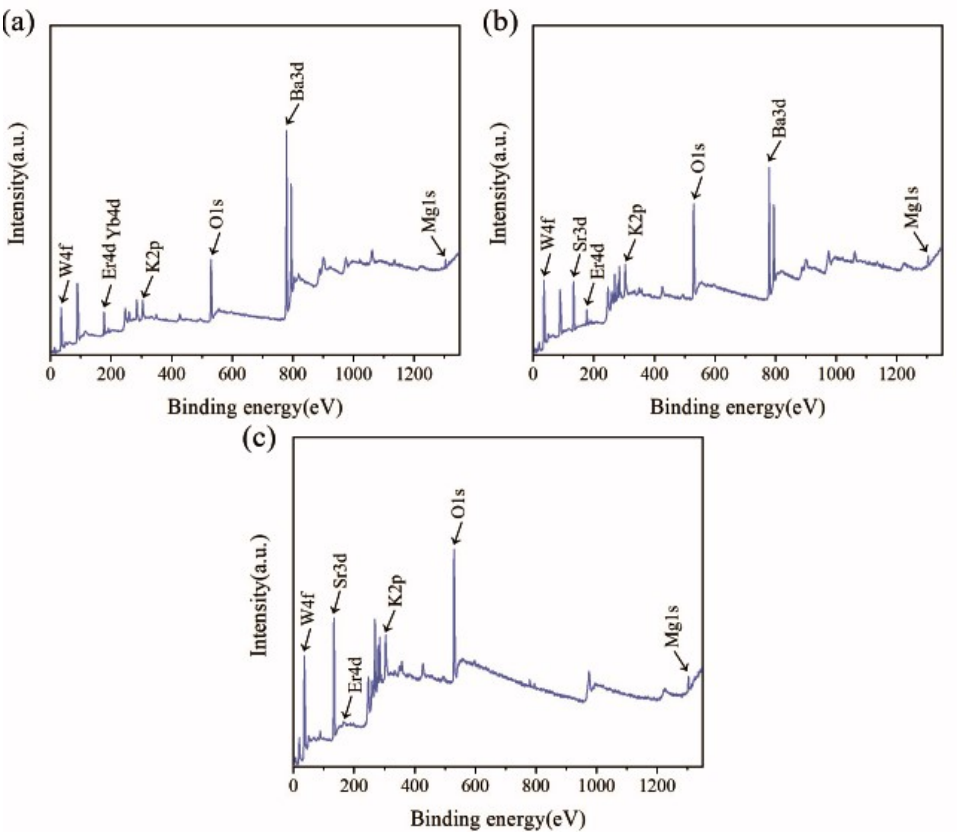


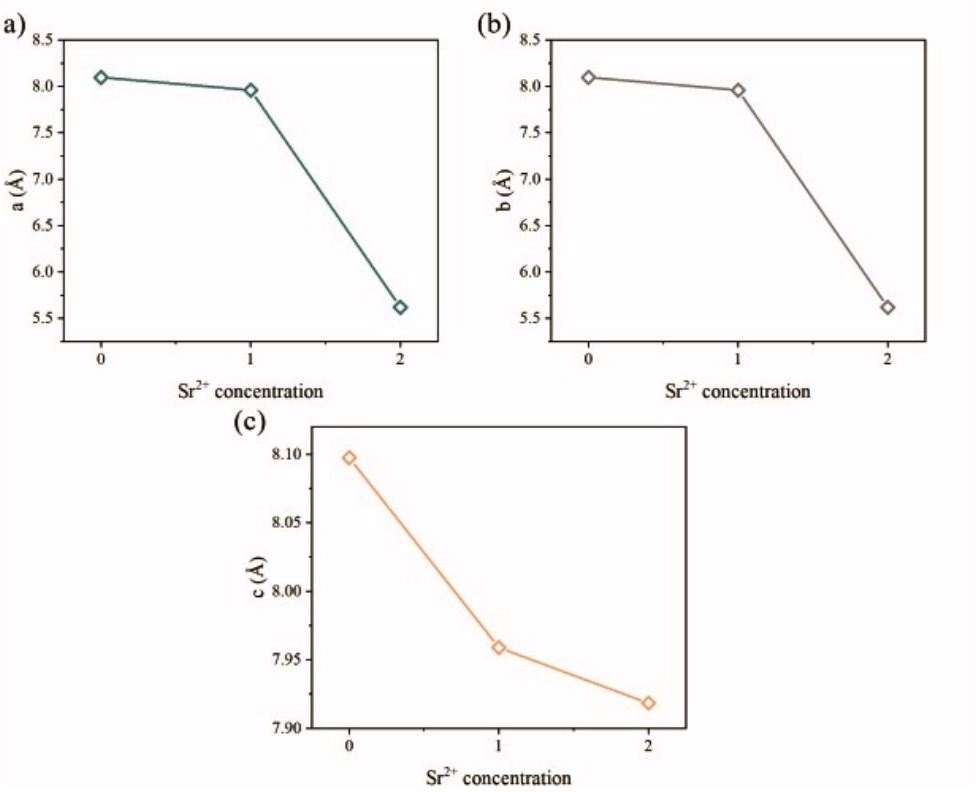
Supplementary Fig. S2. SEM images of (a)Ba_2MgWO_6:7%Er^{3+}, 2%Yb^{3+}, 9%K^+ and (b)Sr_2MgWO_6:7%Er^{3+}, 2%Yb^{3+}, 9%K^+



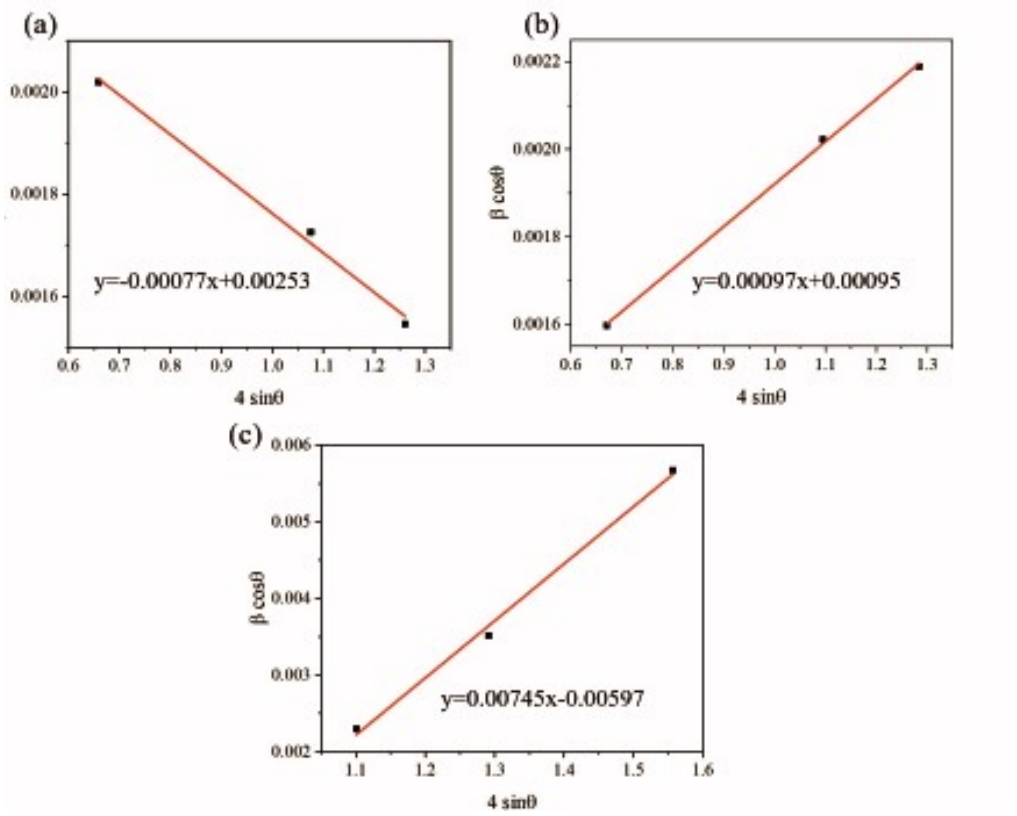
Supplementary Fig. S3. (a-c) EDS of the $Ba_{2-x}Sr_xMgWO_6$:7%Er^{3+}, 2%Yb^{3+}, 9%K^+ (x= 0,1, 2)



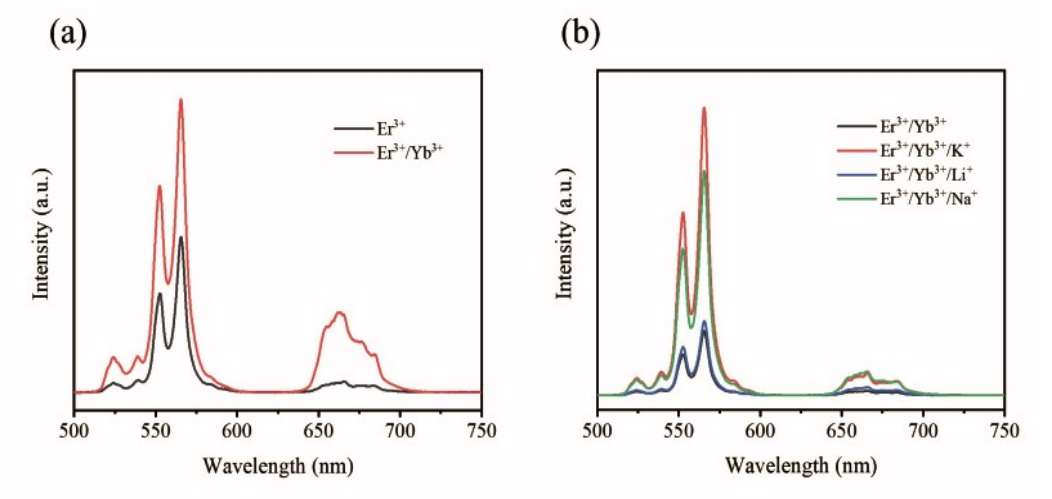
Supplementary Fig. S4. (a-c) XPS spectra of $Ba_{2-x}Sr_xMgWO_6$:7%Er^{3+}, 2%Yb^{3+}, 9%K^+ (x= 0,1, 2)



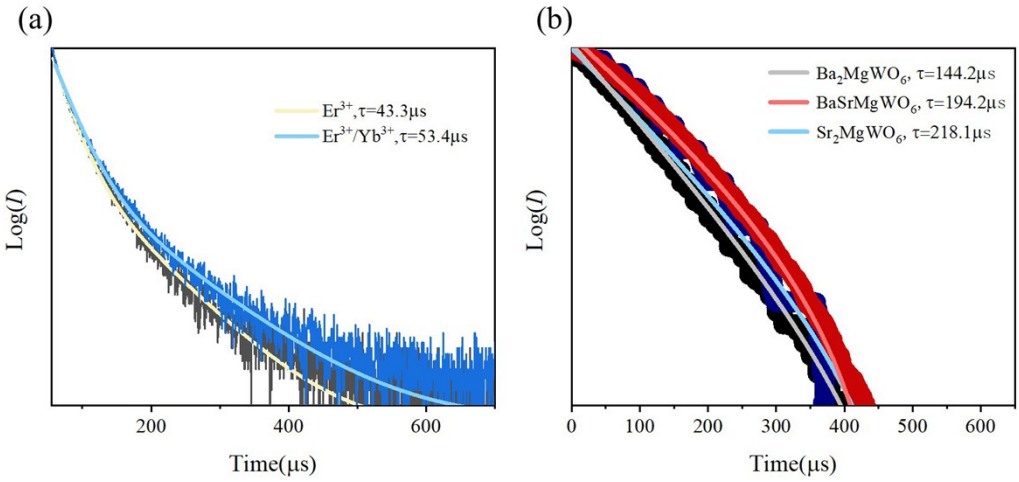
Supplementary Fig. S5. (a-c) Effect of changing Sr^{2+} doping concentration on cell parameters



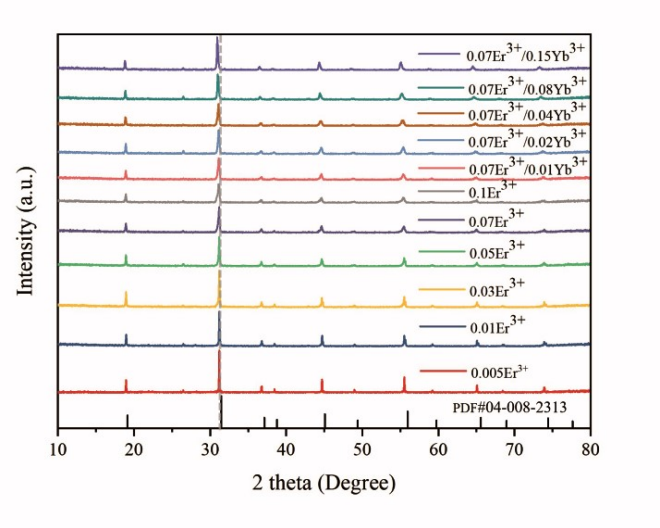
Supplementary Fig. S6. (a-c) Williomson-Hall plot of $Ba_{2-x}Sr_xMgWO_6$:7%Er^{3+}, 2%Yb^{3+}, 9%K^+ (x= 0,1, 2)



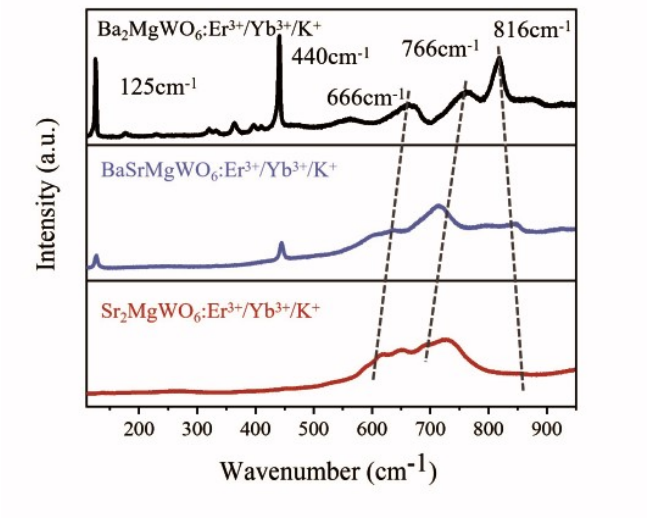
Supplementary Fig. S7. Upconversion emission spectra of (a) $Sr_2Mg_{0.93}WO_6$:7%Er^{3+}, $Sr_2Mg_{0.91}WO_6$:7%Er^{3+}, 2%Yb^{3+}; (b) $Sr_2Mg_{0.91}WO_6$:7%Er^{3+}, 2%Yb^{3+}, $Sr_2Mg_{0.91}WO_6$:7%Er^{3+}, 2%Yb^{3+}, 9%A^+ (A = K^+, Li^+, Na^+)



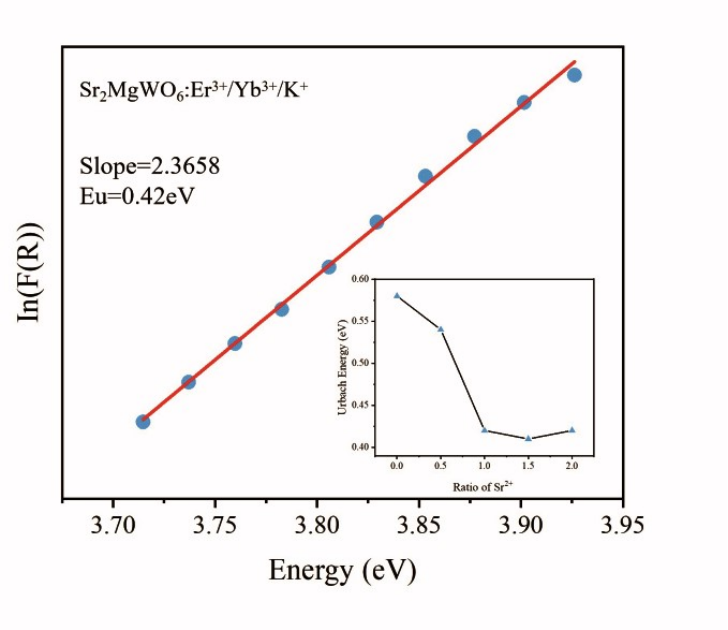
Supplementary Fig. S8. Luminescence decay curves of (a) $Sr_2Mg_{0.93}WO_6$:7%Er^{3+}, $Sr_2Mg_{0.91}WO_6$:7%Er^{3+}, 2%Yb^{3+} (b) $Ba_{(2-x)}Sr_xMgWO_6$ (x=0, 1, 2):7%Er^{3+}, 2%Yb^{3+}, 9%K^+



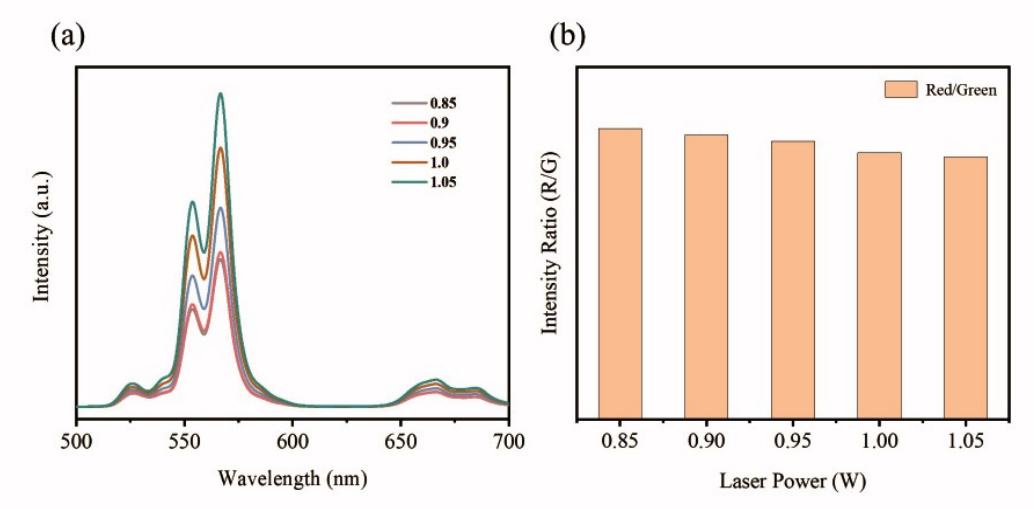
Supplementary Fig. S9. XRD sample of $Sr_2Mg_{1-m}WO_6$: m%Er^{3+};$Sr_2Mg_{0.93-n}WO_6$: 7%Er^{3+}/n%Yb^{3+} (m= 0.05,1, 3, 5, 7, 10/n= 1, 2, 4, 8, 15)



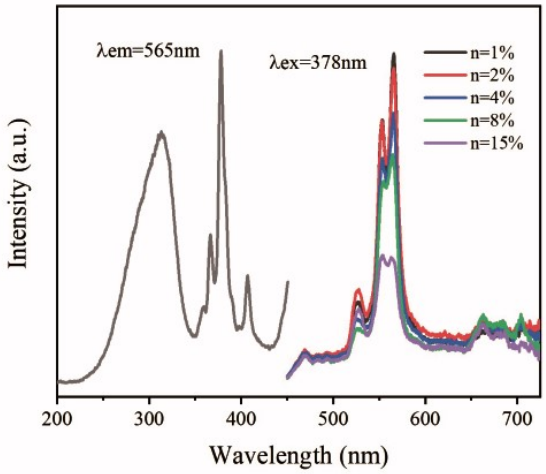
Supplementary Fig. S10. Raman spectra of $Ba_{2-x}Sr_xMgWO_6$:7%Er^{3+}, 2%Yb^{3+}, 9%K^+ (x= 0, 1, 2)



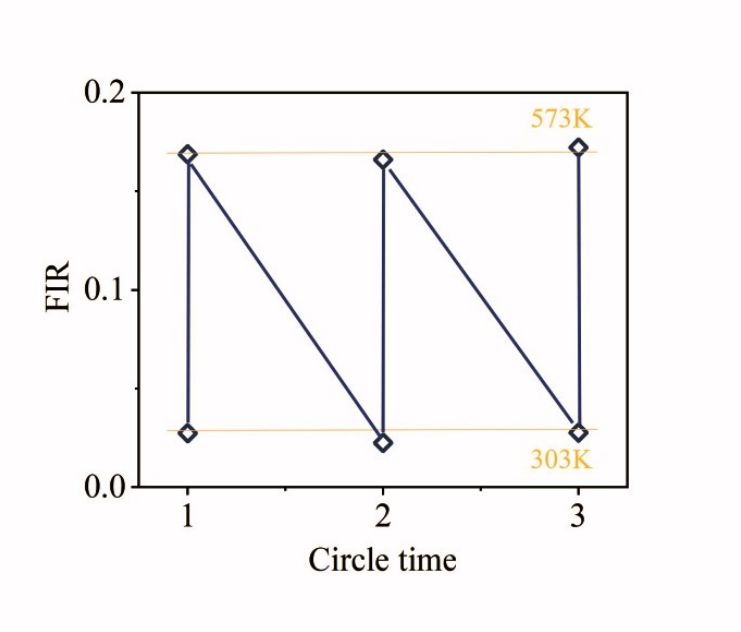
Supplementary Fig. S11. Kubelka-Munk plot ln(F(R)) vs. energy plot of Sr_2MgWO_6:7%Er^{3+}, 2%Yb^{3+},9%K^+, Inset shows urbach energy plot of $Ba_{2-x}Sr_xMgWO_6$:7%Er^{3+}, 2%Yb^{3+}, 9%K^+ (x= 0,0.5, 1, 1.5,2)



Supplementary Fig. S12. (a)Power-dependent spectra of Sr_2MgWO_6:7%Er^{3+}, 2%Yb^{3+}, 9%K^+, (b) Red to green ratio of Sr_2MgWO_6:7%Er^{3+}, 2%Yb^{3+}, 9%K^+ emission peak with laser power



Supplementary Fig. S13. PLE spectrum (λ_{em} = 565 nm) of 7 mol%Er^{3+}, 2 mol%Yb^{3+}: Sr_2MgWO_6 and PL spectra (λ_{ex} = 378 nm) of 2 mol%Er^{3+}, n mol%Yb^{3+}: Sr_2MgWO_6 (n = 1, 2, 4, 8, 15).



Supplementary Fig. S14. Changes in FIR (I527 nm/I553 nm) values for repeated tests between 303 K and 573 K