

**Facile synthesis, morphology and tunable photoluminescence
properties of BaMgF₄:Ce³⁺/Tb³⁺/Eu³⁺ phosphors**

Wenpeng Xia^a, Yufeng Zhang^a, Jie Xiong^a, Shanshan Hu^a, Jie Yu^{*b}, Yanfei Zhang^c and Jun Yang^{*a}

^a School of Chemistry and Chemical Engineering, Southwest University, Chongqing, 400715, China.

^b Academic Affairs Office, Southwest University, Chongqing 400715, China.

^c AECC Harbin Dongan Engine Co Ltd, Harbin 150066, China.

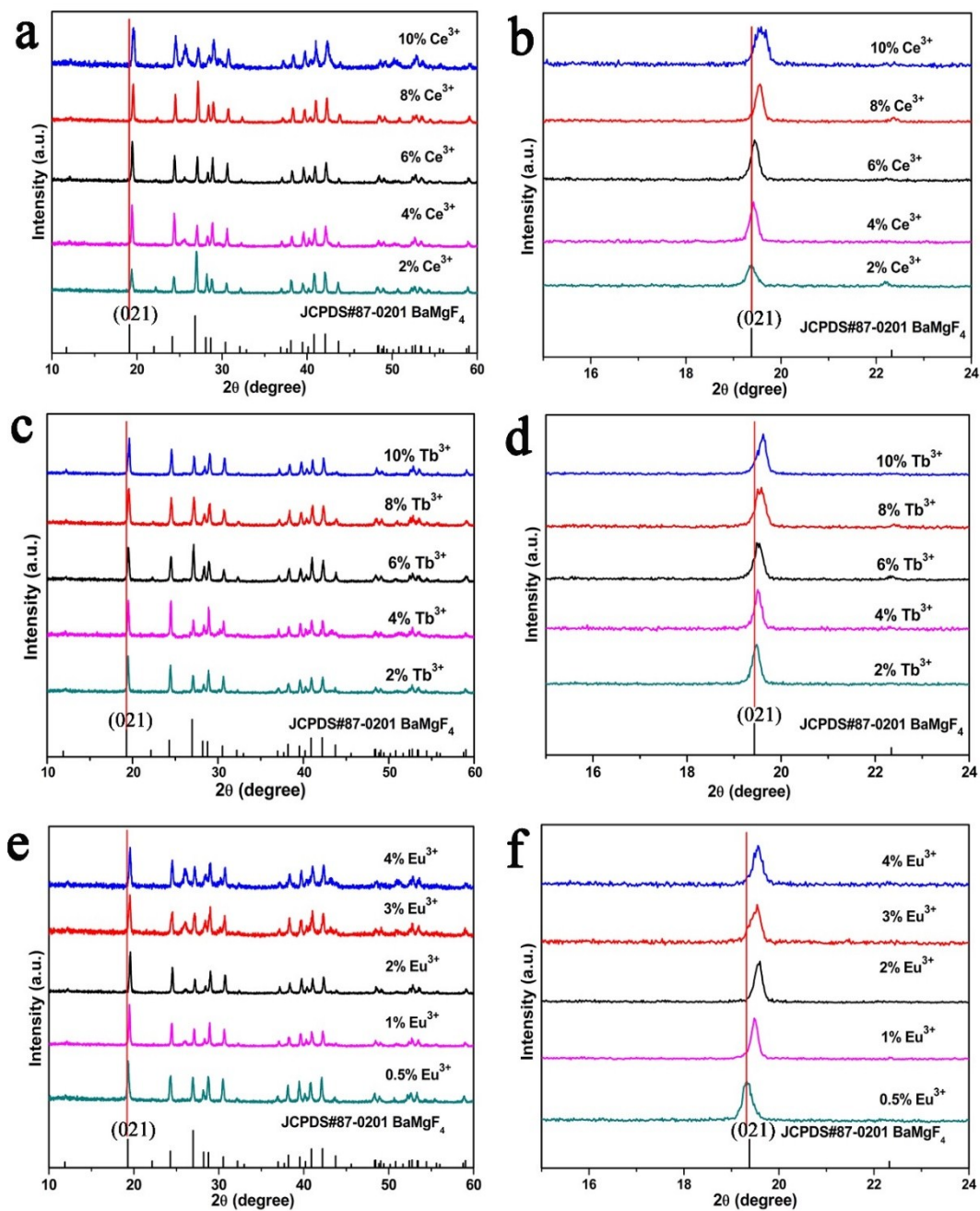


Fig. S1 XRD patterns of BaMgF₄ doped with different concentration of Ln³⁺ (Ln = Ce, Tb and Eu) and the corresponding enlarged XRD patterns in the range of $2\theta = 15^\circ$ to 24° , respectively.

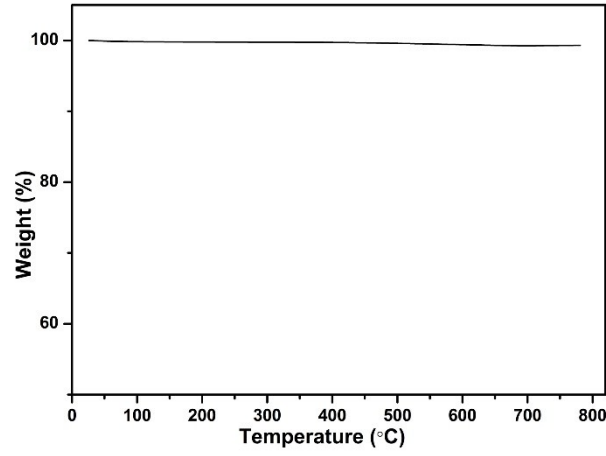


Fig. S2 TG curve of BaMgF₄ sample.

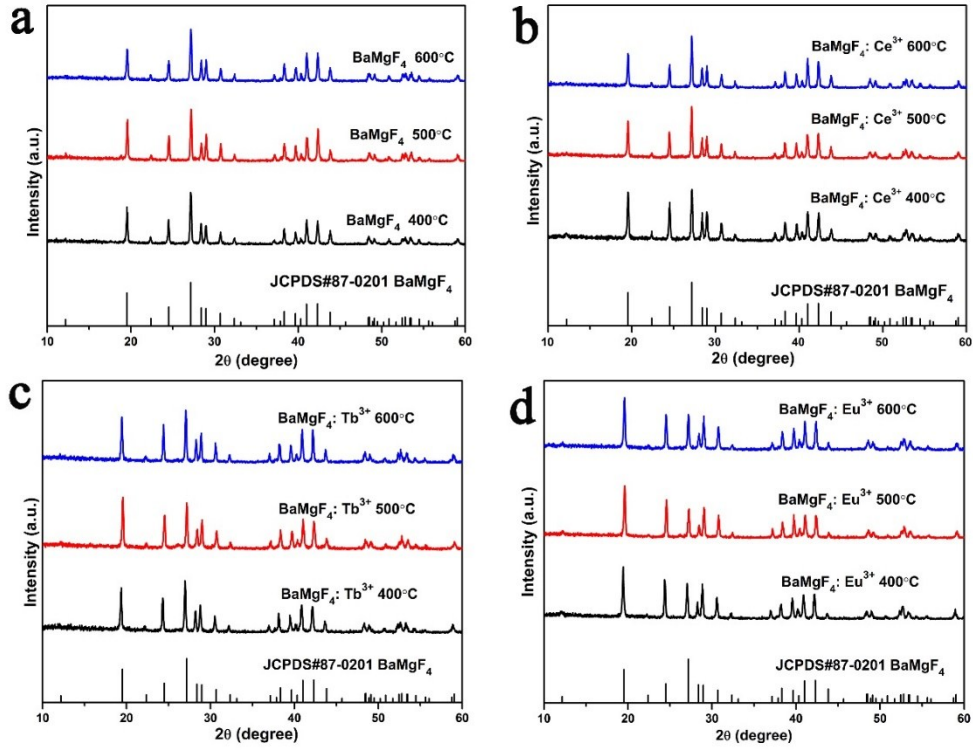


Fig. S3 XRD patterns of BaMgF₄ samples after calcination at different temperatures: (a) BaMgF₄; (b) BaMgF₄: Ce³⁺; (c) BaMgF₄: Tb³⁺ and (d) BaMgF₄: Eu³⁺, respectively.

Table S1 The lattice parameters and cell volume of BaMgF₄:Ce³⁺ samples.

Sample	Lattice parameter (a,b,c)/Å; (α , β , γ) /°	Cell volume V/ Å ³	Crystal system
BaMgF ₄	a=4.126, b=14.518, c=5.821 $\alpha = \beta = \gamma = 90^\circ$	V=348.7	Orthorhombic
BaMgF ₄ :2%Ce ³⁺	a=4.114, b=14.508, c=5.805 $\alpha = \beta = \gamma = 90^\circ$	V=346.4	Orthorhombic
BaMgF ₄ :4%Ce ³⁺	a=4.108, b=14.506, c=5.785 $\alpha = \beta = \gamma = 90^\circ$	V=344.7	Orthorhombic
BaMgF ₄ :6%Ce ³⁺	a=4.072, b=14.482, c=5.774 $\alpha = \beta = \gamma = 90^\circ$	V=340.5	Orthorhombic
BaMgF ₄ :8%Ce ³⁺	a=4.015, b=14.475, c=5.761 $\alpha = \beta = \gamma = 90^\circ$	V=334.8	Orthorhombic
BaMgF ₄ :10%Ce ³⁺	a=4.008, b=14.461, c=5.755 $\alpha = \beta = \gamma = 90^\circ$	V=333.5	Orthorhombic

Table S2 The lattice parameters and cell volume of BaMgF₄:Tb³⁺ samples.

Sample	Lattice parameter (a,b,c)/Å; (α , β , γ) /°	Cell volume V/ Å ³	Crystal system
BaMgF ₄	a=4.126, b=14.518, c=5.821 $\alpha = \beta = \gamma = 90^\circ$	V=348.7	Orthorhombic
BaMgF ₄ :2%Tb ³⁺	a=4.105, b=14.481, c=5.795 $\alpha = \beta = \gamma = 90^\circ$	V=344.4	Orthorhombic
BaMgF ₄ :4%Tb ³⁺	a=4.084, b=14.458, c=5.774 $\alpha = \beta = \gamma = 90^\circ$	V=340.9	Orthorhombic
BaMgF ₄ :6%Tb ³⁺	a=4.069, b=14.403, c=5.762 $\alpha = \beta = \gamma = 90^\circ$	V=342.4	Orthorhombic
BaMgF ₄ :8%Tb ³⁺	a=4.015, b=14.475, c=5.741 $\alpha = \beta = \gamma = 90^\circ$	V=333.6	Orthorhombic
BaMgF ₄ :10%Tb ³⁺	a=3.974, b=14.452, c=5.710 $\alpha = \beta = \gamma = 90^\circ$	V=327.9	Orthorhombic

Table S3 The lattice parameters and cell volume of BaMgF₄:Eu³⁺ samples.

Sample	Lattice parameter (a,b,c)/Å; (α , β , γ) /°	Cell volume V/Å ³	Crystal system
BaMgF ₄	a=4.126, b=14.518, c=5.821 $\alpha = \beta = \gamma = 90^\circ$	V=348.7	Orthorhombic
BaMgF ₄ :0.5%Eu ³⁺	a=4.118, b=14.509, c=5.812 $\alpha = \beta = \gamma = 90^\circ$	V=347.2	Orthorhombic
BaMgF ₄ :1%Eu ³⁺	a=4.110, b=14.484, c=5.805 $\alpha = \beta = \gamma = 90^\circ$	V=345.5	Orthorhombic
BaMgF ₄ :2%Eu ³⁺	a=4.083, b=14.457, c=5.786 $\alpha = \beta = \gamma = 90^\circ$	V=341.5	Orthorhombic
BaMgF ₄ :3%Eu ³⁺	a=4.058, b=14.430, c=5.762 $\alpha = \beta = \gamma = 90^\circ$	V=337.4	Orthorhombic
BaMgF ₄ :4%Eu ³⁺	a=4.025, b=14.417, c=5.724 $\alpha = \beta = \gamma = 90^\circ$	V=332.2	Orthorhombic