Support information

Yttrium aluminum garnet fluorescent conversion film for solid-state lighting: interface reaction synthesis strategy and modulation of warm white light

Haoxuan Zeng, [a] Taihui Chen, [a] Yongping Guo, [a] Xiaoli Wu*[a, b,c]

a. College of Materials Science and Engineering, Guilin University of Technology, Guilin 541004, People's Republic of China

b. Guangxi Key Laboratory of Optical and Electronic Materials and Devices, Guilin University of Technology, Guilin 541004, People's Republic of China

c. Collaborative Innovation Center for Exploration of Nonferrous Metal Deposits and Efficient Utilization of Resources in Guangxi; Guilin University of Technology, Guilin 541004, China

Table S1. Reactions between precursors and sapphire occurring at different ranges of temperature.

Temperature	Reaction
900—1000°C	$2Y_2O_3 + Al_2O_3 \rightarrow Y_4Al_2O_9$
1000—1100°C	$Y_4Al_2O_9 + Al_2O_3 \rightarrow 4YAlO_3$
1100—1550°C	$3YAlO_3 + Al_2O_3 \rightarrow Y_3Al_5O_{12}$

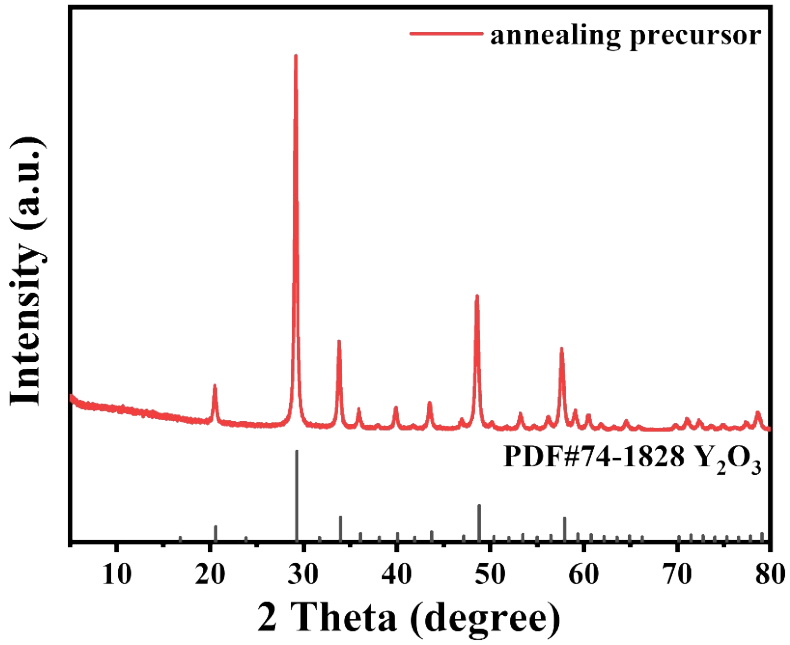

Fig. S1 XRD patterns of the precursor calcined at 630 °C.

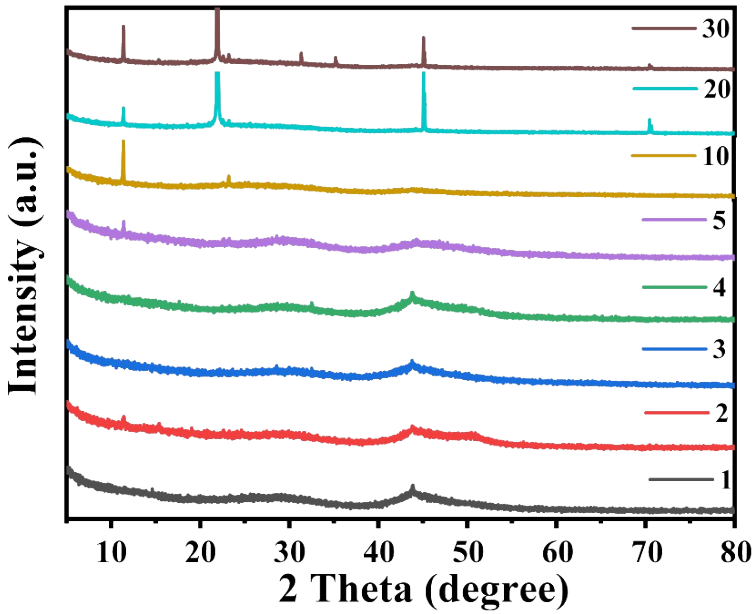

Fig. S2 XRD patterns of the precursors at different molar ratios of urea/$Y(NO_3)_3$ preparation.

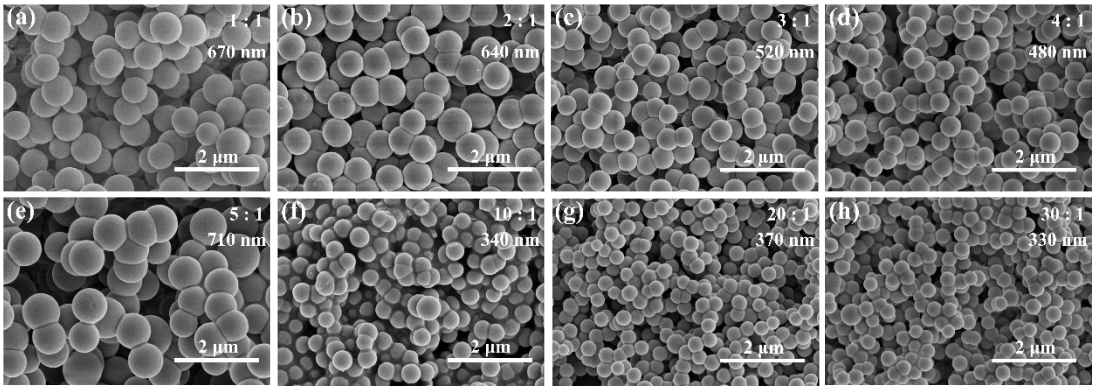

Fig. S3 SEM images of the precursors prepared with different R values: R=1(a), R=2(b), R=3(c), R=4(d), R=5(e), R=10(f), R=20(g) and R=30 (h).

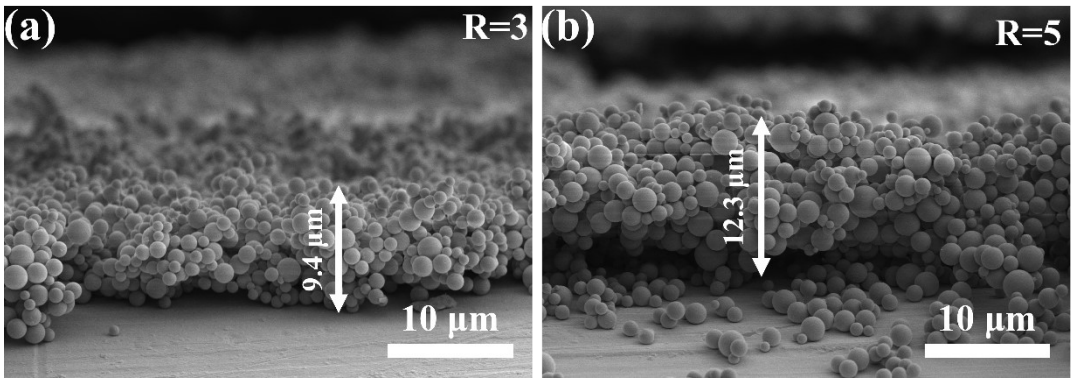

Fig. S4 Cross-section images the precursors at different R value: R=3(a), R=5(b).

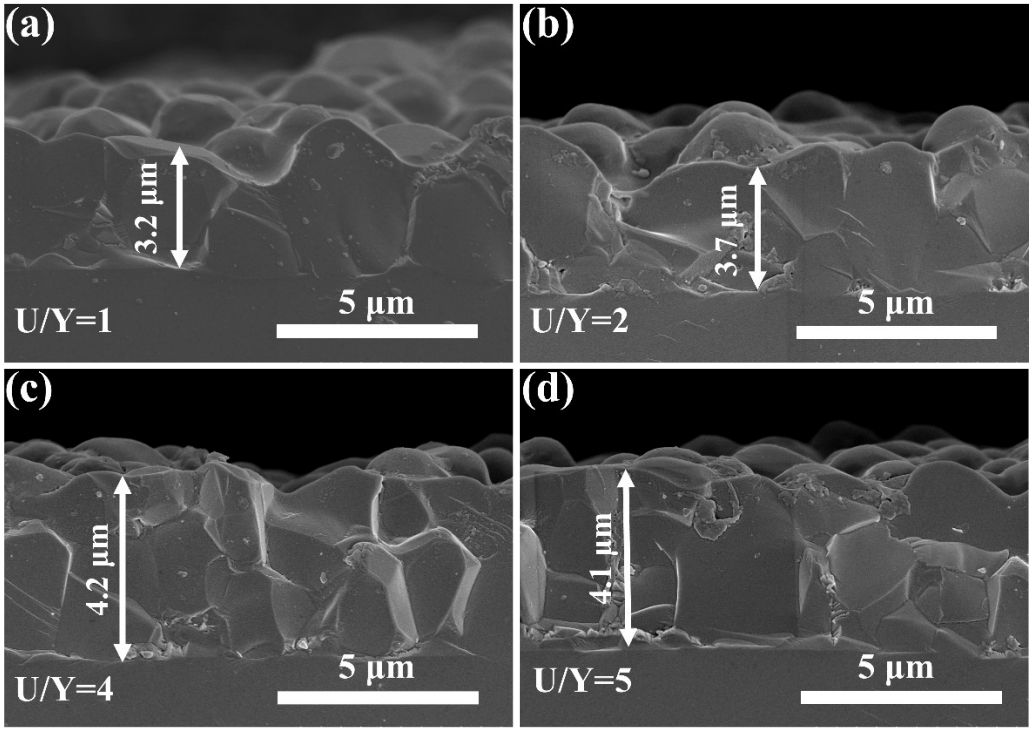

Fig. S5 Cross-section images the transparent polycrystalline films at different R value preparation.

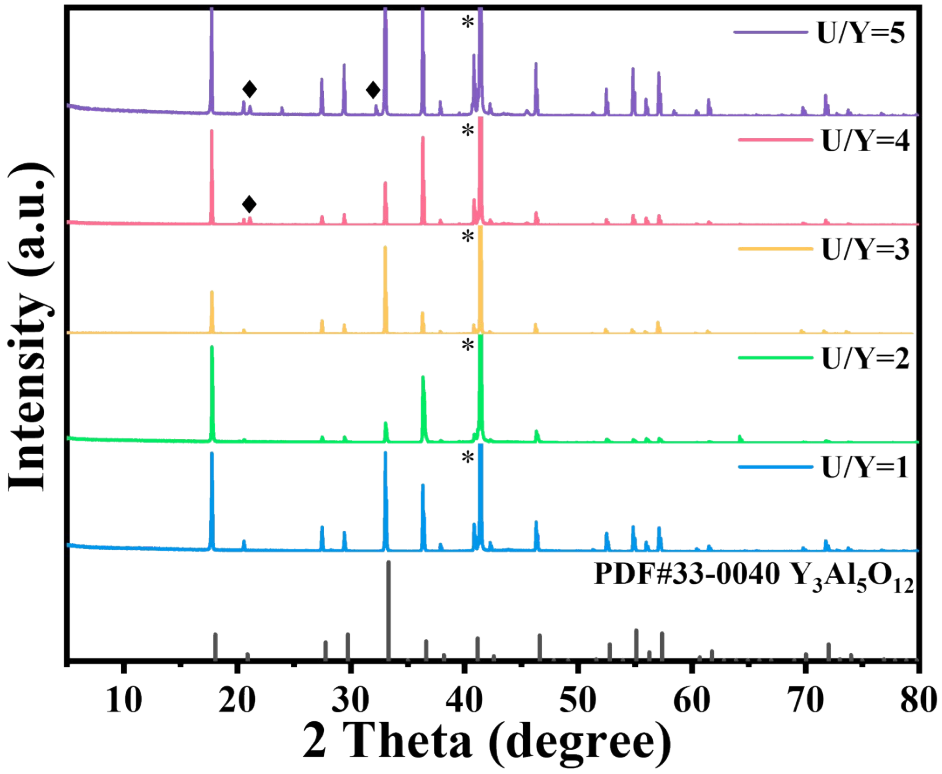

Fig. S6 XRD patterns of annealing films after interfacial reaction with different R value. The peaks marked by * are from Sapphire substrate

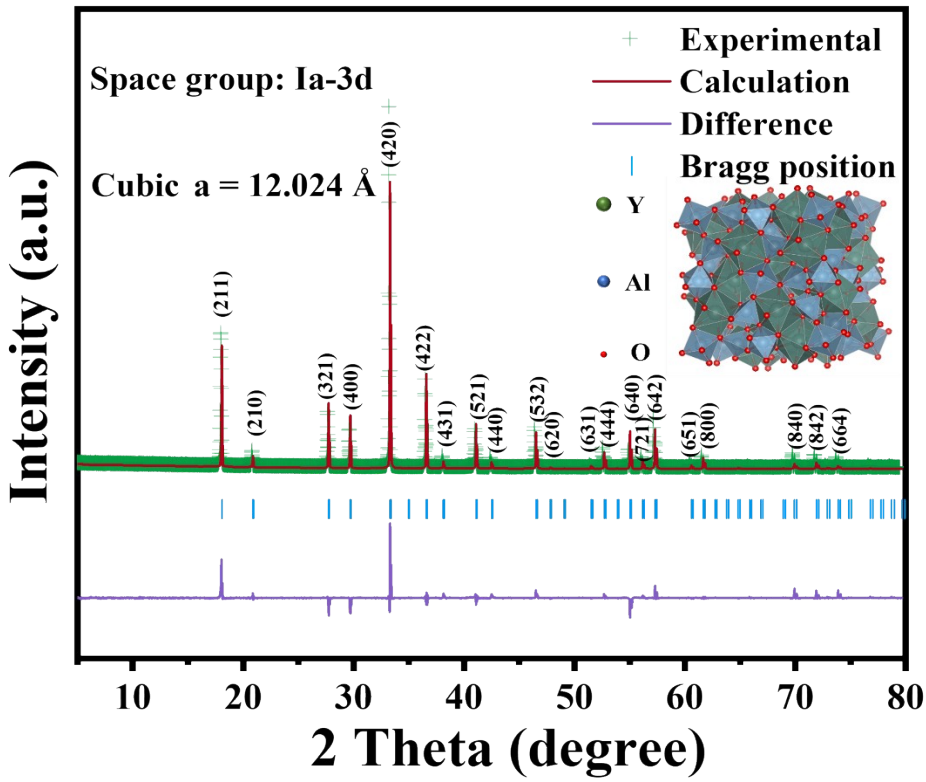

Fig. S7 Rietveld refinements of the transparent polycrystalline film calcined at 1550 °C

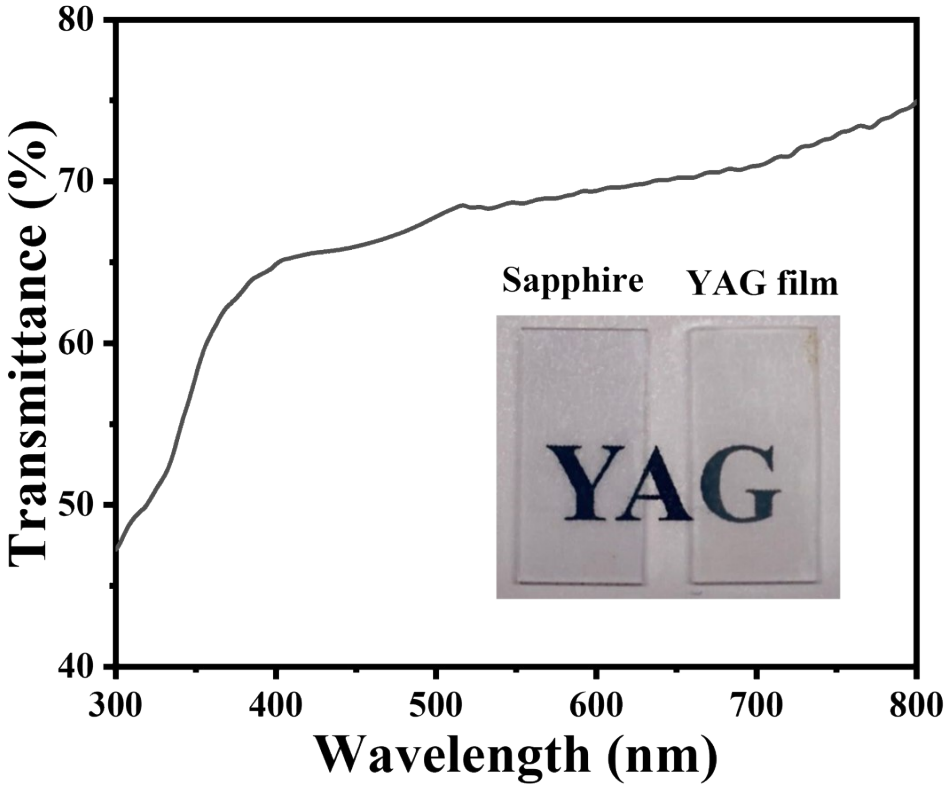

Fig. S8 Transmittance spectrum of YAG transparent polycrystalline films with R = 3.

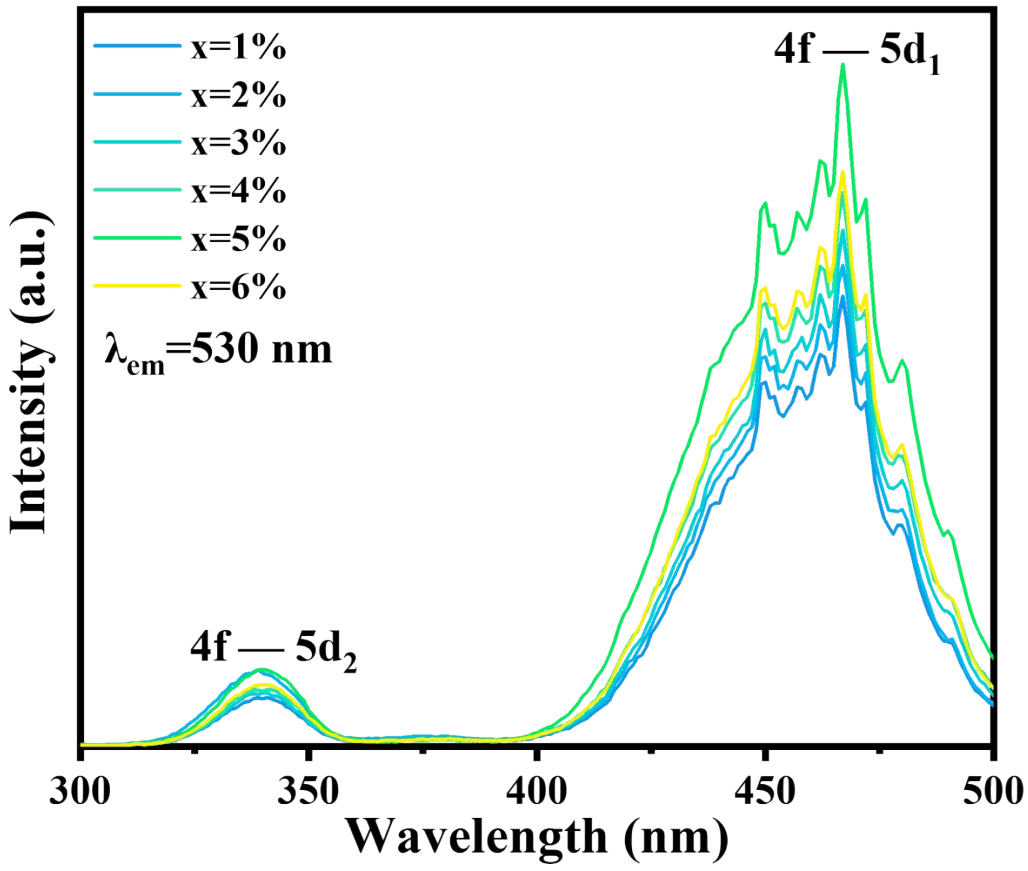

Fig. S9 The PLE spectra of the YAG: *x*Ce polycrystalline films

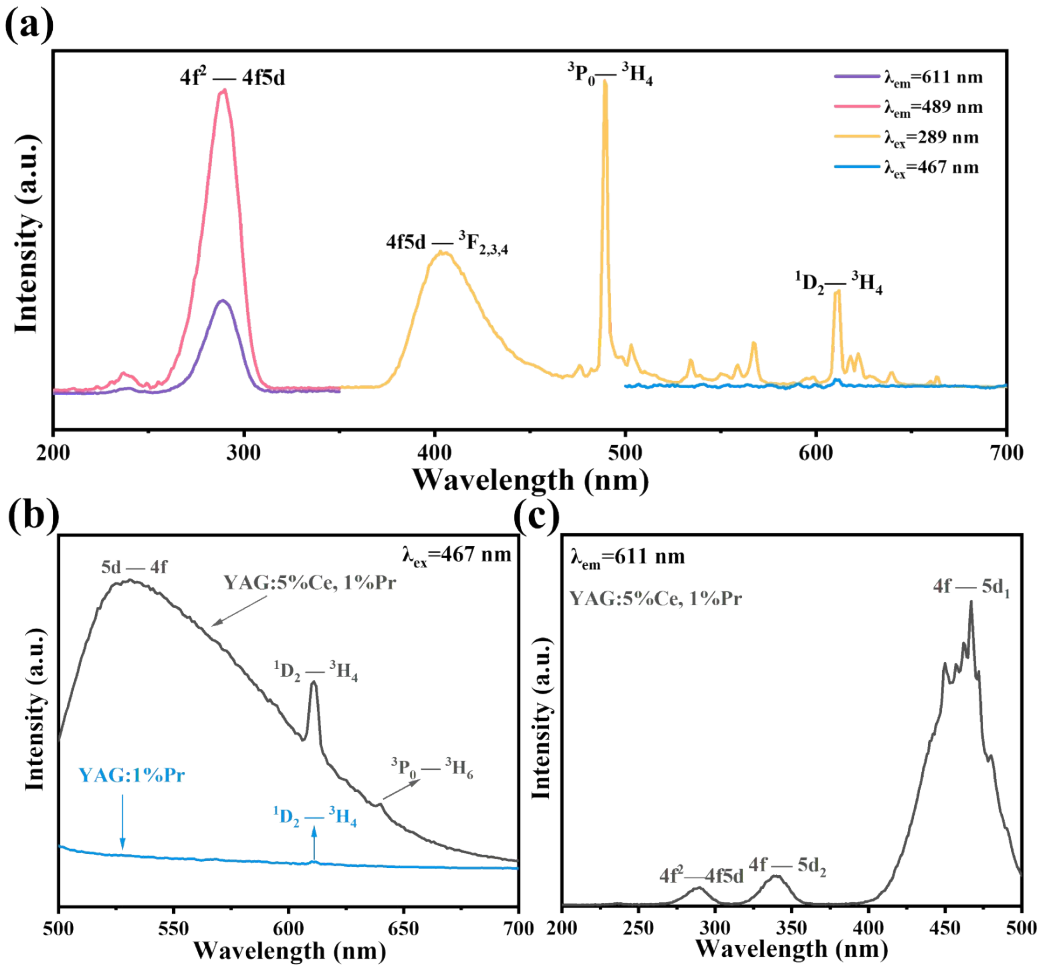

Fig. S10 The PLE and PL spectra of YAG: 1%Pr film (a) and YAG: 5%Ce,1%Pr (b-c).

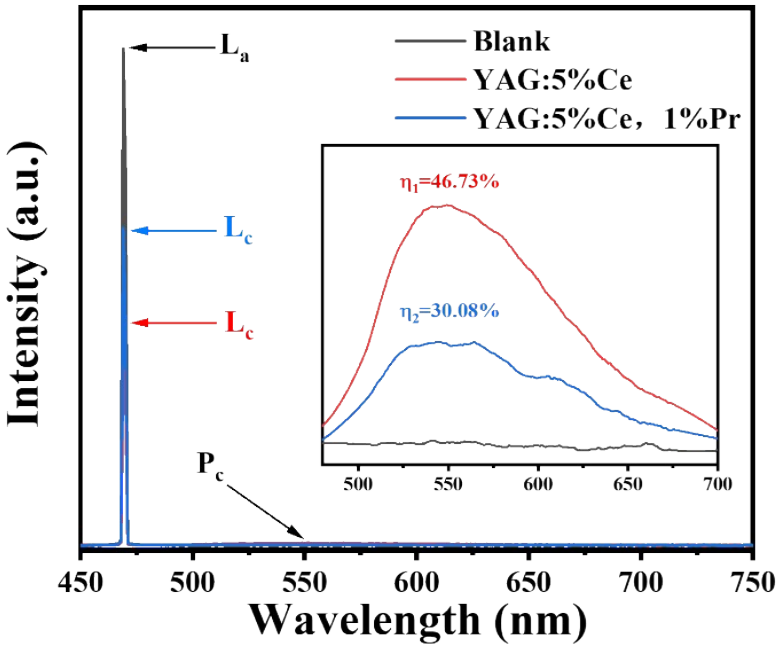

Fig. S11 PL spectra measured in an integrating sphere with air as reference and YAG: RE (RE=Ce, Pr) transparent polycrystalline films.

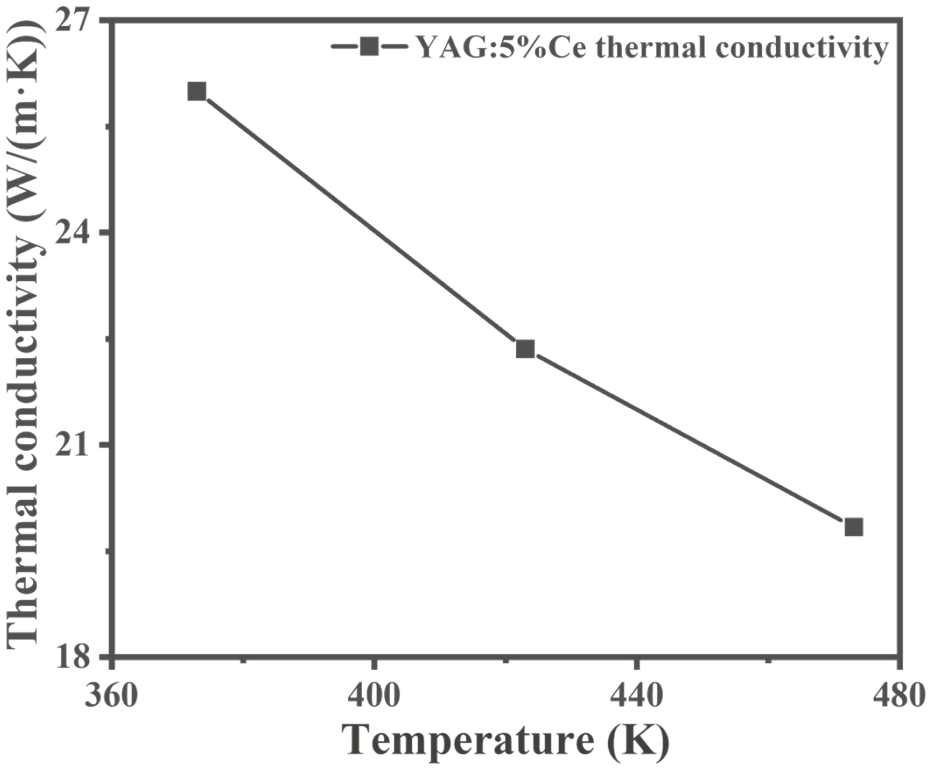

Fig. S12 Thermal conductivity of YAG: 5%Ce film.

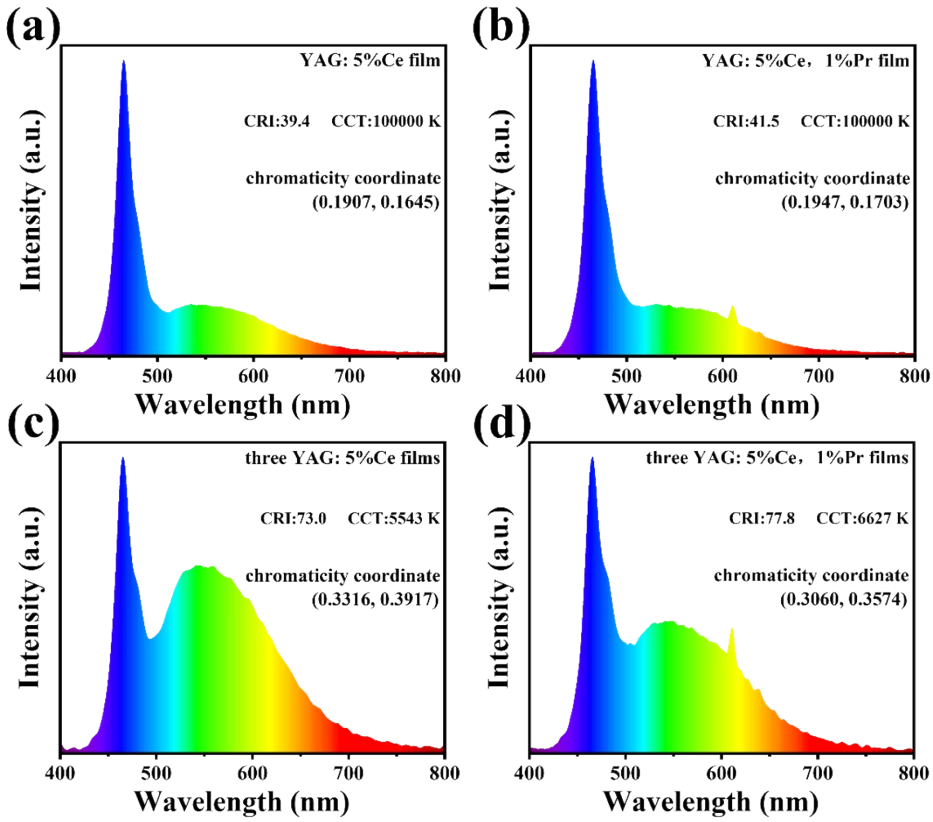

Fig. S13 EL spectra of one layer (a-b) and 3 layers (c-d) of YAG: RE (RE=Ce, Pr) transparent polycrystalline films.