Electronic Supplementary Material (ESI) for RSC Advances.

Supporting Information

Superior white light emission and color tunability of tri-doped YBO_3:Tb^{3+}, Eu^{3+} and Dy^{3+} for white light emitting diodes

Kaushik Das,[a] Archis Marathe,[a] Xianwen Zhang[b], Zhi Zhao*[c] and Jharna Chaudhuri*[a]

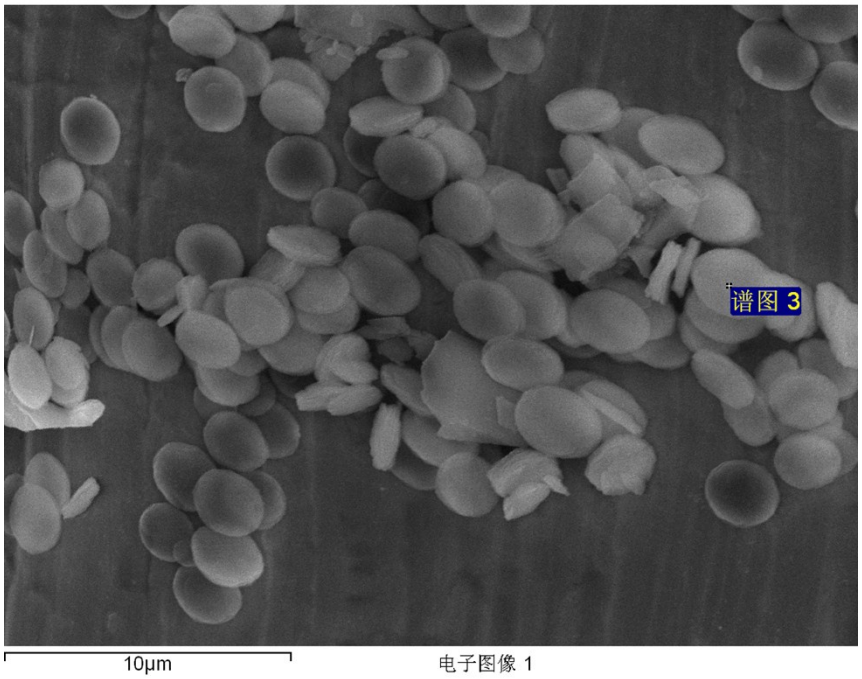
[a]*Department of Mechanical Engineering, Texas Tech University, Lubbock, Texas, USA, Fax:+806-742-3540, Tel:+503-509-8421*

[b]*School of Automobile and Transportation Engineering, Hefei University of Technology, Hefei, Anhui 230009, China.*

[c]*Hefei National Laboratory for Physical Sciences on at the Microscale, University of Science & Technology of China, Hefei, Anhui 230026, China*

**Corresponding authors: Jharna.chaudhuri@ttu.edu, zhizhao@ustc.edu.cn*

Element	Weight percent	Atomic percent
B K	14.83	32.83
C K	4.24	8.46
O K	29.54	44.19
Cu K	16.73	6.30
Y L	26.24	7.06
Eu L	1.59	0.25
Tb L	2.02	0.30
Dy L	0.73	0.11
Pt M	4.07	0.50
Gross weight	100.00	



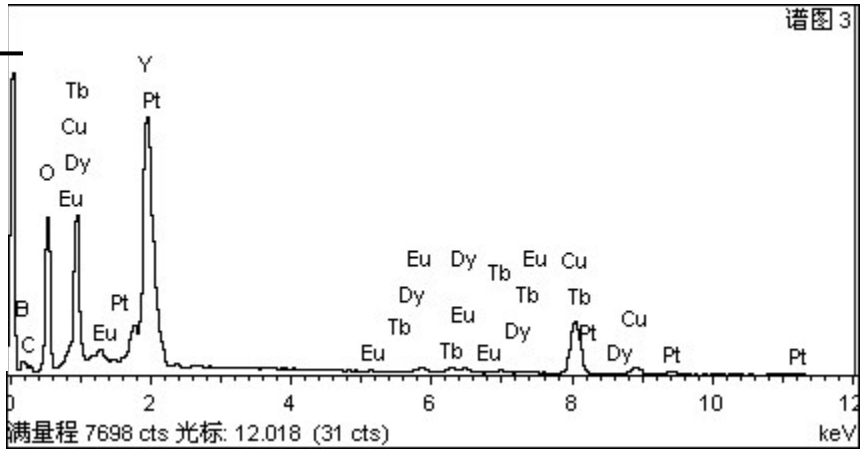
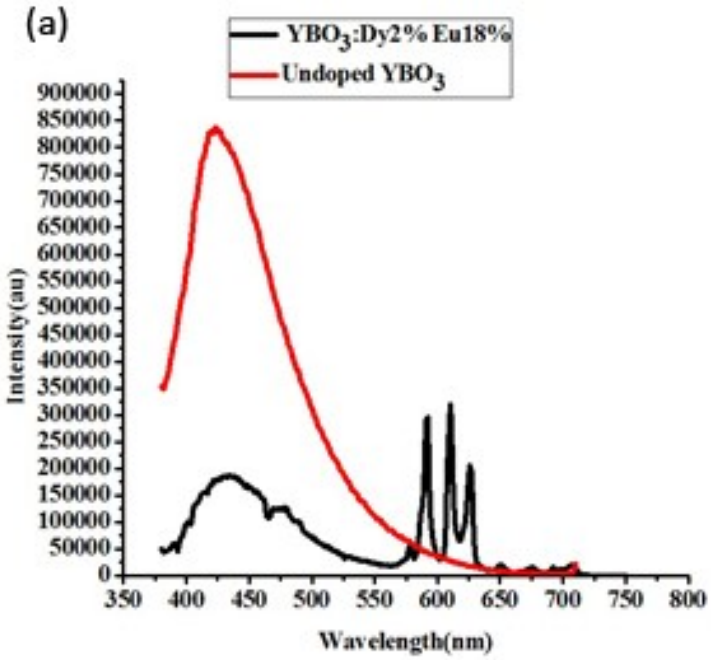
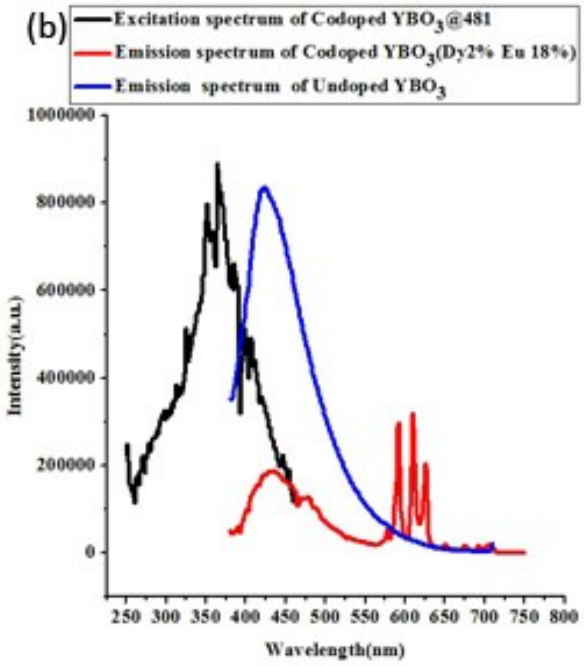
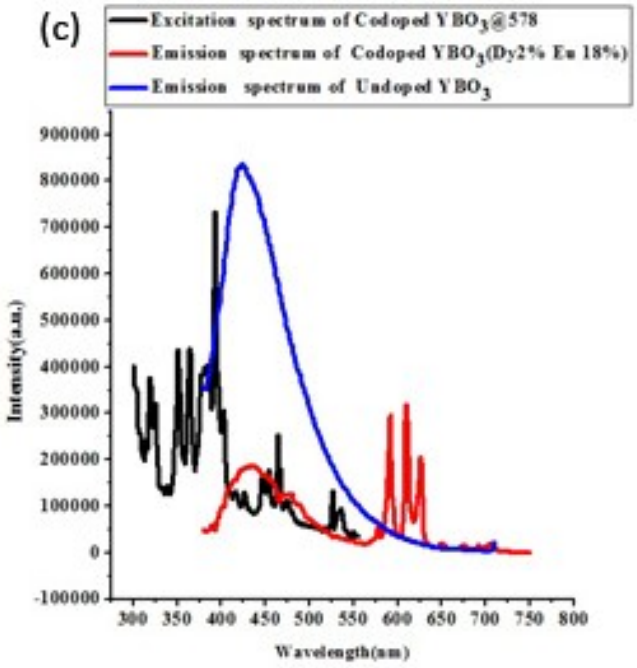
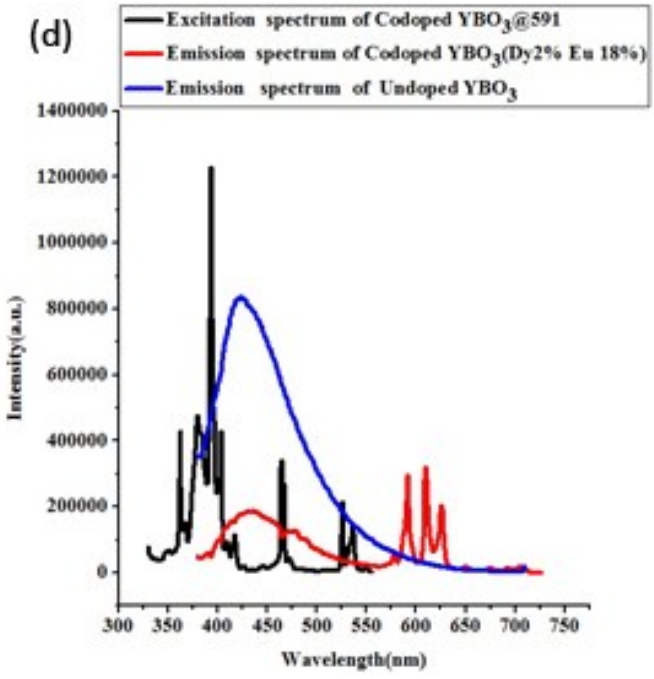


Fig. S1 Energy dispersive X-ray spectroscopy (EDS) Spectra of the sample YBO_3: Dy^{3+} 2%, Tb^{3+} 5%, Eu^{3+} 4%.


(a)
YBO3:Dy2% Eu18%
Undoped YBO3
Intensity(au)
Wavelength(nm)


(b)
Excitation spectrum of Codoped YBO3@481
Emission spectrum of Codoped YBO3(Dy2% Eu 18%)
Emission spectrum of Undoped YBO3
Intensity(a.u.)
Wavelength(nm)


(c)
Excitation spectrum of Codoped YBO3@578
Emission spectrum of Codoped YBO3(Dy2% Eu 18%)
Emission spectrum of Undoped YBO3
Intensity(a.u.)
Wavelength(nm)


(d)
Excitation spectrum of Codoped YBO3@591
Emission spectrum of Codoped YBO3(Dy2% Eu 18%)
Emission spectrum of Undoped YBO3
Intensity(a.u.)
Wavelength(nm)

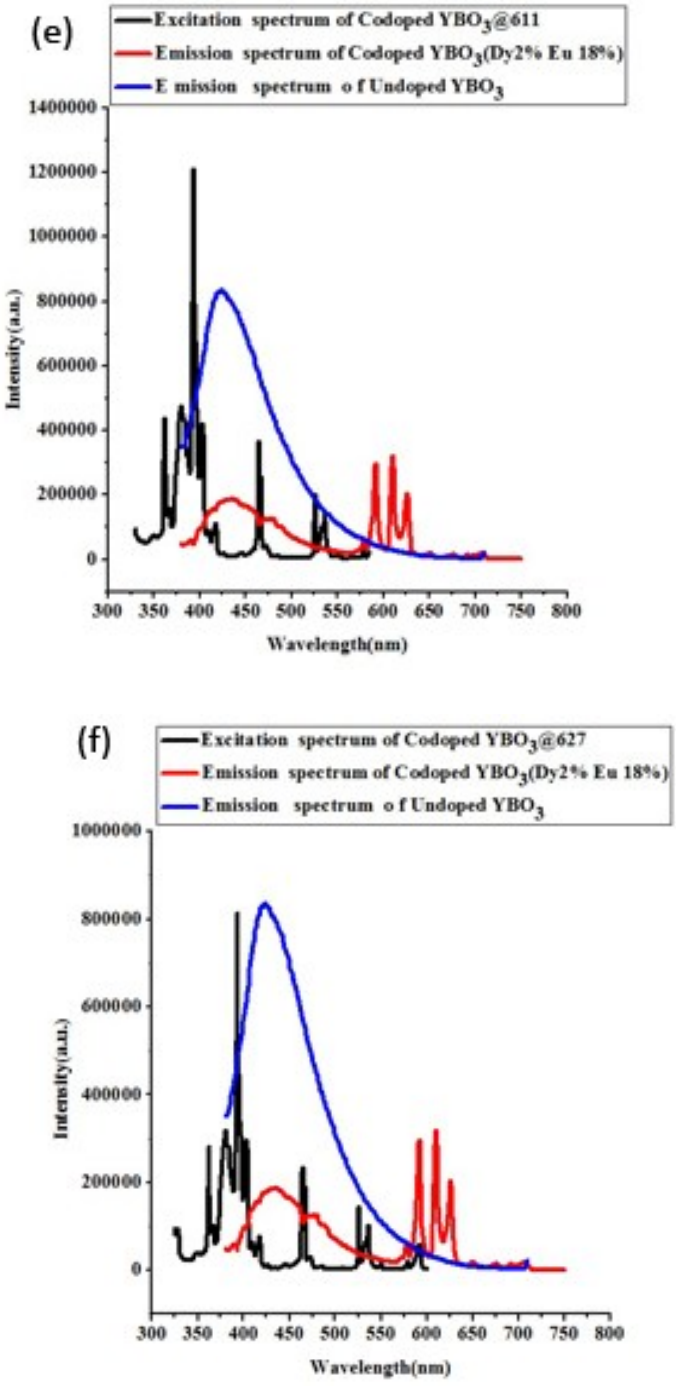
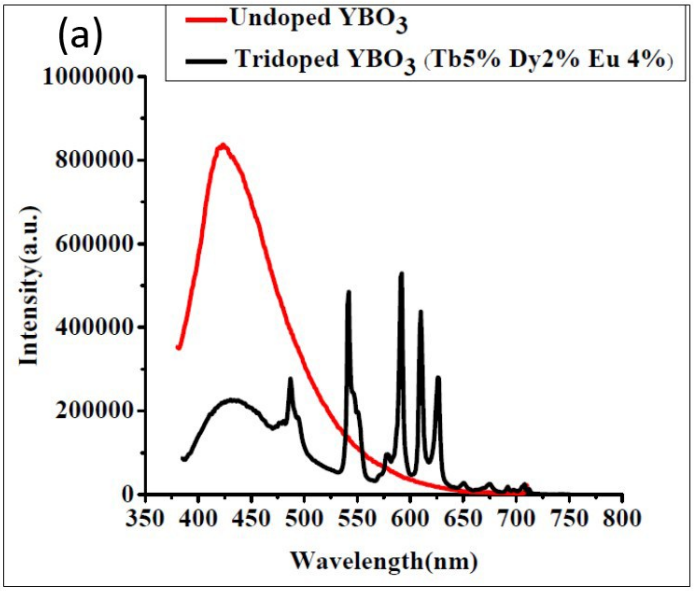
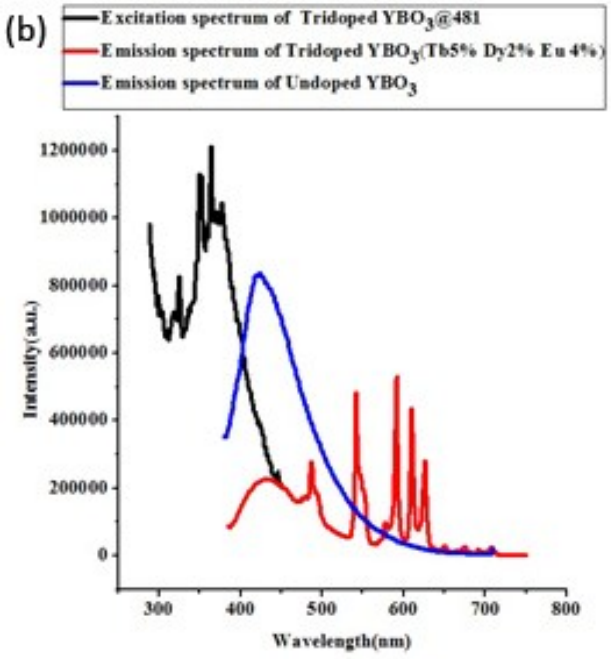
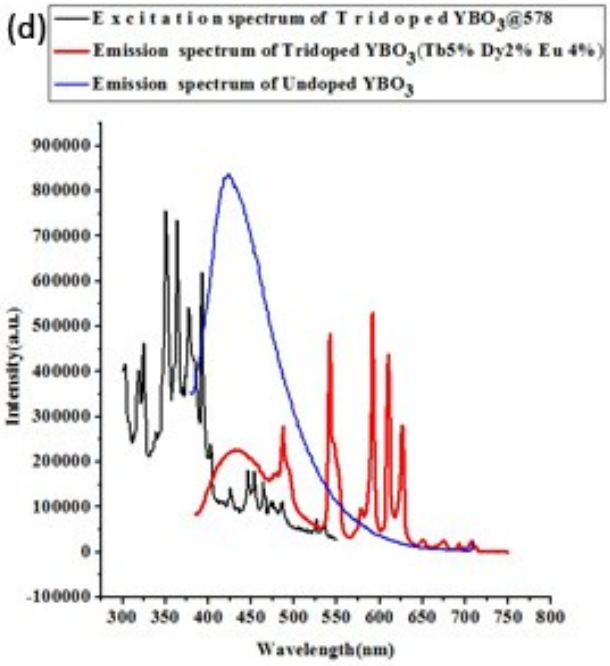


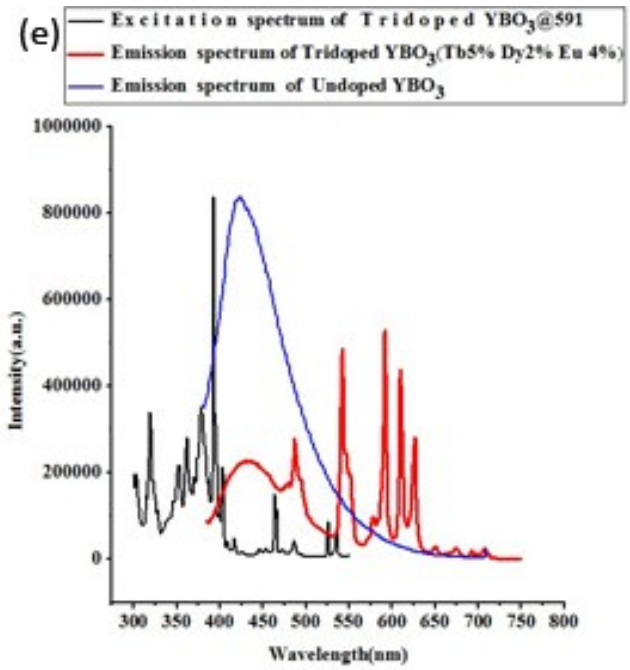
Fig. S2 (a) Overlap of the emission spectra of undoped YBO_3 and co-doped YBO_3: Dy^{3+} 2% and Eu^{3+} 18% under the excitation at 365 nm. **(b), (c), (d), (e) and (f)** Overlap of the emission spectrum of undoped YBO_3 and the emission and excitation spectra of co-doped YBO_3: Dy^{3+} 2% and Eu^{3+} 18% monitored at 481, 578, 591, 611 and 627 nm, respectively.


(a)
Undoped YBO3
Tridoped YBO3 (Tb5% Dy2% Eu 4%)
Intensity(a.u.)
1000000
800000
600000
400000
200000
0
350 400 450 500 550 600 650 700 750 800
Wavelength(nm)

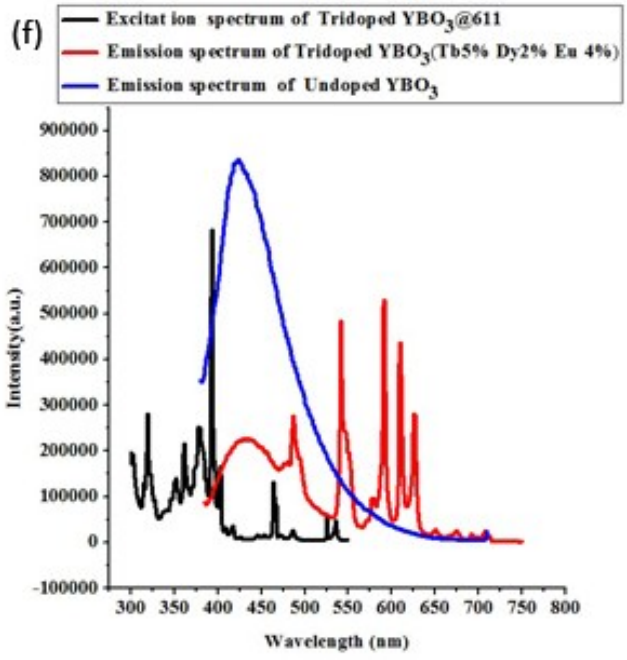

(b)
Excitation spectrum of Tridoped YBO3@481
Emission spectrum of Tridoped YBO3(Tb5% Dy2% Eu 4%)
Emission spectrum of Undoped YBO3
Intensity(a.u.)
1200000
1000000
800000
600000
400000
200000
0
300 400 500 600 700 800
Wavelength(nm)


(d)
Excitation spectrum of Tridoped YBO3@578
Emission spectrum of Tridoped YBO3(Tb5% Dy2% Eu 4%)
Emission spectrum of Undoped YBO3
Intensity(a.u.)
900000
800000
700000
600000
500000
400000
300000
200000
100000
0
-100000
300 350 400 450 500 550 600 650 700 750 800
Wavelength(nm)

(e)


Excitation spectrum of Tridoped YBO3@591
Emission spectrum of Tridoped YBO3(Tb5% Dy2% Eu 4%)
Emission spectrum of Undoped YBO3
Intensity(a.u.)
Wavelength(nm)

(f)


Excitation spectrum of Tridoped YBO3@611
Emission spectrum of Tridoped YBO3(Tb5% Dy2% Eu 4%)
Emission spectrum of Undoped YBO3
Intensity(a.u.)
Wavelength (nm)

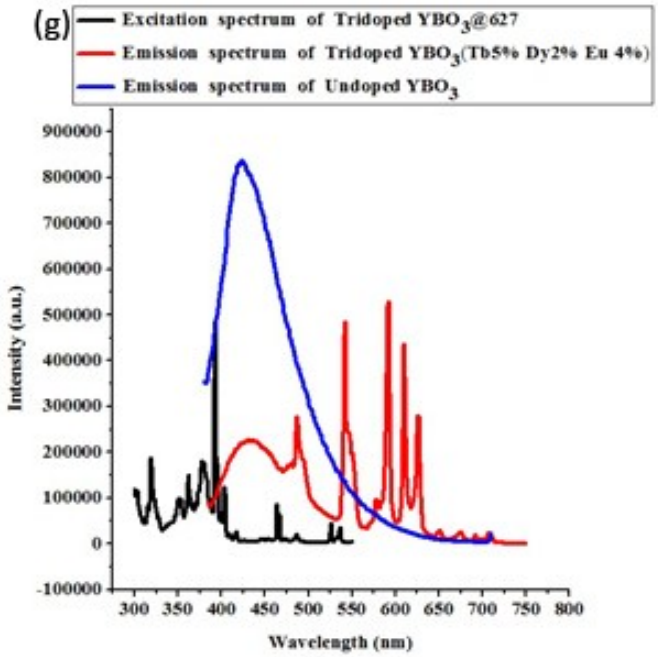


Fig. S3 (a) Overlap of the emission spectra of undoped YBO_3 and tri-doped YBO_3:Dy^{3+} 2%, Eu^{3+} 4% and Tb^{3+} 5% under the excitation at 365 nm. **(b), (c), (d), (e), (f) and (g)** Overlap of the emission spectrum of undoped YBO_3 and the emission and excitation spectra of tri-doped YBO_3:Dy^{3+} 2%, Eu^{3+} 4% and Tb^{3+} 5% monitored at 481, 541, 578, 591, 611 and 627 nm, respectively.