(Supplementary Information)

Luminescent and Photocatalytic Activity of $NaGd(MoO_4)_2:Dy^{3+}/Eu^{3+}$ and $NaGd(WO_4)_2:Dy^{3+}/Eu^{3+}$ Nanorods for Efficient Sensing and Degradation of Antibiotic Drug; Nitrofurantoin

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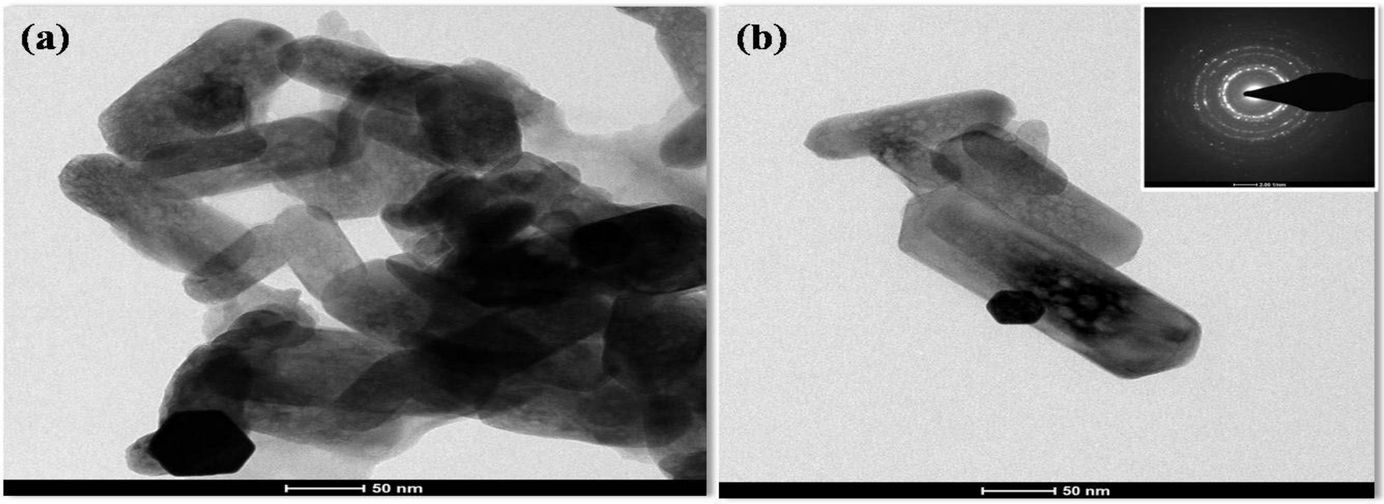

Fig. S1 TEM micrographs of (a) $NaGd(MoO_4)_2$ and (b) $NaGd(MoO_4)_2:Dy^{3+}/Eu^{3+}$ (7% Eu^{3+}) nanorods prepared at 200 ºC.

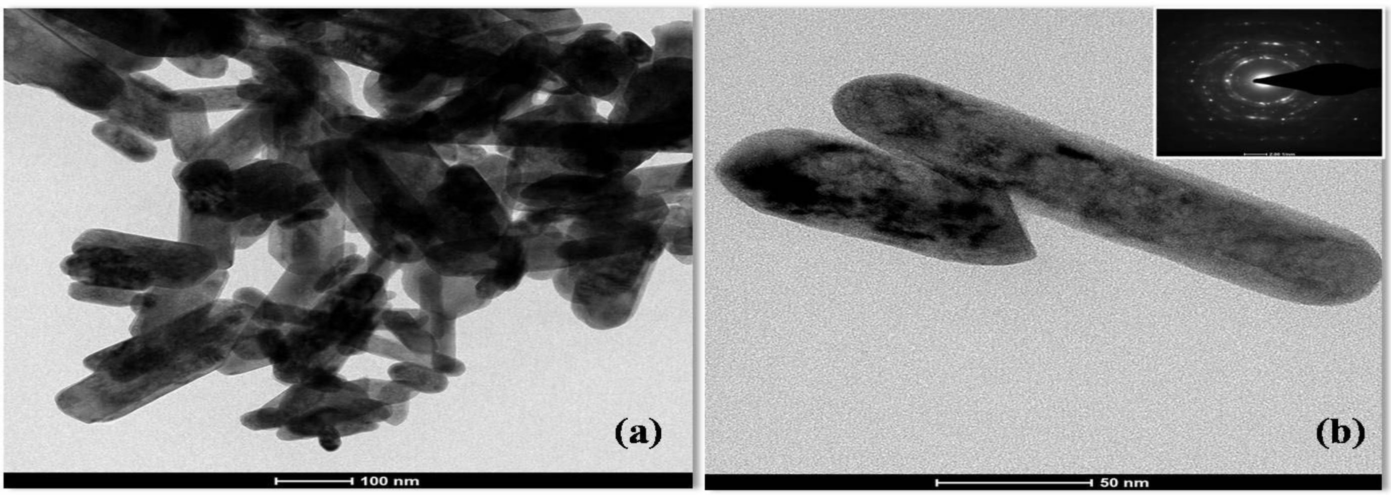

Fig. S2 TEM micrographs of (a) $NaGd(WO_4)_2$ and (b) $NaGd(WO_4)_2:Dy^{3+}/Eu^{3+}$ nanorods prepared at 200 ºC.

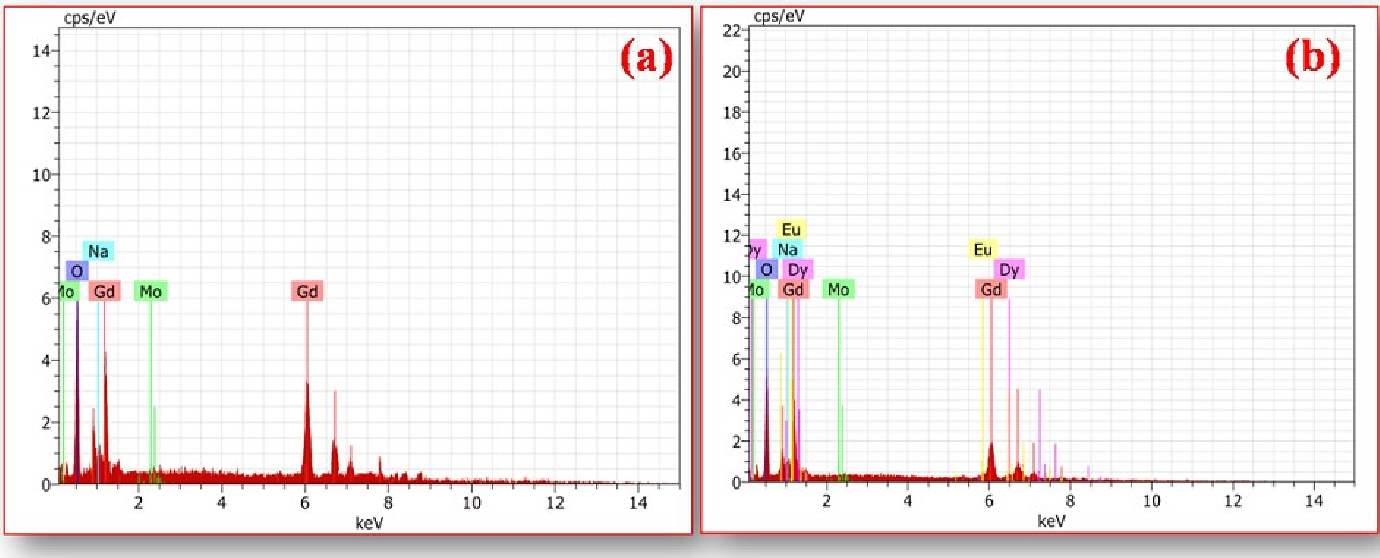

Fig. S3 EDS spectra of (a) $NaGd(MoO_4)_2$ and (b) $NaGd(MoO_4)_2{:}Dy^{3+}/Eu^{3+}$ (7% Eu^{3+}) nanorods prepared at 200 ºC.

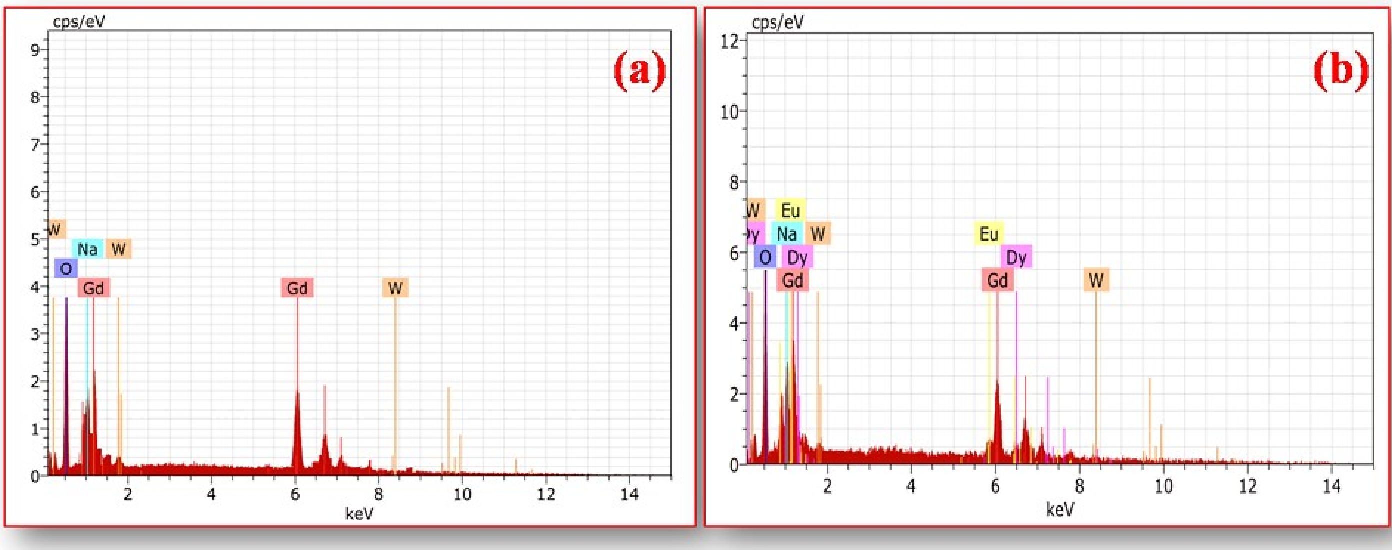

Fig. S4 EDS spectra of (a) $NaGd(WO_4)_2$ and (b) $NaGd(WO_4)_2{:}Dy^{3+}/Eu^{3+}$ (7% Eu^{3+}) nanorods prepared at 200 ºC.

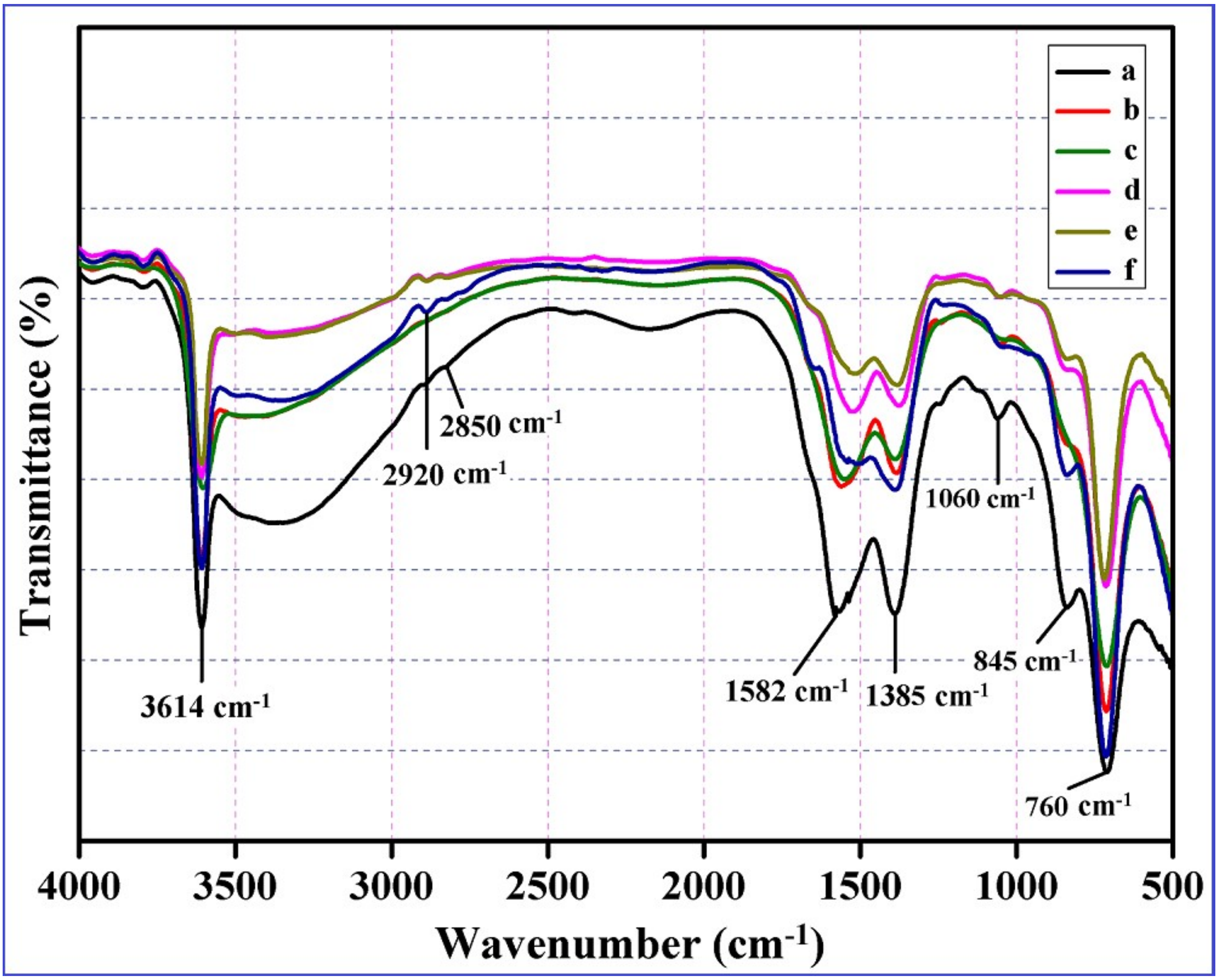

Fig. S5 FT-IR spectra of $NaGd(MoO_4)_2$ synthesized at different temperatures (a) 140 (b) 160 (c) 180 (d) 200 and (e) 220 ºC and (f) $NaGd(MoO_4)_2$:Dy^{3+}/Eu^{3+} (7% Eu^{3+}, 200 ºC).

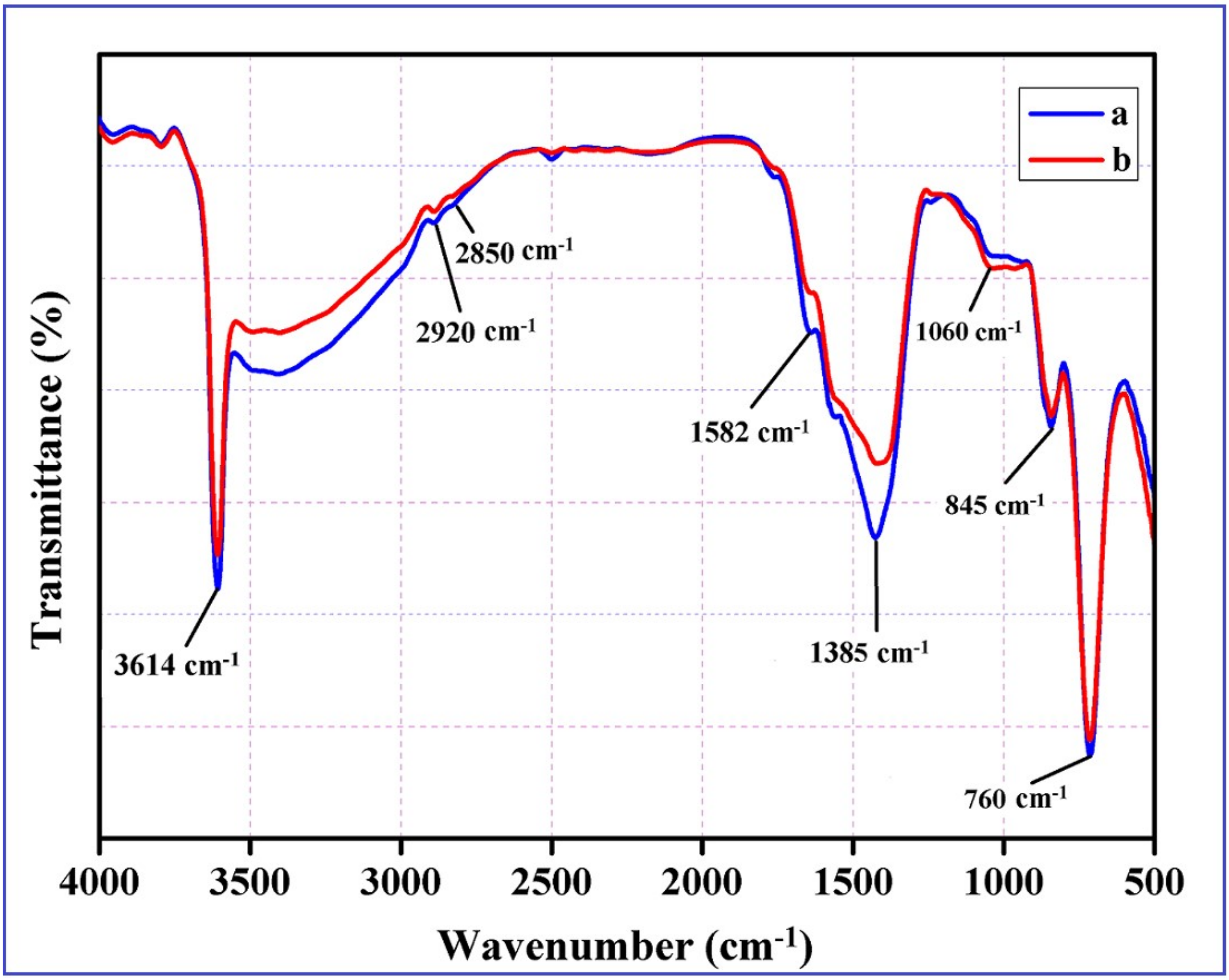

Fig. S6 FT-IR spectra of (a) $NaGd(WO_4)_2$ and (b) $NaGd(WO_4)_2:Dy^{3+}/Eu^{3+}$ (7% Eu^{3+}) synthesized at 200 ºC.

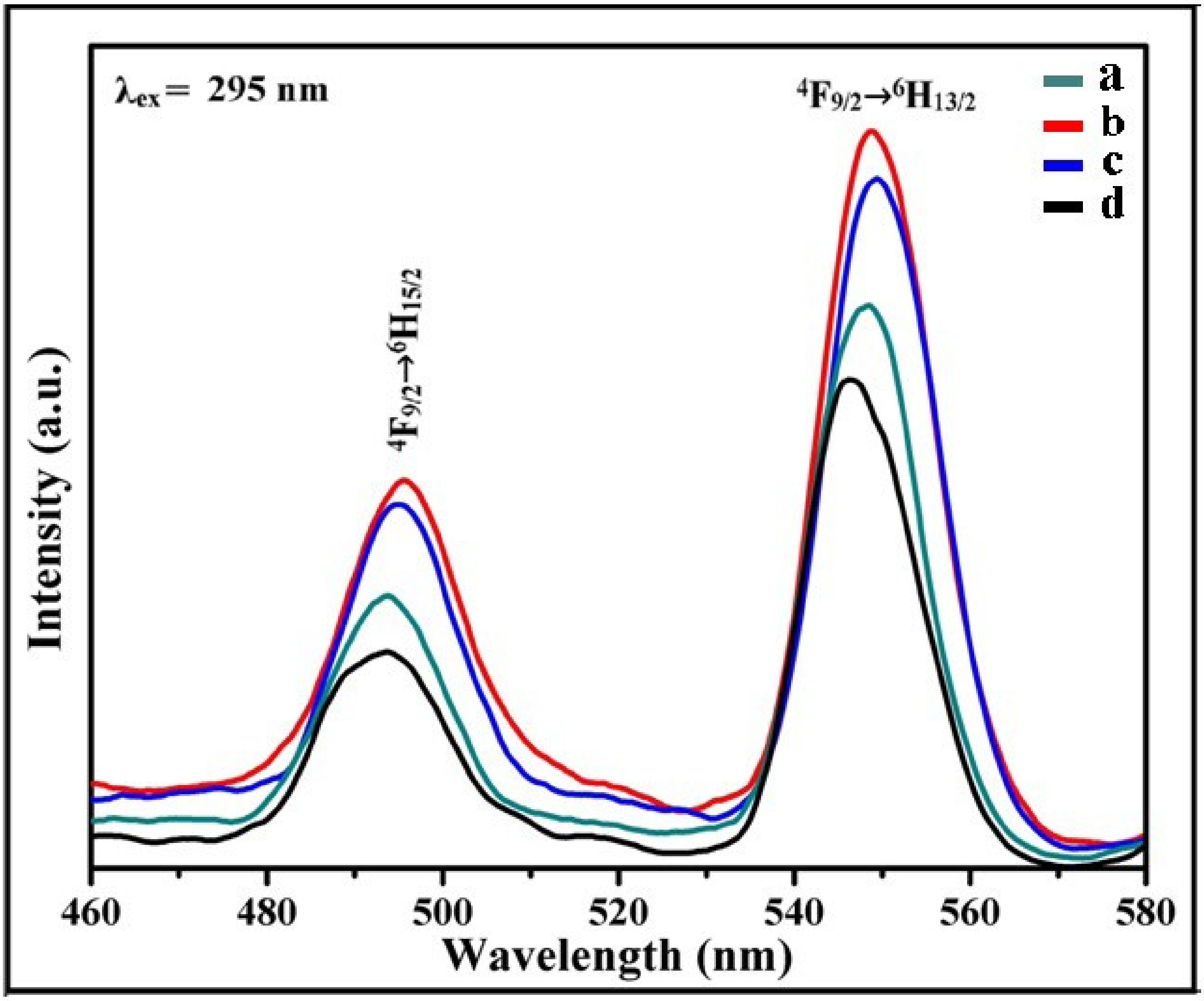

Fig. S7 Photoluminescence emission spectra of $NaGd(MoO_4)_2:Dy^{3+}$ displaying different emissions at varying Dy^{3+} ion content: (a) 3%, (b) 5%, (c) 7% and (d) $NaGd(WO_4)_2:Dy^{3+}$ (5%)

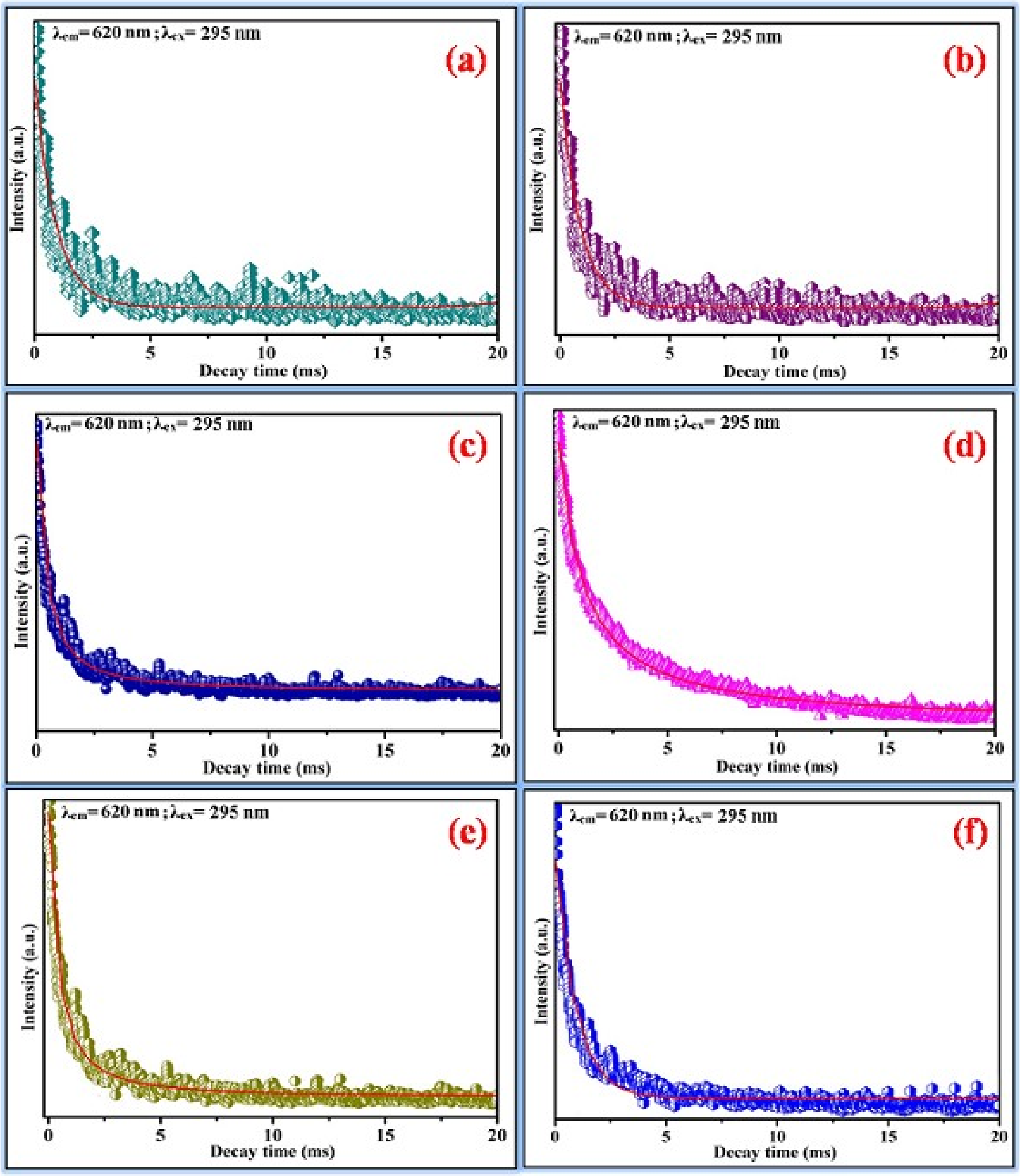

Fig. S8 Decay curves of $NaGd(MoO_4)_2$:Dy^{3+}/Eu^{3+} nanorods with different Eu^{3+} ion content: (a) 1%, (b) 3, (c) 5%, (d) 7%, (e) 9% and (f) $NaGd(WO_4)_2$:Dy^{3+}/Eu^{3+} (7% Eu^{3+}).

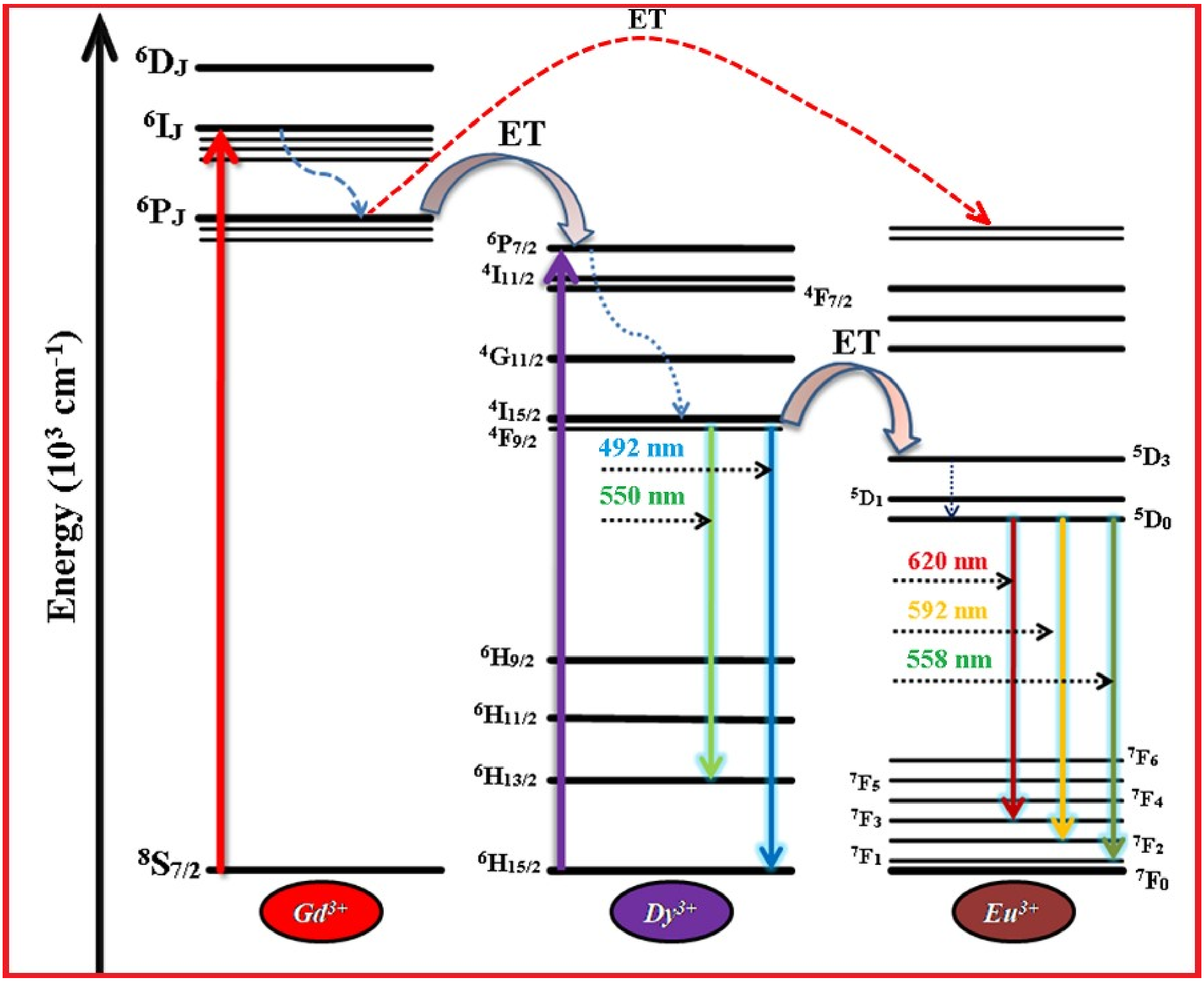

Fig. S9 The plausible energy transfer mechanism between Gd^{3+}, Dy^{3+} and Eu^{3+} ions.

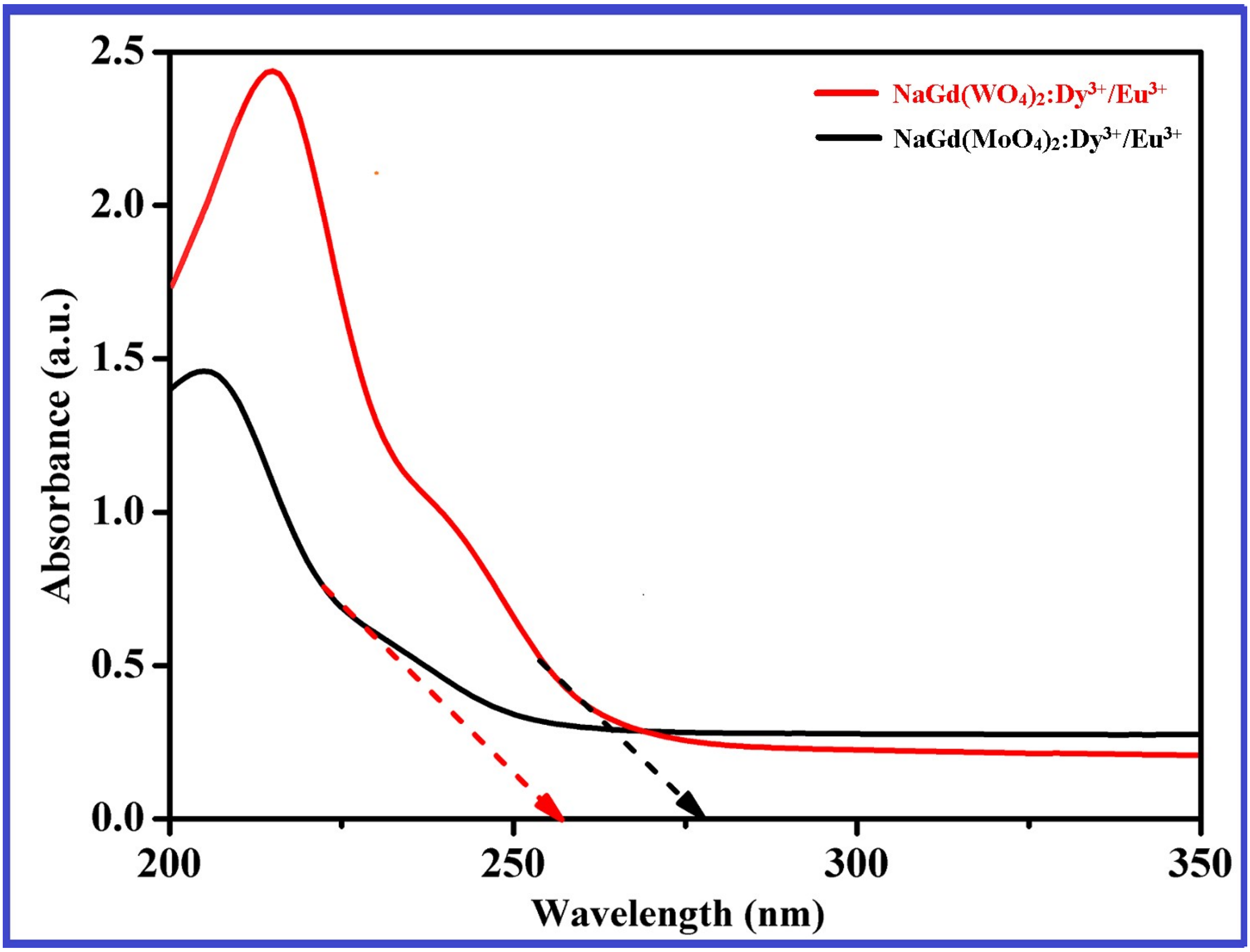

Fig. S10 UV-visible absorption spectra of $NaGd(WO_4)_2:Dy^{3+}/Eu^{3+}$ and $NaGd(MoO_4)_2:Dy^{3+}/Eu^{3+}$ nanorods.

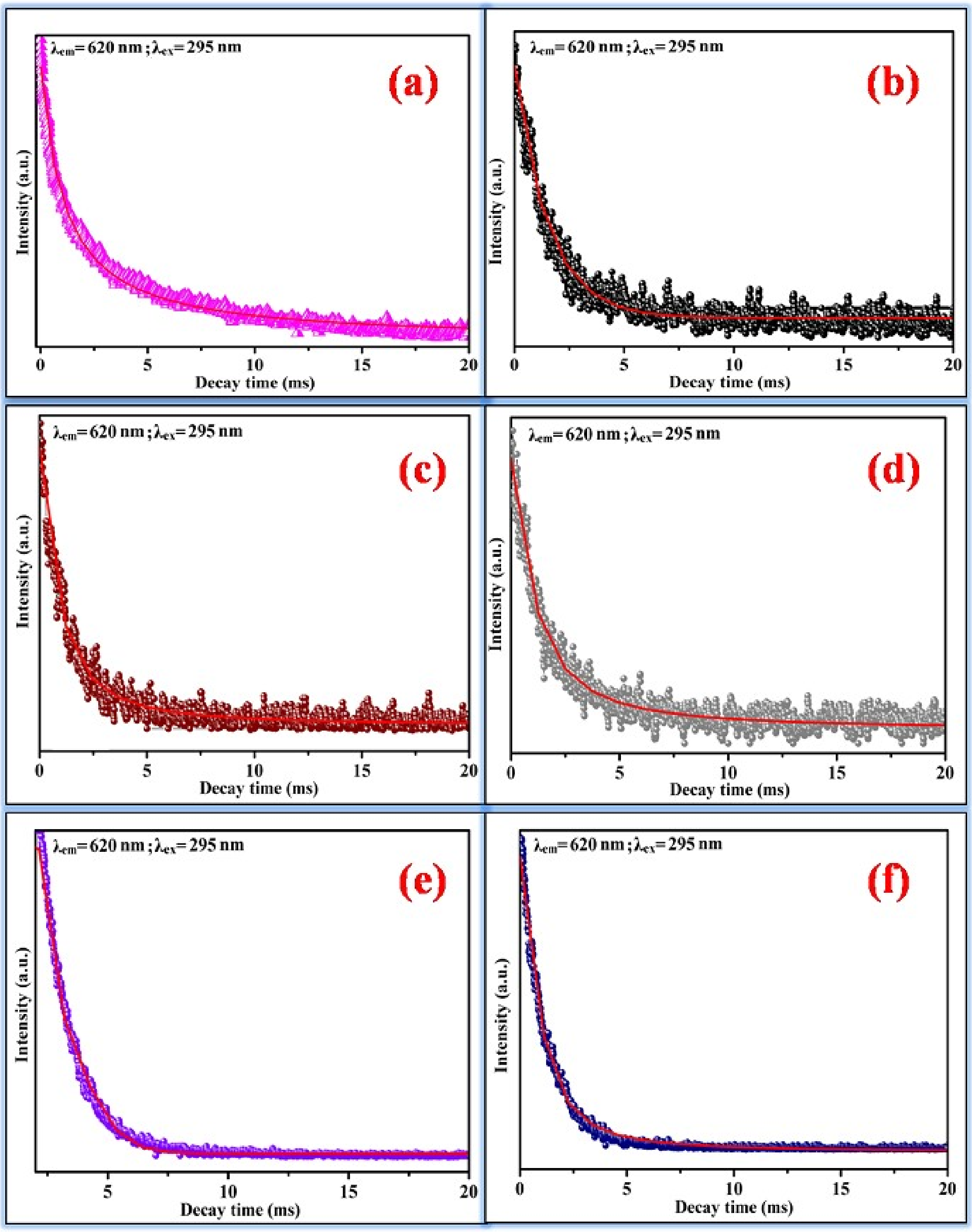

Fig. S11 Time-resolved decay dynamics of $NaGd(MoO_4)_2$:Dy^{3+}/Eu^{3+} after excitation at 295 nm in the presence of NFT (0, 20, 40, 60, 80 and 100 ppm).

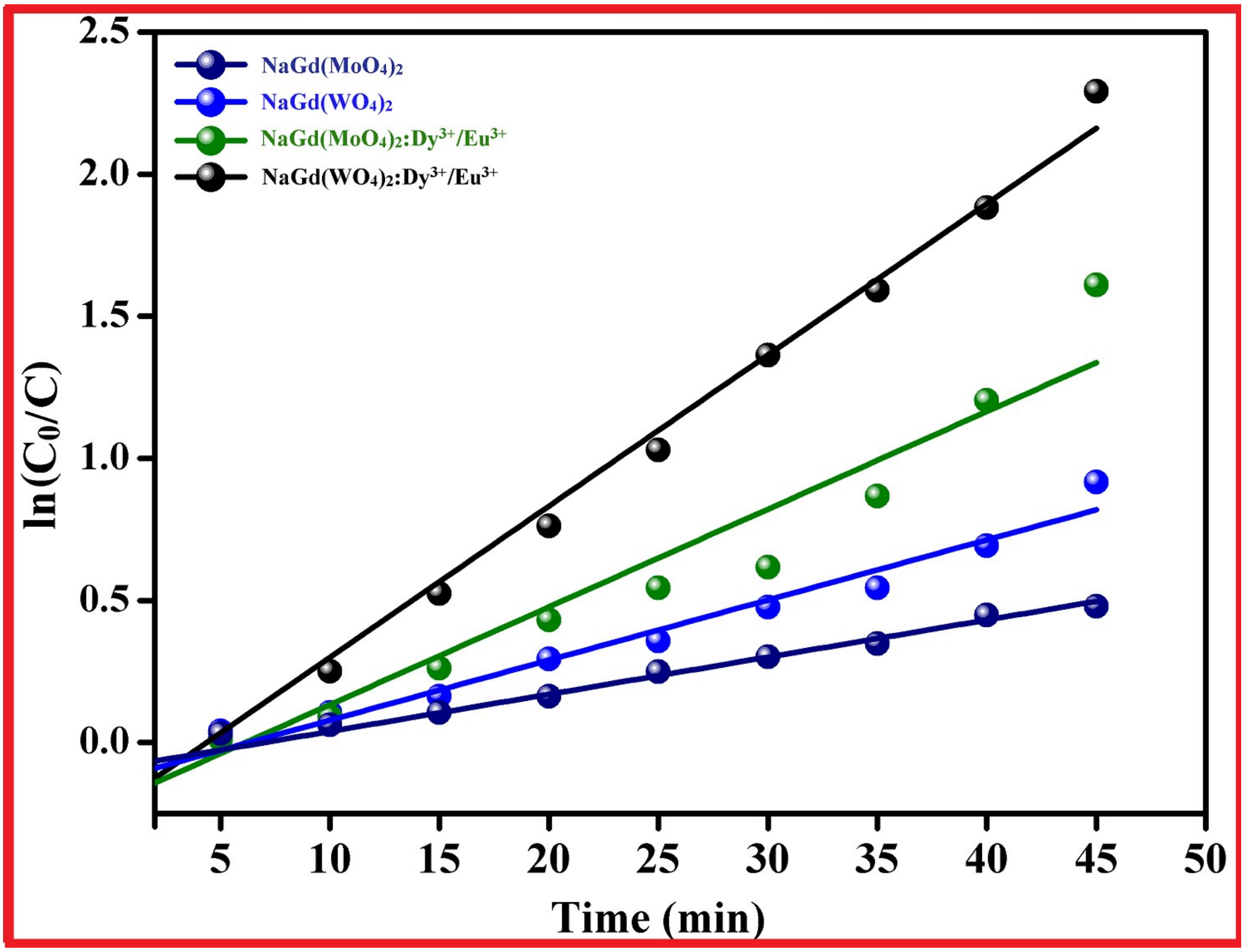

Fig. S12 Pseudo-first order plots of photodegradation of NFT by $NaGd(MoO_4)_2$, $NaGd(WO_4)_2$, $NaGd(MoO_4)_2:Dy^{3+}/Eu^{3+}$ and $NaGd(WO_4)_2:Dy^{3+}/Eu^{3+}$ nanocatalysts under UV light irradiation.

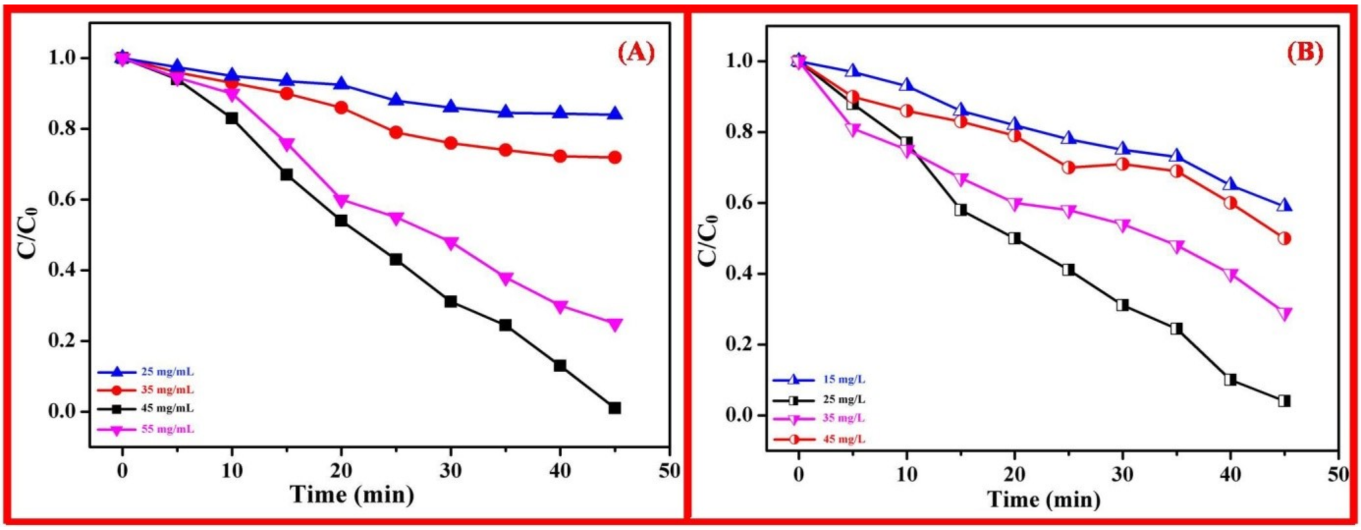

Fig. S13 (A) Effect of different amount of $NaGd(WO_4)_2{:}Dy^{3+}/Eu^{3+}$ catalyst and (B) Initial NFT concentration on the photodegradation of NFT.

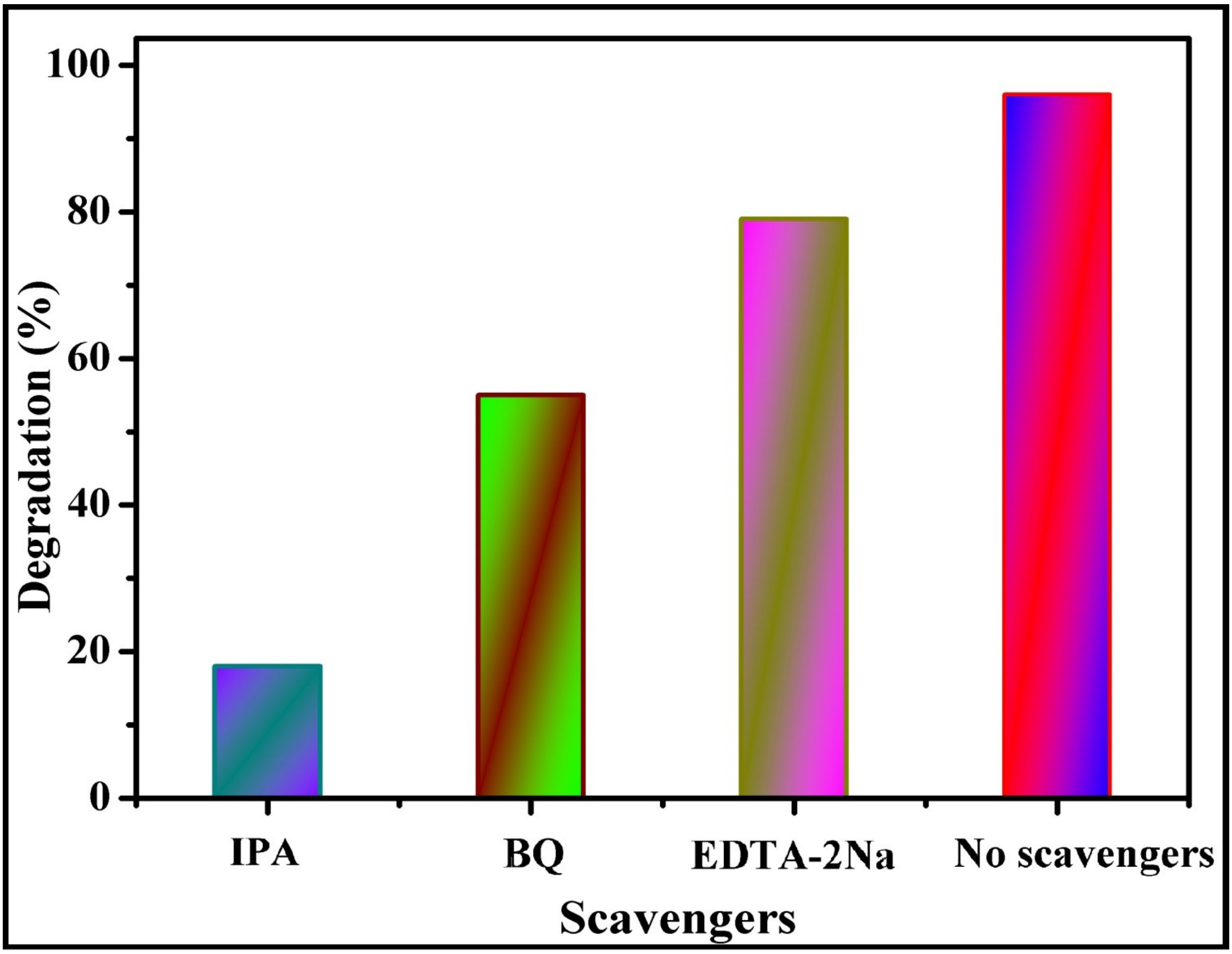

Fig. S14 Impact of different scavengers on the photodegradation of NFT.

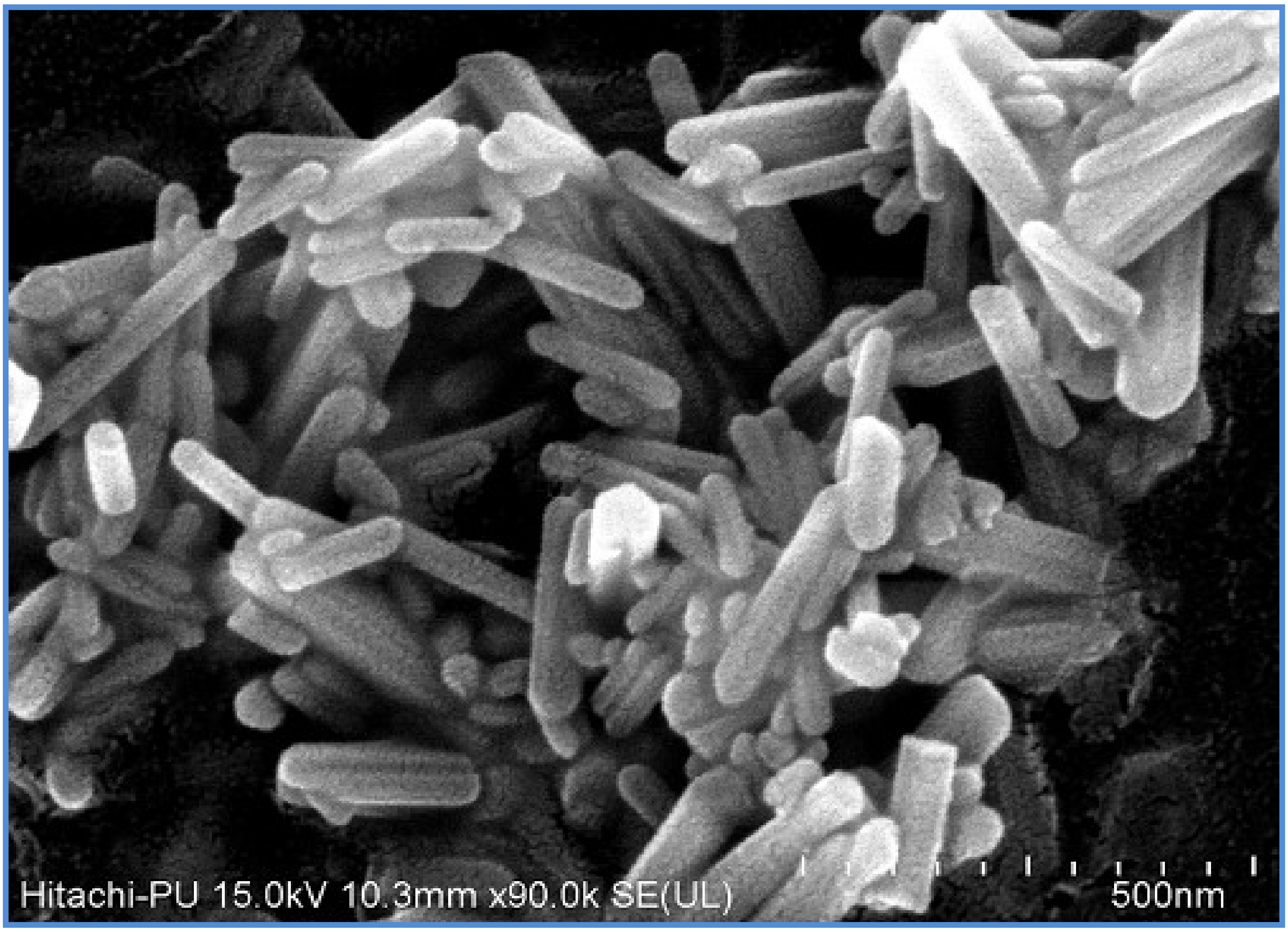

Fig. S15 FE-SEM micrograph of $NaGd(WO_4)_2{:}Dy^{3+}/Eu^{3+}$ after photodegradtion of NFT.

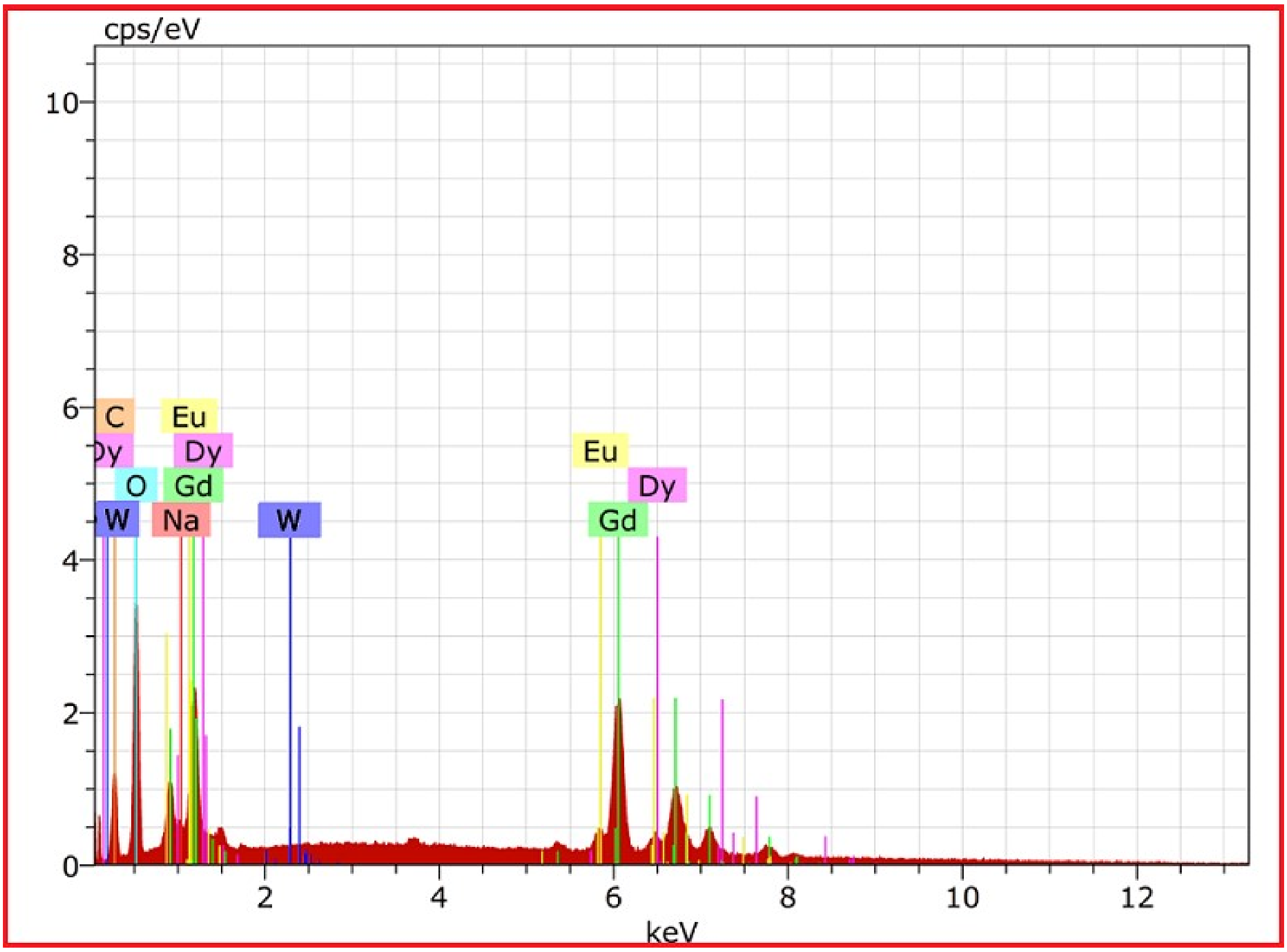

Fig. S16 EDS spectrum of $NaGd(WO_4)_2:Dy^{3+}/Eu^{3+}$ after photodegradation of NFT.

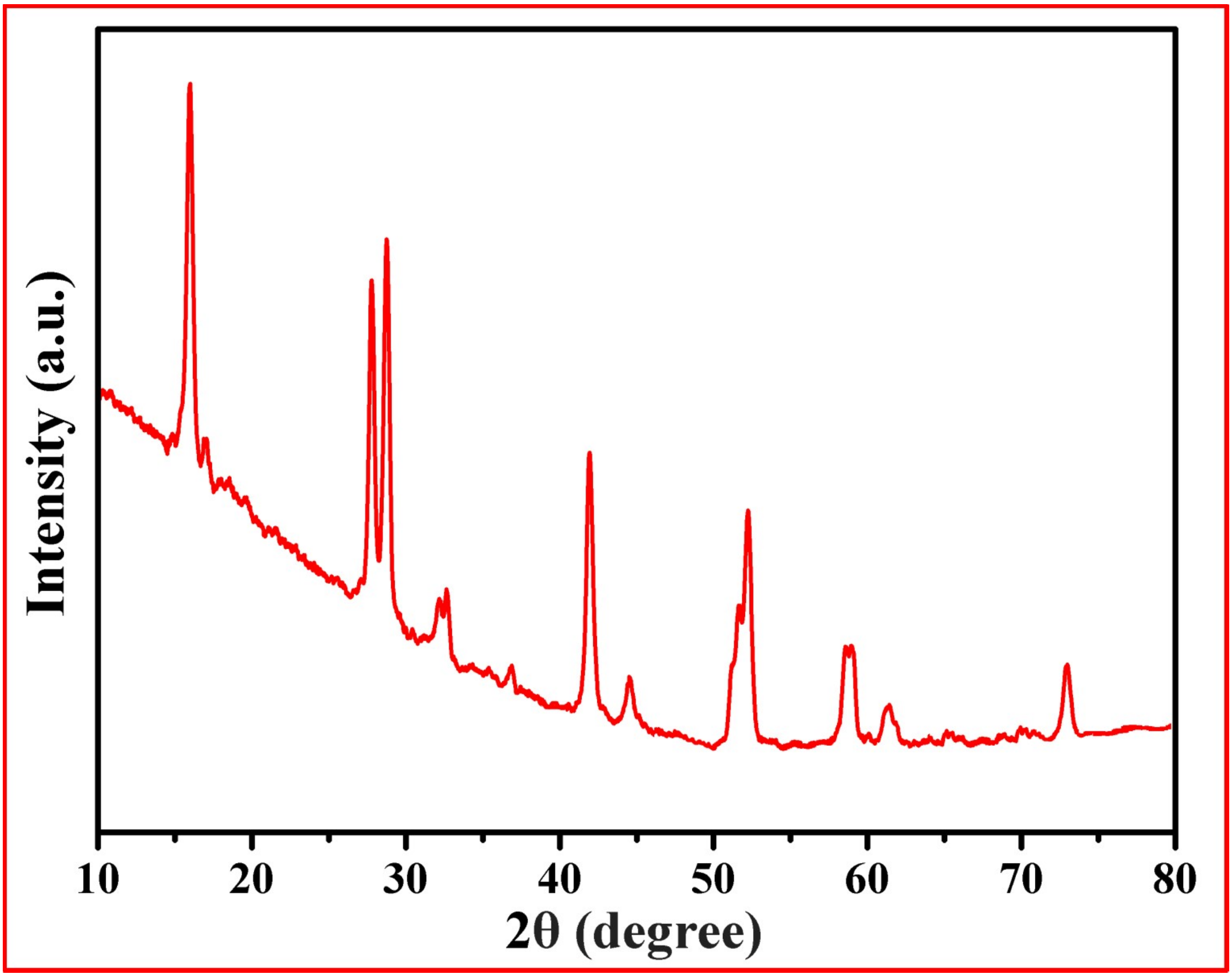

Fig. S17 PXRD spectrum of $NaGd(WO_4)_2:Dy^{3+}/Eu^{3+}$ after photodegradation of NFT.

Table S1 Atomic and Weight % of elements present in $NaGd(MoO_4)_2$ and $NaGd(MoO_4)_2$:Dy^{3+}/Eu^{3+} nanorods prepared at 200 ºC

Elements	**$NaGd(MoO_4)_2$**		**$NaGd(MoO_4)_2$:Dy^{3+}/Eu^{3+}**	
	Wt %	At %	Wt %	At %
Sodium	0.85	1.74	1.99	2.27
Gadolinium	73.28	27.33	62.14	20.85
Molybdenum	5.25	1.68	2.65	0.78
Oxygen	24.31	68.58	21.80	71.90
Dysprosium	-	-	4.85	1.57
Europium	-	-	7.57	2.63

Table S2 Atomic and Weight % of elements present in $NaGd(WO_4)_2$ and $NaGd(WO_4)_2:Dy^{3+}/Eu^{3+}$ nanorods prepared at 200 ºC

Elements	**$NaGd(WO_4)_2$**		**$NaGd(WO_4)_2:Dy^{3+}/Eu^{3+}$**	
	Wt %	At %	Wt %	At %
Sodium	1.55	2.98	1.95	5.08
Gadolinium	75.67	33.17	61.65	23.51
Tungstate	6.26	2.37	3.53	1.15
Oxygen	13.95	60.11	17.31	64.91
Dysprosium	-	-	6.32	2.33
Europium	-	-	7.53	3.68