Supporting Information

Optical control of Er^{3+} doped $M_{0.5}Bi_{2.5}Nb_2O_9$ (M=Li, Na, K) materials for thermal stability and temperature sensing using photochromic reactions

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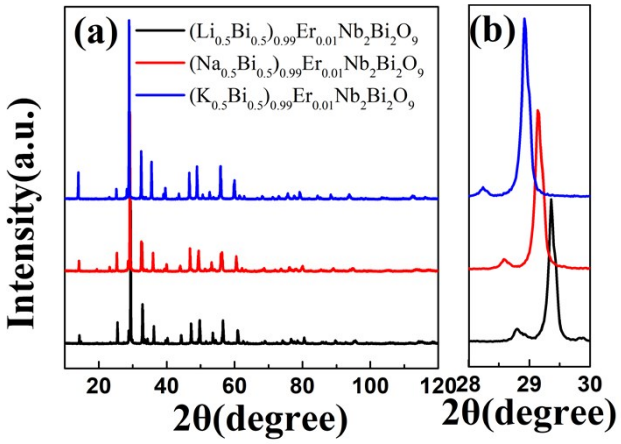

Fig. S1. (a) XRD patterns of Er doped $M_{0.5}Bi_{2.5}Nb_2O_9$ ceramics. (b) zoomed XRD patterns at 28-30°.

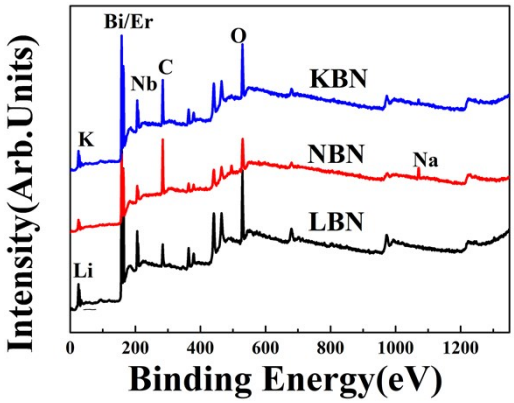

Fig. S2 XPS full spectra of $M_{0.5}Bi_{2.5}Nb_2O_9$ (M=Li,Na,K) materials.

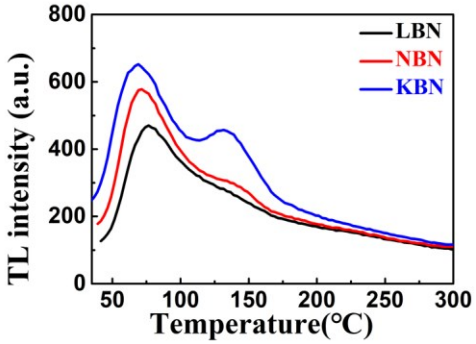

Fig. S3 TL curves of Er doped $(A_{0.5}Bi_{0.5})Nb_2Bi_2O_9$ (A=Li, Na, K) ceramics.

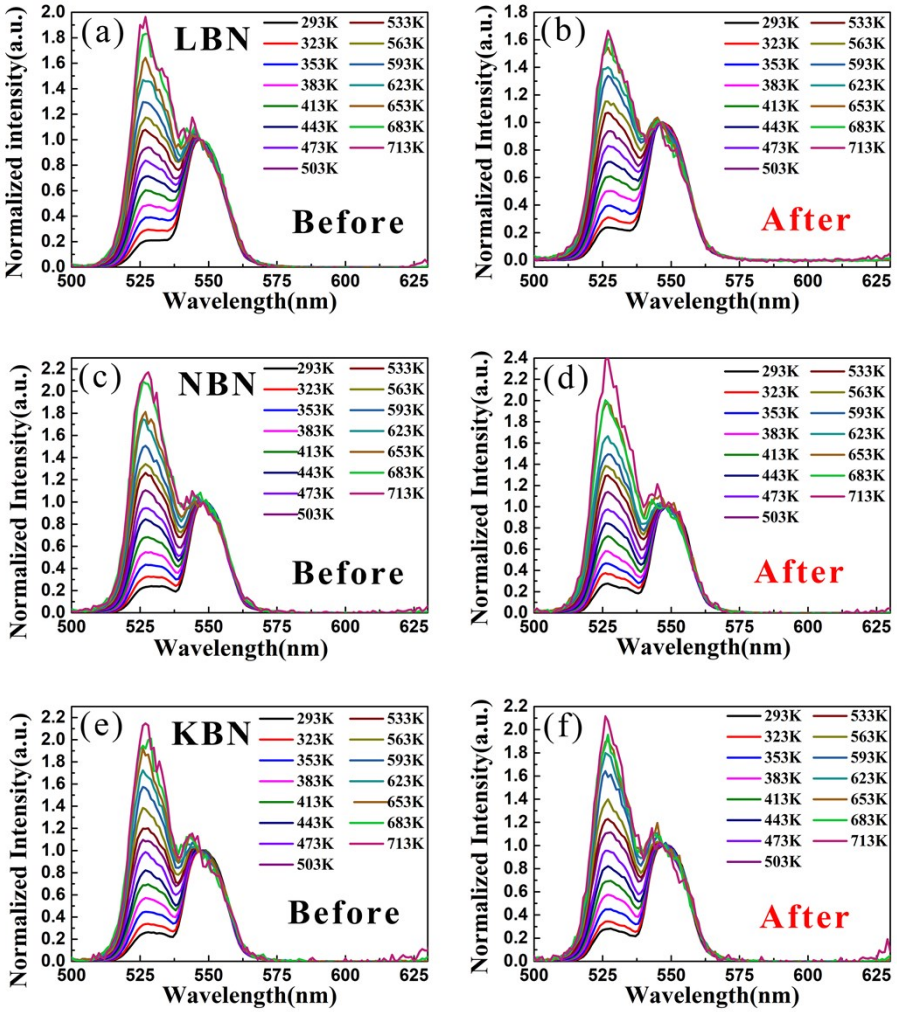

Fig. S4. (a), (c) and (e) The normalized temperature-dependent UC emission spectra of Er^{3+} doped $M_{0.5}Bi_{2.5}Nb_2O_9$ ceramics at various temperatures of 293-713 K before 405nm irradiation. (b), (d) and (f) The normalized temperature-dependent UC emission spectra of Er^{3+} doped $M_{0.5}Bi_{2.5}Nb_2O_9$ ceramics after 405nm irradiation.

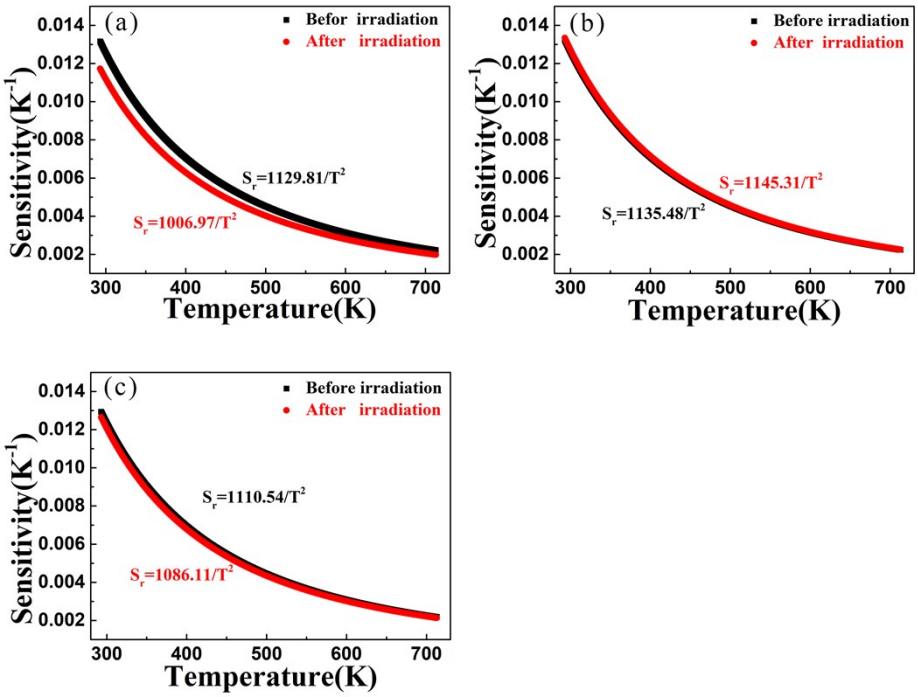

Fig. S5. The relative sensitivity (S_r) dependence on temperature before and after irradiation, (a) LBN, (b) NBN, and (c) KBN.

Table S1. The fitted parameters of Er doped $M_{0.5}Bi_{2.5}Nb_2O_9$ (M=Li,Na,K) materials based on the

Samples	LBN	NBN	KBN
a(Å)	5.4489	5.4950	5.4982
b(Å)	5.4412	5.4578	5.4958
c(Å)	24.7942	24.9311	25.2255
V(Å^3)	735.1126	747.6933	762.2444
W_{rp}	0.1604	0.1286	0.1457
Rp	0.1150	0.936	0.1112
X^2	1.756	1.234	1.646

GSAS-EXPGUI software.

Table S2. Fitting parameters of the O_{1s} spectra of Er doped $M_{0.5}Bi_{2.5}Nb_2O_9$ (M=Li, Na, K) materials.

Samples	Lattice O (O^{2-})	Absorbed O (*Vo)	Vo/O^{2-} -
$Li_{0.5}Bi_{2.5}Nb_2O_9$	529.55	531.33	1.6295
$Na_{0.5}Bi_{2.5}Nb_2O_9$	529.41	531.31	1.0473
$K_{0.5}Bi_{2.5}Nb_2O_9$	529.54	531.31	0.8604

Table S3. The distribution of the defect depths for LBN, NBN, and KBN samples

Samples	ΔE_1 (eV)	ΔE_2 (eV)	ΔE_3 (eV)	ΔE_4 (eV)
LBN	0.69(342.79K)	0.72(361.47K)	0.79(396.53K)	0.93(462.74K)
NBN	0.68(338.79K)	0.71(357.23K)	0.80(342.79K)	0.93(462.89K)
KBN	0.67(333.10K)	0.70(352.80K)	0.81(403.49K)	0.94(467.88K)

Table S4. Fitting parameters of the decay lifetime curves in Er^{3+} doped $M_{0.5}Bi_{2.5}Nb_2O_9$ ceramics

Samples	τ_1(μ s)		τ_2(μ s)		χ^2		τ(μ s)	
	before	after	before	after	before	after	before	after
LBN	77.3571	73.4623	249.8923	248.0094	1.191	1.252	106.8445	103.5073
NBN	84.8503	79.8672	264.3951	262.6132	1.129	1.258	118.2152	113.1451
KBN	95.5833	92.8704	286.0412	264.6992	1.249	1.218	118.5063	116.7655