Supporting Information

NIR II responsive core–shell $La_2O_2S:Er^{3+}$@ La_2O_2S nanoparticles towards 1.5 µm photodetection

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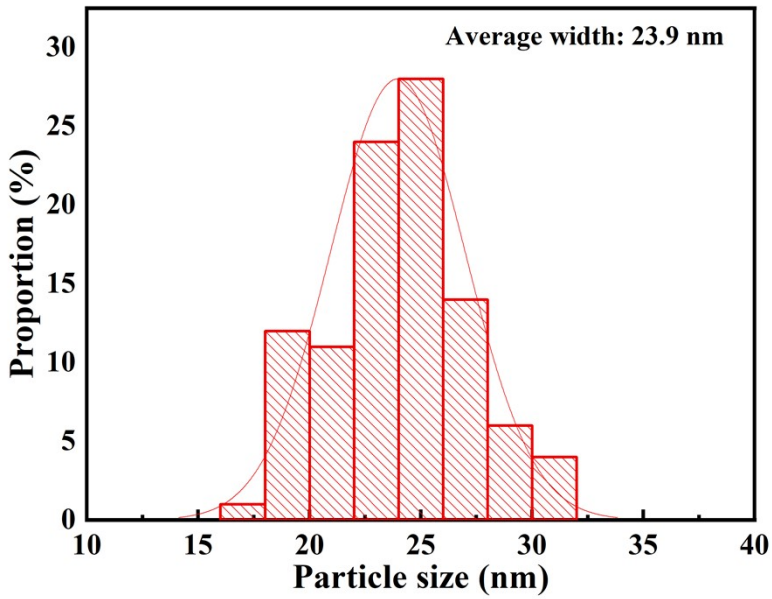

Fig. S1 The particle size distribution statistics results of core nanoparticles.

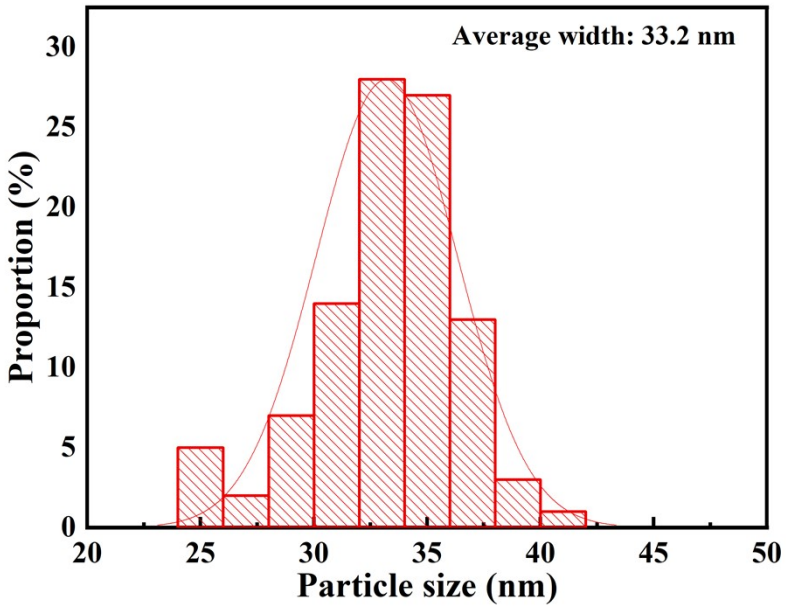

Fig. S2 The particle size distribution statistics results of core-shell nanoparticles.

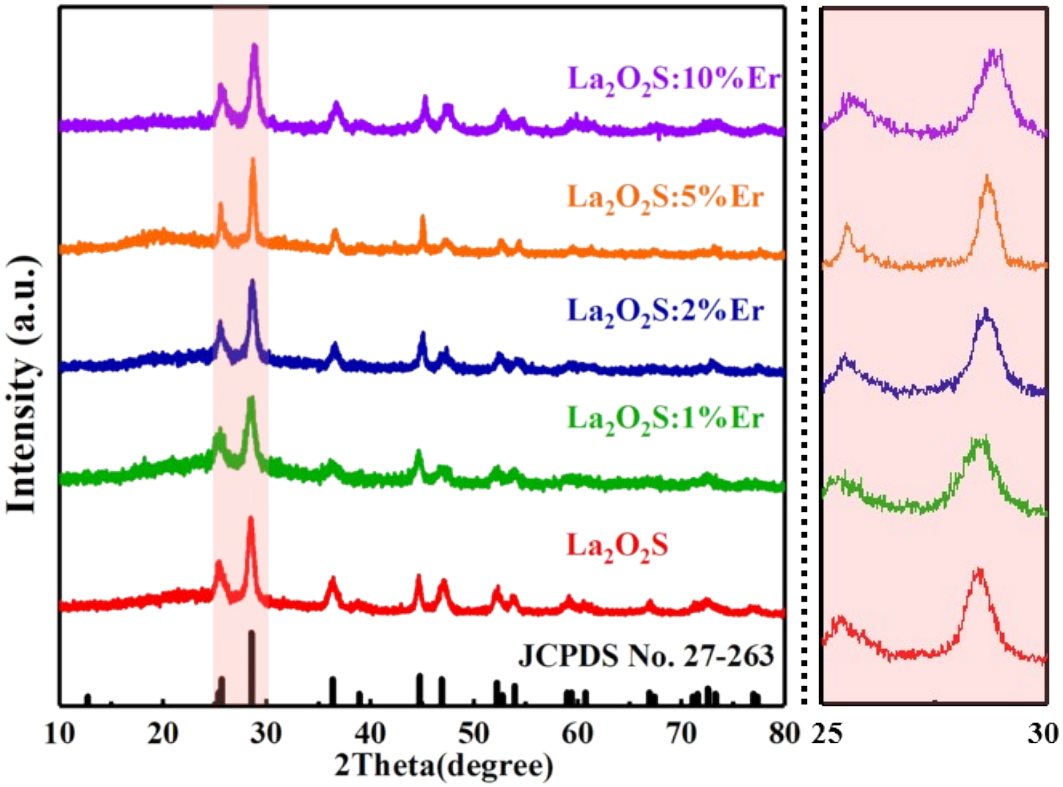

Fig. S3 XRD patterns of the $La_2O_2S:xEr^{3+}$ (x = 0, 1, 2, 5, 10 mol%) nanoparticles.

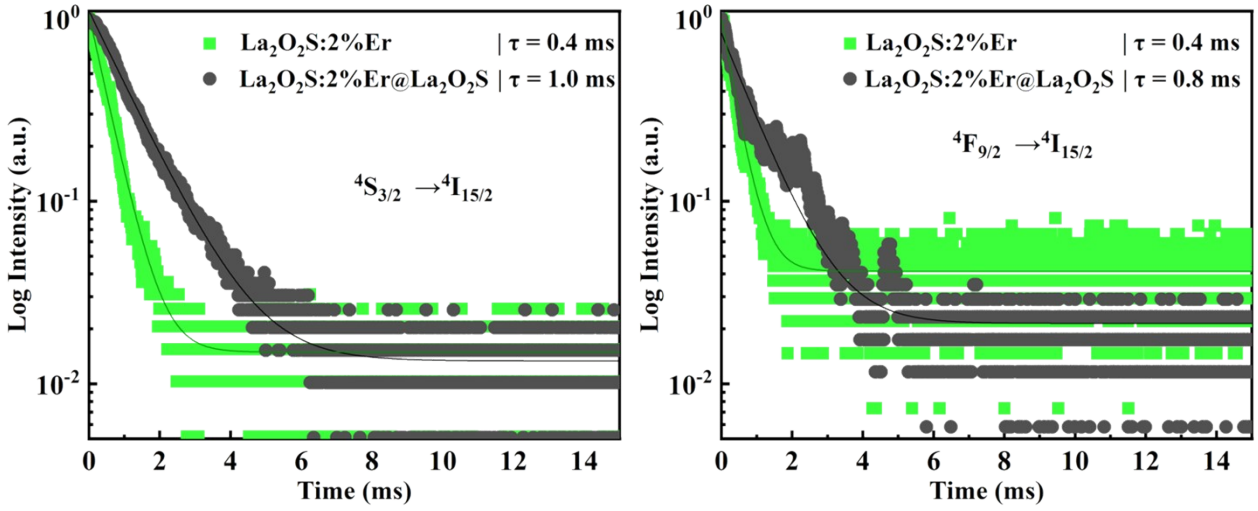

Fig. S4 Decay profiles of $^4S_{3/2}$ and $^4F_{9/2}$ levels of La_2O_2S: 2%Er^{3+} and La_2O_2S:2%Er^{3+}@La_2O_2S under 1550 nm excitation.

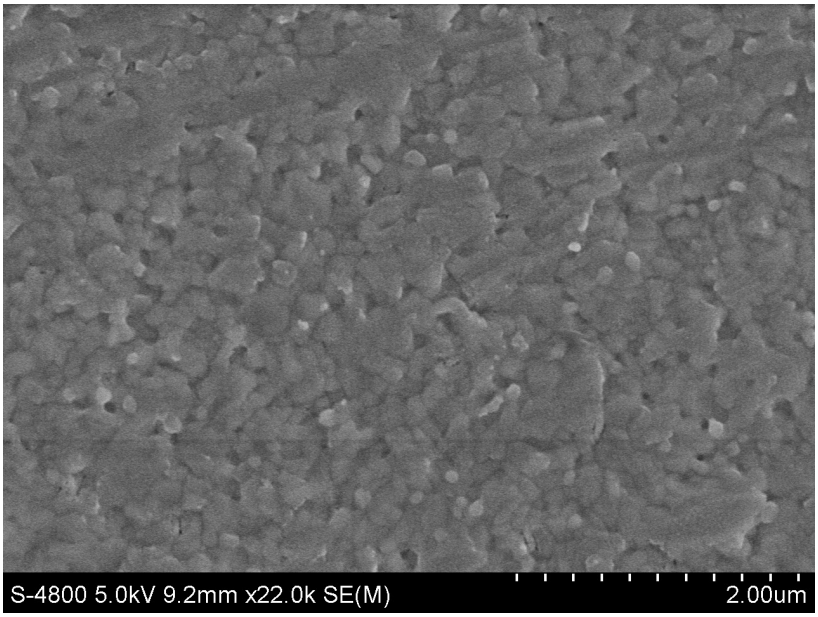

Fig. S5 Top view SEM image of $MAPbI_3/La_2O_2S:2\%Er^{3+}@La_2O_2S$ composite film.

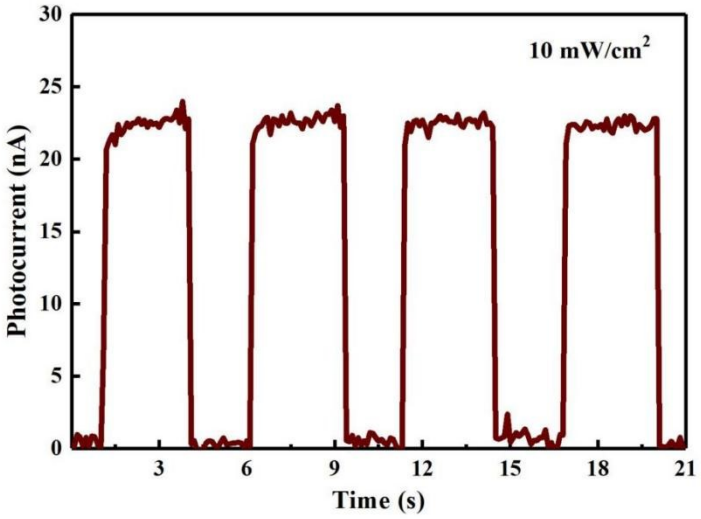

Fig. S6 Photocurrent-time response curve under 1550 nm excitation at power density of $10mW/cm^2$

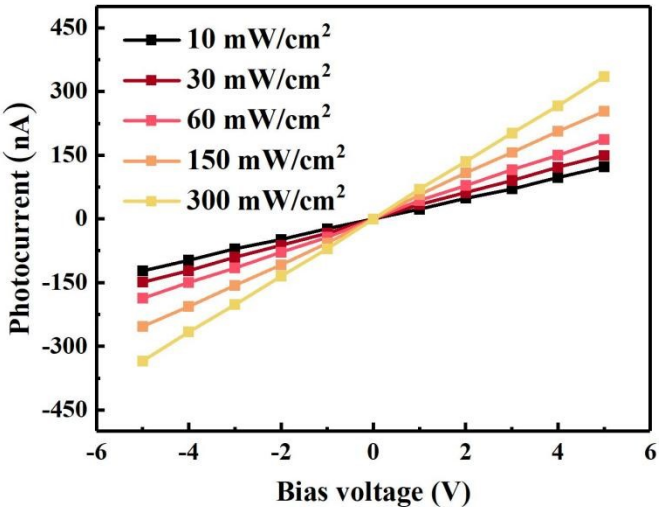

Fig. S7 Photocurrent of $MAPbI_3/La_2O_2S:2\%Er^{3+}@La_2O_2S$ PDs power density increased from 10 mW/cm^2 to 300 mW/cm^2

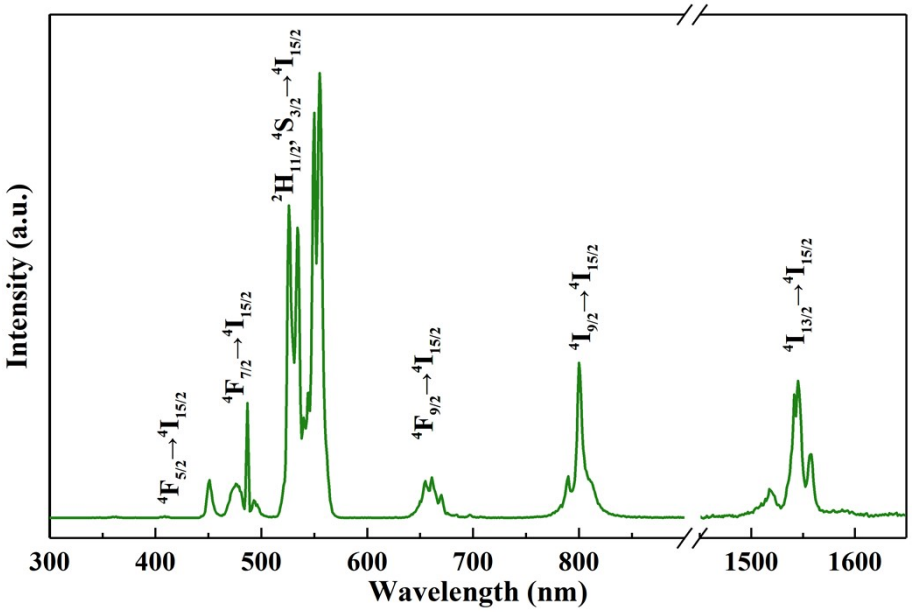

Fig. S8 UC luminescence spectrum of La_2O_2S:2%Er^{3+}@La_2O_2S under 980 nm excitation

Tab. S1 Comparison with other photodetectors

Samples	λ (nm)	T_r (s)	T_d (s)	Ref.
$MAPbI_3$ film	365	＜0.2	＜0.2	[35]
	780	＜0.1	＜0.1	
$NaYS_2:Er^{3+}/MAPbI_3$	1550	0.48	0.31	[21]
$MAPbI_3/Cs_xWO_3/NaYF_4$/ $NaYF_4:Yb^{3+},Er^{3+}@NaYF_4:Yb^{3+},Tm^{3+}$	980	0.18	0.19	[15]
$MAPbI_3/La_2O_2S$:2%Er^{3+}@La_2O_2S	1550	0.22	0.21	this work