Supporting Information

Superlattice films of semiconducting oxide and rare-earth hydroxide nanosheets for tunable and efficient photoluminescent energy transfer

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Table S1. Elemental analysis results (mass%) of the as-prepared samples

sample	Estimated composition	Elemental analysis	
		Calculated	Measured
LGdH:Eu	$(Gd_{0.96}Eu_{0.04})_2(OH)_{5.51}(C_{12}H_{25}SO_4)_{0.49}\cdot 1.9H_2O$	Gd 36.1	Gd 36.1
		Eu 1.8	Eu 1.7
LGdH:Tb	$(Gd_{0.98}Tb_{0.02})_2(OH)_{5.46}(C_{12}H_{25}SO_4)_{0.54}\cdot 2.0H_2O$	Gd 43.3	Gd 43.3
		Tb 1.0	Tb 1.0

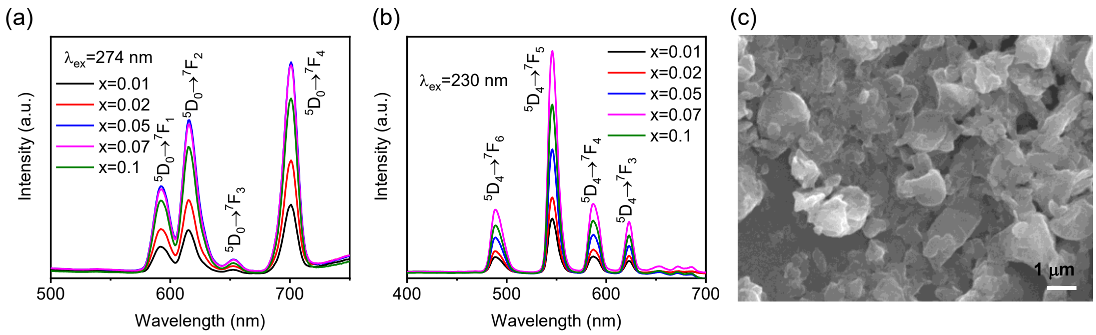

Figure S1. Photoluminescence emission spectra for (a) $LGd_{1-x}H:Eu_x$ and (b) $LGd_{1-x}H:Tb_x$ with different doped amount of Eu^{3+} and Tb^{3+}; (c) SEM images of $LGd_{0.95}H:Tb_{0.05}$.

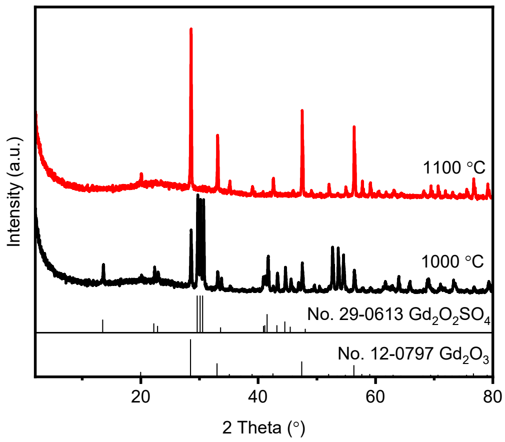

Figure S2. XRD patterns of LGdH:Eu powder sample after calcined at 1000 ˚C and 1100 ˚C for 7 h.

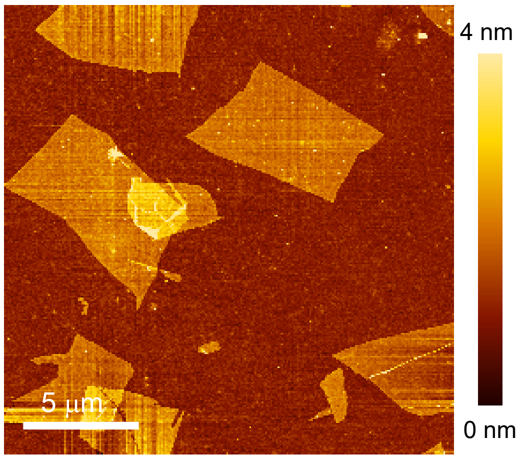

Figure S3. AFM image of $Ti_{0.87}O_2^{0.52-}$ nanosheets.

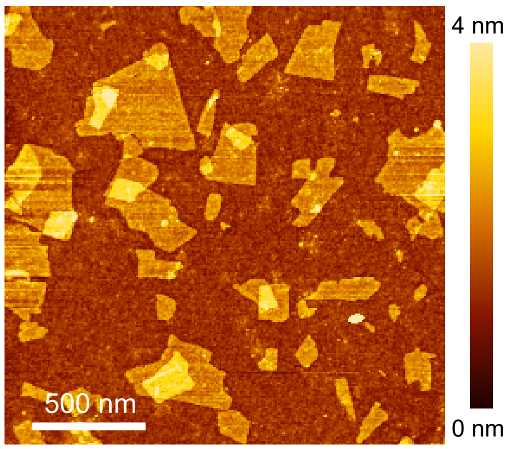

Figure S4. AFM image of TaO_3^- nanosheets.

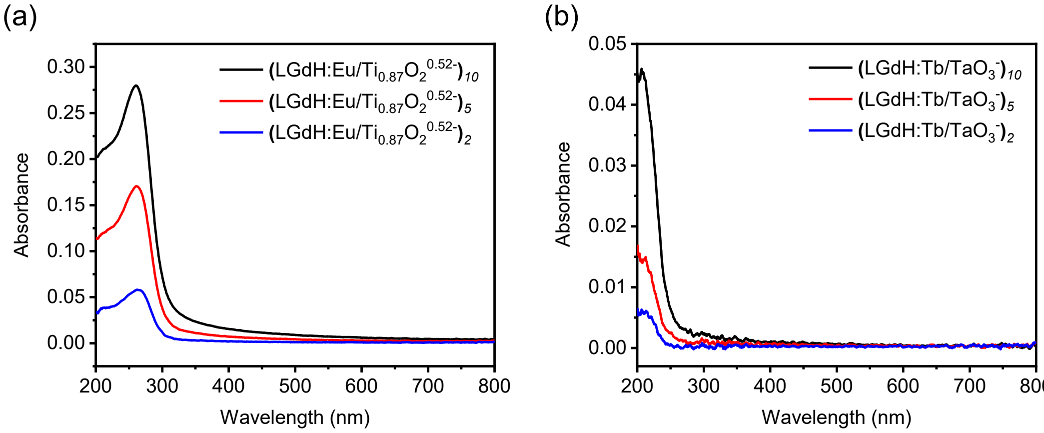

Figure S5. Typical UV-vis absorption spectra of (a) (LGdH:Eu/$Ti_{0.87}O_2^{0.52-}$)$_n$ and (b) (LGdH:Tb/TaO_3^-)$_n$ films (n = 2, 5, 10).

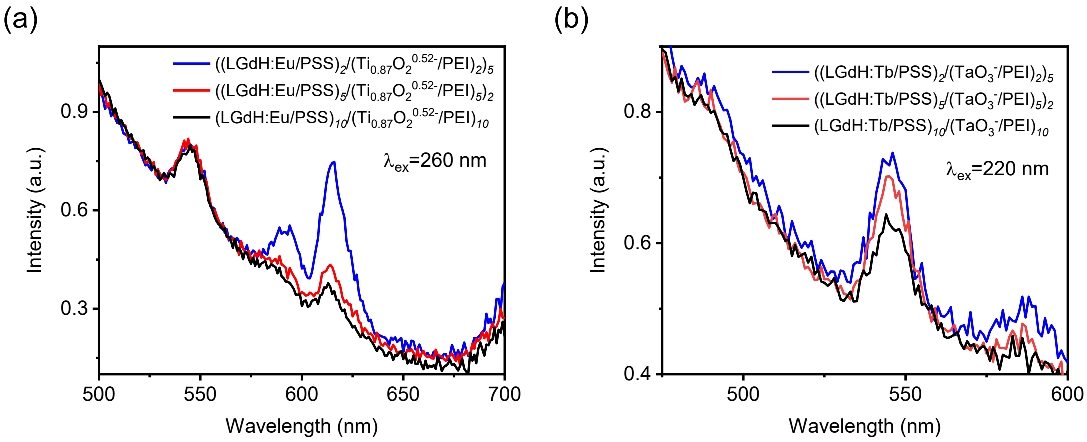

Figure S6. Normalized emission spectra of (a) ((LGdH:Eu/PSS)$_m$/($Ti_{0.87}O_2^{0.52-}$/PEI)$_m$)$_n$ and (b) ((LGdH:Tb/PSS)$_m$/(TaO_3^-/PEI)$_m$)$_n$ series with a total of 20 layers (m = 2, 5 and 10 , while n = 5, 2 and 1, respectively). PSS or PEI was used as charge-balancing counterions for assembling rare-earth hydroxide nanosheets and oxide nanosheets, respectively.

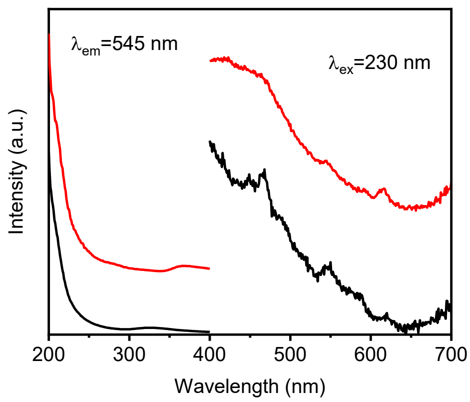

Figure S7. Photoluminescence excitation and emission spectra of (LGdH:Tb/PSS)$_{10}$ (black trace) and (LGdH:Tb/$Ti_{0.87}O_2^{0.52-}$)$_{10}$ (red trace) films.

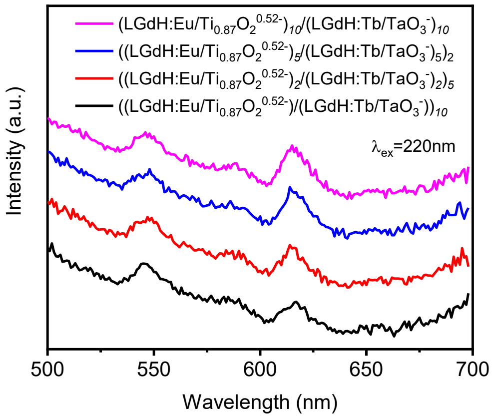

Figure S8. Photoluminescence emission spectra of $((LGdH:Eu/Ti_{0.87}O_2^{0.52-})_m/(LGdH:Tb/TaO_3^-)_m)_n$ films (m = 1, 2, 5 and 10 , while n = 10, 5, 2 and 1, respectively) under excitation of 220 nm.