Supporting Information

Flexible Scintillation Films Based on Ni Co-doped $LiLuF_4$:Tb for High-Resolution X-ray and Thermoluminescence Dual-Mode Imaging

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Figures:

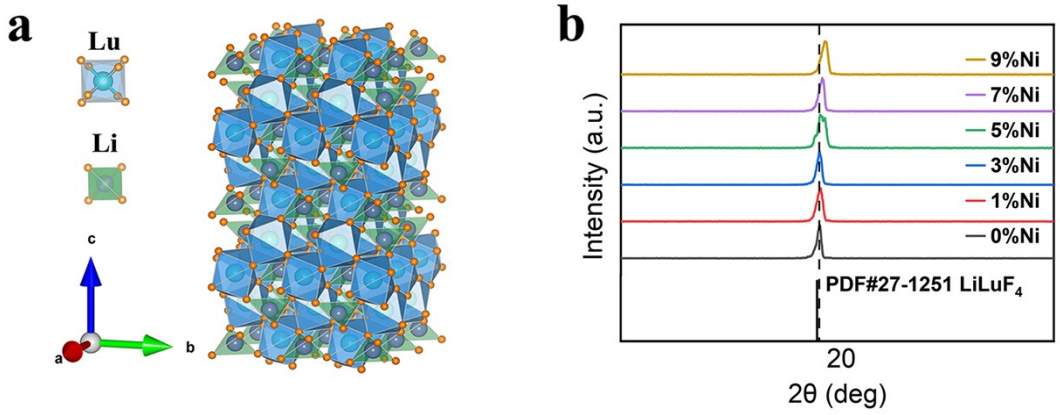

Figure S1 (a)Model diagram of the phase structure of $LiLuF_4$ microcrystals; (b) XRD of Ni^{2+} doped $LiLuF_4$:Tb microcrystals;

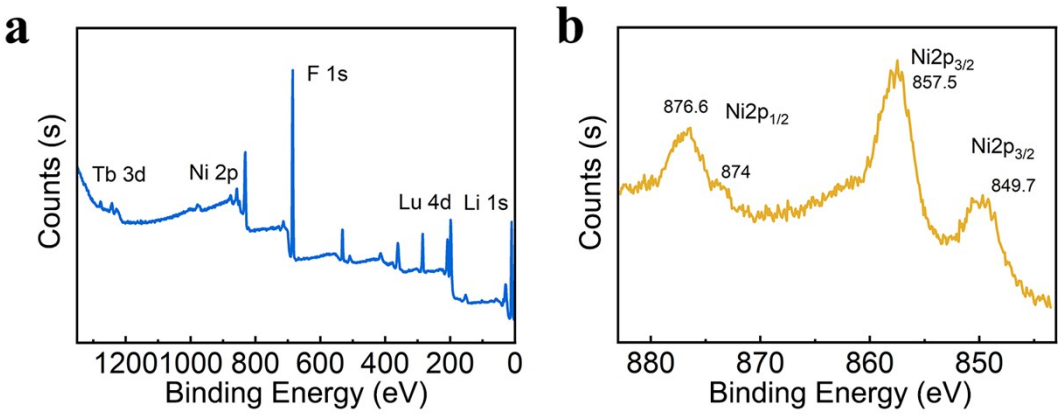

Figure S2 XPS spectral of Ni doped $LiLuF_4$:Tb microcrystals

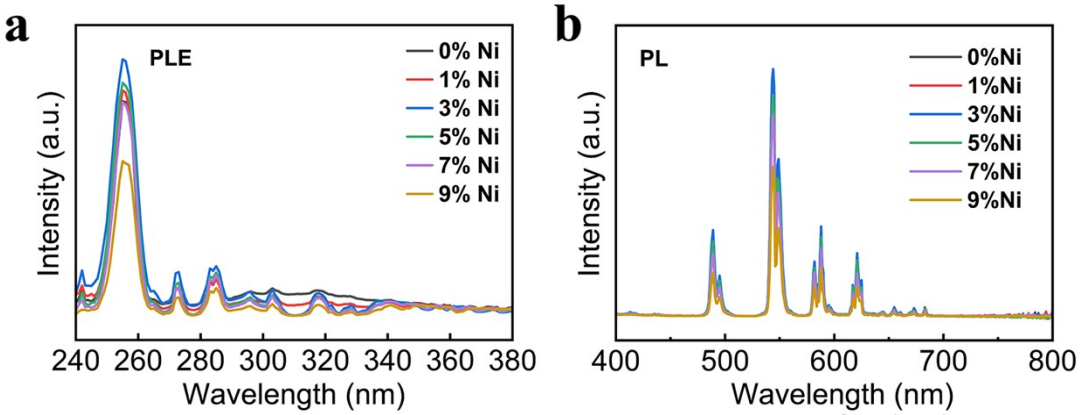

Figure S3 Fluorescence spectral of Ni doped $LiLuF_4$:Tb microcrystals

(a) excitation spectrum; (b) emission spectrum

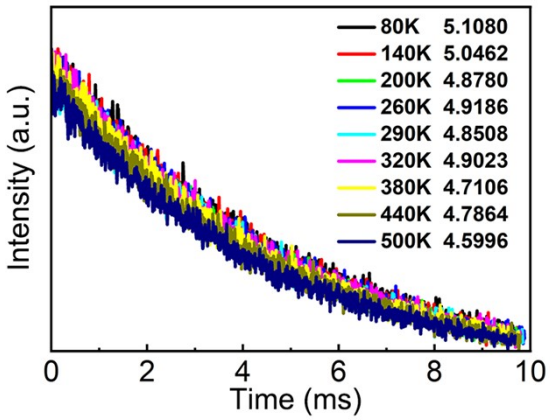

Figure S4 Decay curves of Ni doped $LiLuF_4$:Tb microcrystals at different temperatures

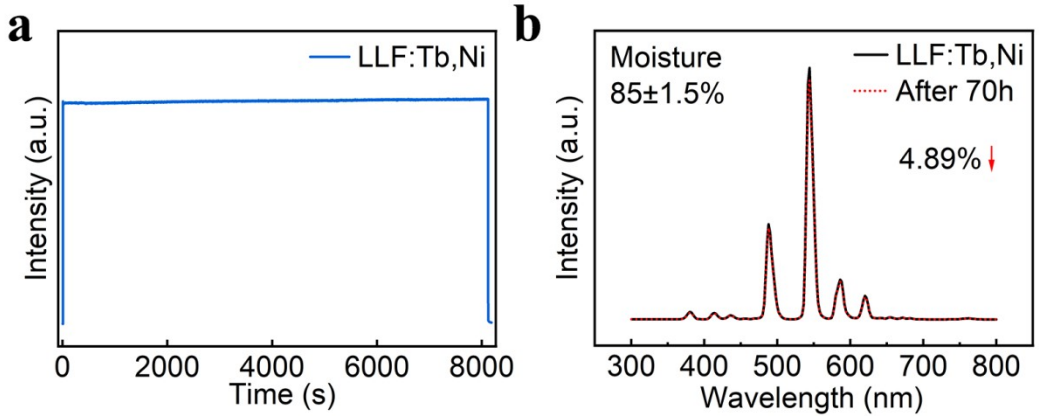

Figure S5 (a) Continuous irradiation stability of Ni doped $LiLuF_4$:Tb microcrystals; (b) humidity stability of Ni doped $LiLuF_4$:Tb microcrystals

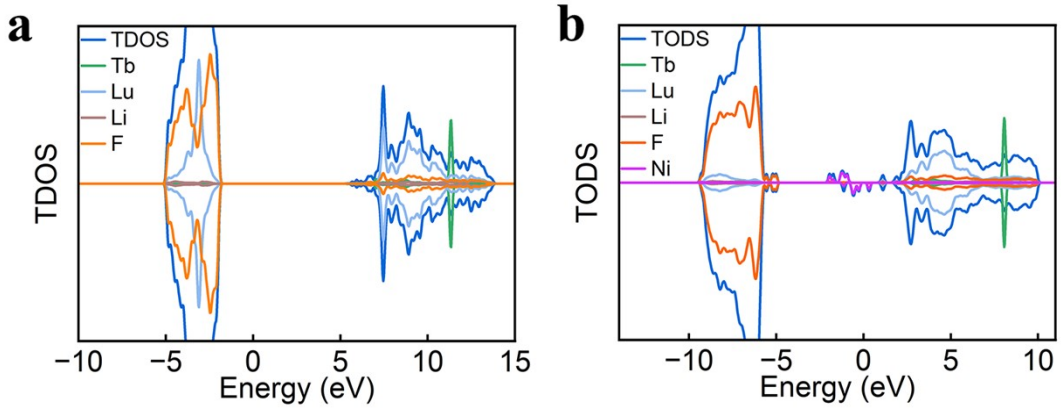

Figure S6 Density of states analysis of (a) $LiLuF_4$:Tb; (b) $LiLuF_4$:Tb,Ni

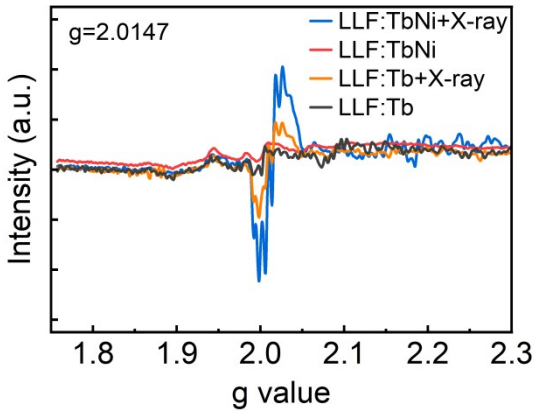

Figure S7 Comparative EPR spectra of $LiLuF_4$:Tb microcrystals before and after Ni co-doping and X-ray irradiation

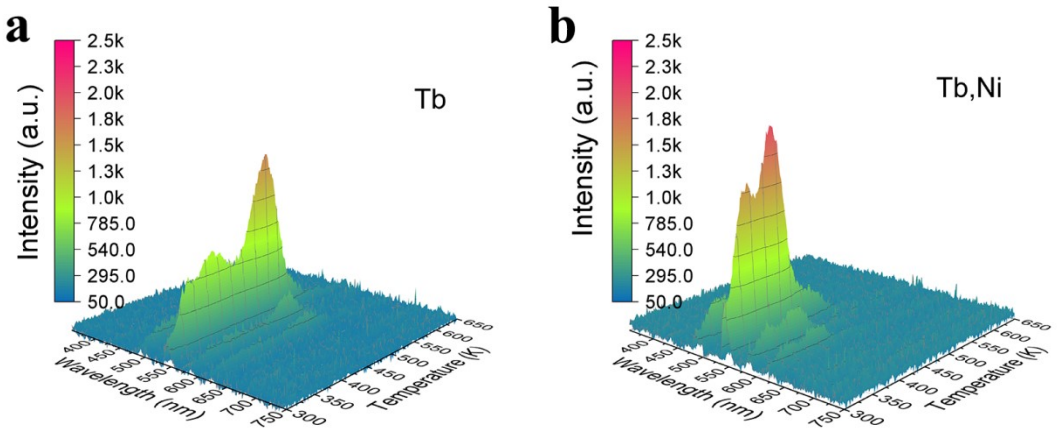

Figure S8 (a) 3D thermoluminescence spectrum of $LiLuF_4$:Tb microcrystals ; (b) 3D thermoluminescence spectrum of Ni doped $LiLuF_4$:Tb microcrystals

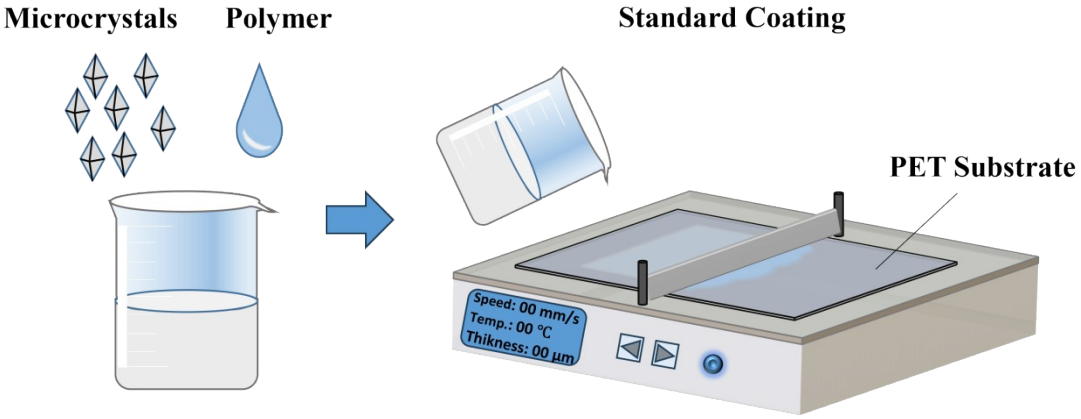

Figure S9 Schematic diagram of $LiLuF_4$ microcrystal polymer composite scintillation film preparation

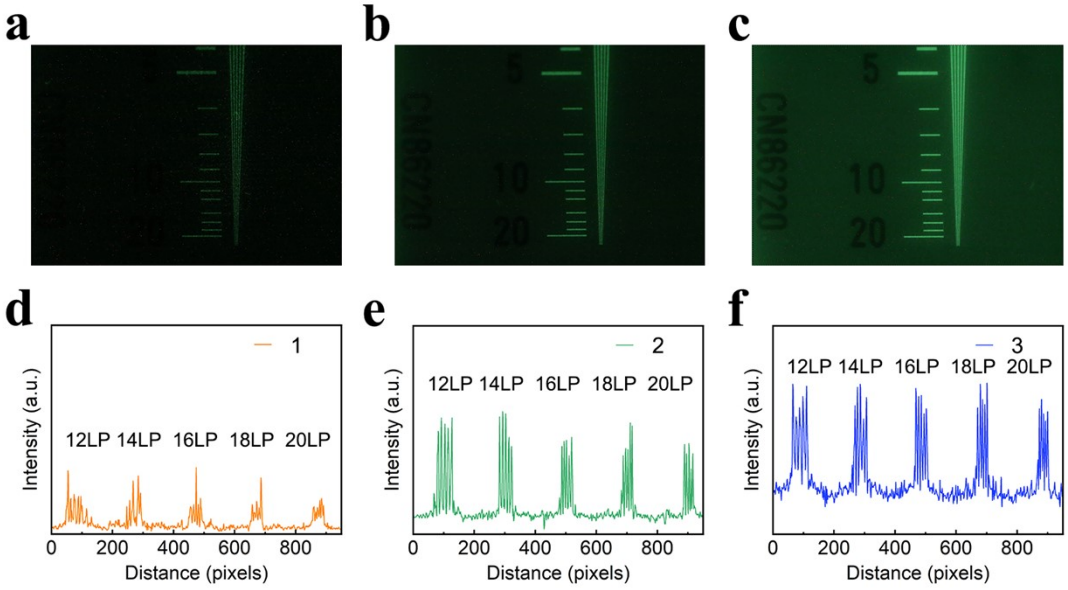

Figure S10 Line-to-card X-ray imaging photographs of $LiLuF_4$:Tb,Ni composite films with different coating thicknesses. (a) 50 μm; (b) 100 μm; (c) 200 μm; Curve of pixel brightness and darkness change at different line pairs. (a) 50 μm; (b) 100 μm; (c) 200 μm

Table S1. Trap depths in $LiLuF_4$:Tb and $LiLuF_4$:Tb,Ni microcrystals derived from 2D-TL measurements.

	$LiLuF_4$:Tb			$LiLuF_4$:Tb,Ni		
No.	T (K)	Trap depths (eV)	Integral area	T (K)	Trap depths (eV)	Integral area
T1	348.85	0.70	36218	334.85	0.67	122264
T2	382.55	0.77	132304	375.05	0.75	106949
T3	473.25	0.95	171489	396.05	0.79	260987
T4	513.85	1.03	28370	450.75	0.90	191925
T5	538.15	1.08	46681	472.05	0.94	92909
T6	-	-	-	531.85	1.06	29359