

Highly Thermal Stable Broadband Near-Infrared Luminescence in Ni²⁺-doped LaAlO₃ with Charge Compensator

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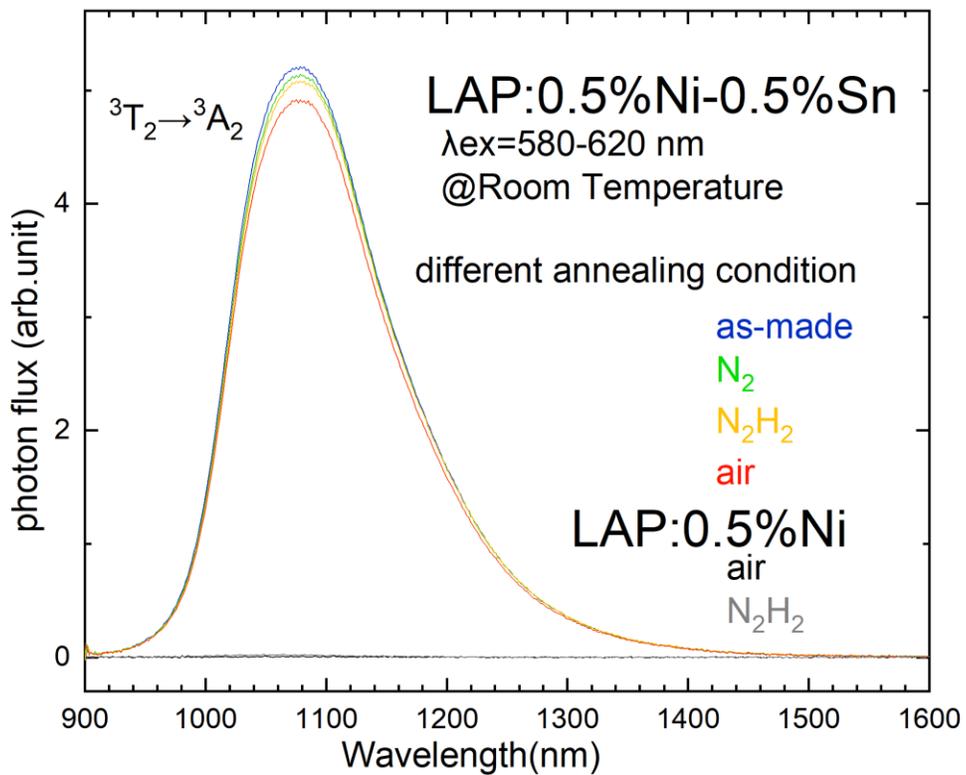


Figure S1. NIR PL spectra of $LaAlO_3:Ni^{2+}-Sn^{4+}$ annealed under air, N_2 and N_2-H_2 and as-made sample and $LaAlO_3:Ni^{2+}$ sintered under air and N_2-H_2 .

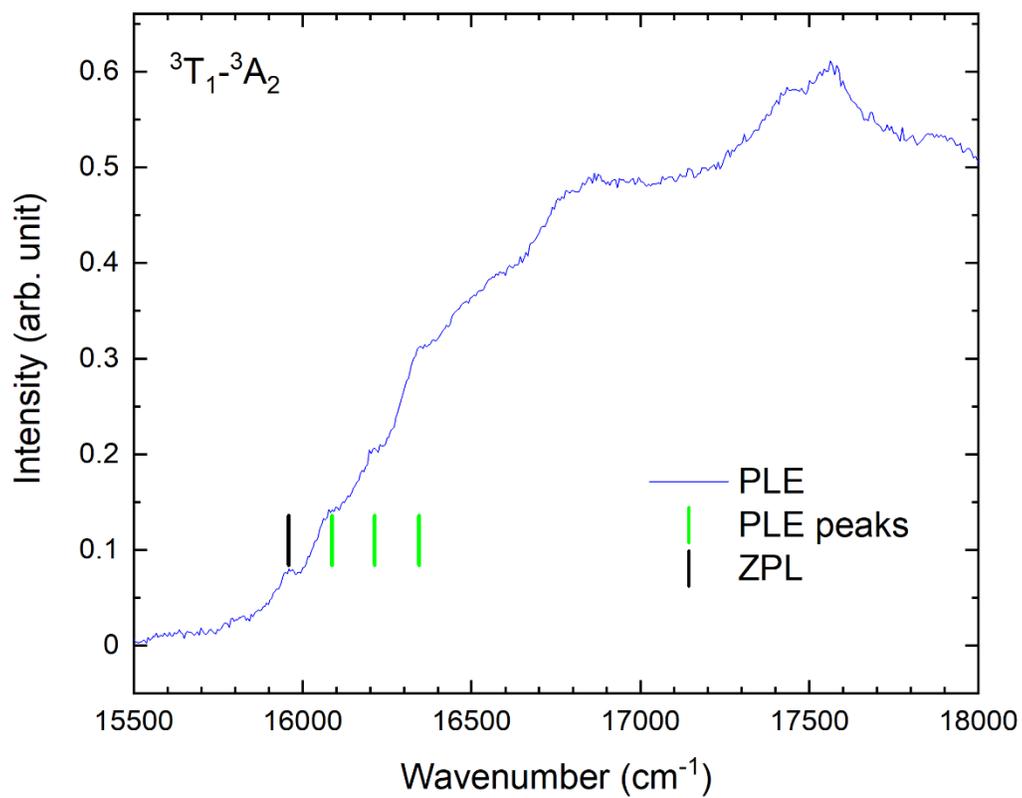


Figure S2. Enlarged PLE spectrum of $\text{LaAlO}_3:\text{Ni}^{2+}-\text{Sn}^{4+}$ at 3.6 K in wavenumber scale.

Table S1. Wavenumber of ZPL and PSBs, difference with respect to ZPL and energy gap for the ${}^3T_1 \leftarrow {}^3A_2$ PLE band.

Assignment in PL	Wavenumber (cm^{-1})	Difference to ZPL (cm^{-1})	Energy gap to previous peak (cm^{-1})
ZPL	1595	0	
PSB 1	16087	128	128
PSB 2	16213	254	126
PSB 3	16345	386	132

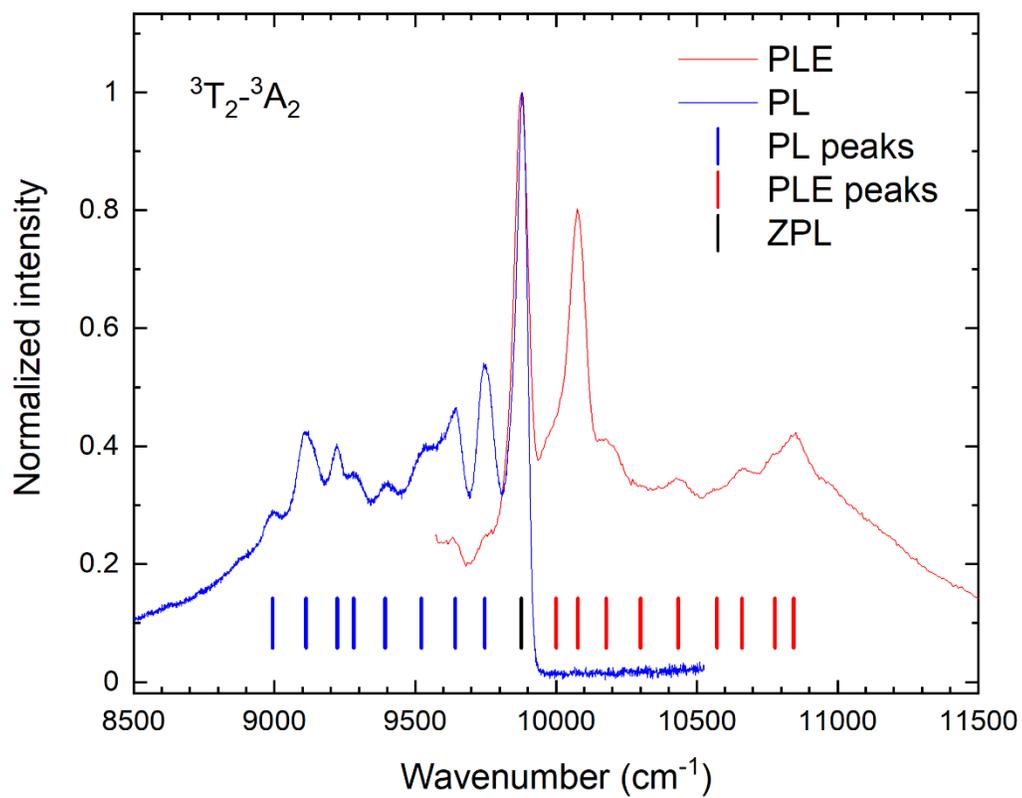


Figure S3. Normalized PLE and PL spectra of $\text{LaAlO}_3:\text{Ni}^{2+}\text{-Sn}^{4+}$ at 3.6 K in wavenumber scale.

Table S2. Wavenumber of ZPL and PSBs, difference with respect to ZPL and energy gap for the ${}^3T_2 \rightarrow {}^3A_2$ PL band.

Assignment in PL	Wavenumber (cm^{-1})	Difference to ZPL (cm^{-1})	Energy gap to previous peak (cm^{-1})
ZPL	9877	0	
PSB1	9747	-130	130
PSB 2	9642	-235	105
PSB 3	9522	-355	120
PSB 4	9393	-484	129
PSB 5	9281	-596	112
PSB 6	9222	-655	59
PSB 7	9112	-765	110
PSB 8	8993	-884	119

Table S3. Wavenumber of ZPL and PSBs, the difference with respect to ZPL and energy gap for the ${}^3T_2 \leftarrow {}^3A_2$ PLE band.

Assignment in PLE	Wavenumber (cm^{-1})	Difference to ZPL (cm^{-1})	Energy gap to next peak (cm^{-1})
ZPL 1	9877	0	
PSB1	10001	124	124
ZPL 2	10077	200	76
PSB 2	10178	301	101
PSB 3	10300	423	122
PSB 4	10434	557	134
PSB 5	10572	695	138
PSB 6	10661	784	89
PSB 7	10778	901	117
PSB 8	10844	967	66

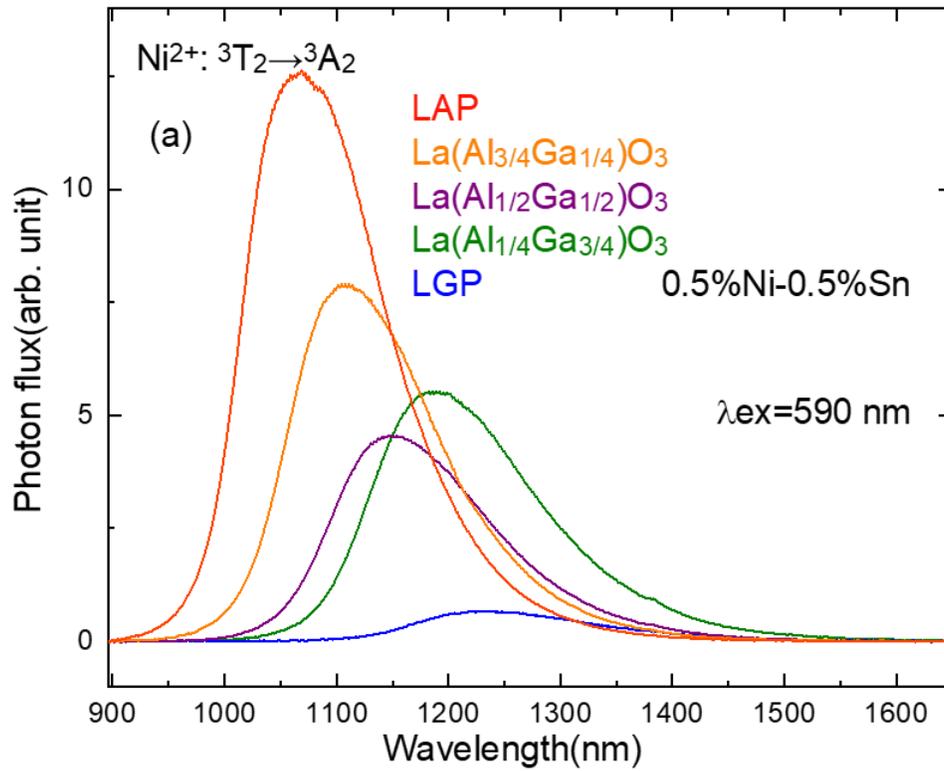


Figure S4. PL spectra of 0.5%Ni-0.5%Sn codoped solid solutions between LaAlO_3 (LAP) and LaGaO_3 (LGP).