Supporting Information

Doping Pb^{2+} in $LaAlO_3$ to generate dual emission centers and optical storage container for visible and near infrared persistent luminescence

Siyuan Li,[a] Qi Zhu,[*,a] Junqing Xiahou[a] and Ji-Guang Li[*,b]

[a]*Key Laboratory for Anisotropy and Texture of Materials (Ministry of Education), School of Materials Science and Engineering, Northeastern University, Shenyang, Liaoning 110819, China*

[b]*Research Center for Functional Materials, National Institute for Materials Science, Namiki 1-1, Tsukuba, Ibaraki 305-0044, Japan*

*Corresponding author

Dr. Qi Zhu

Tel: +86-24-8367-2700

E-mail: zhuq@smm.neu.edu.cn

Dr. Ji-Guang Li

Tel: +81-29-860-4394

E-mail: LI.Jiguang@nims.go.jp

Table S1 Wyckoff lattice position (Wyck), atomic coordinates (x, y, z), isotropic displacement parameter (B_{iso}) and atom occupancy (Occ.) for $LaAlO_3$ host and $LaAlO_3$:0.02Pb^{2+} sample

Atom	Wyck.	x	y	z	B_{iso} (Å^2)	Occ.
$LaAlO_3$ host						
La	1a	0	0	0	0.018(22)	1
Al	1a	0.5	0.5	0.5	0.074(65)	1
O	3b	0.5	0.5	0	0.462(74)	1
$LaAlO_3$:0.02Pb^{2+}						
La	1a	0	0	0	0.413(36)	0.98
Al	1a	0.5	0.5	0.5	0.330(61)	1
O	3b	0.5	0.5	0	1.277(99)	1
Pb	1a	0	0	0	0.413(36)	0.02

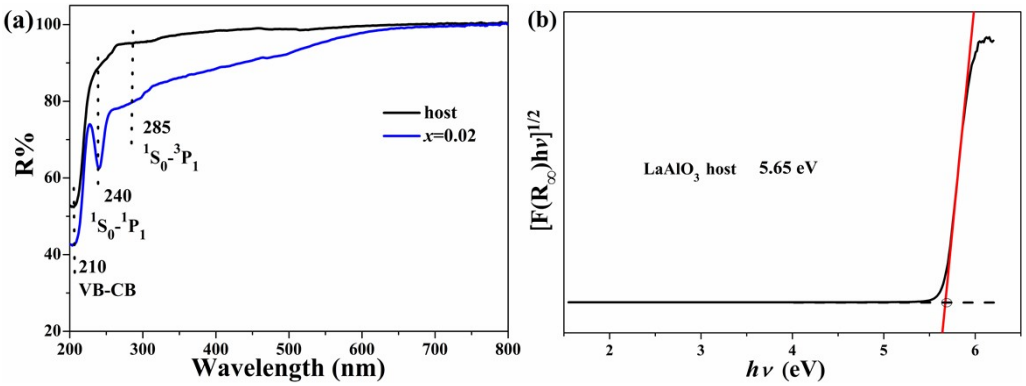

Fig. S1 (a) UV-vis diffuse reflectance apectra for $LaAlO_3$: $x$$Pb^{2+}$ (x=0, 0.02) samples. (b) Extrapolation of the band gap of the $LaAlO_3$ host.

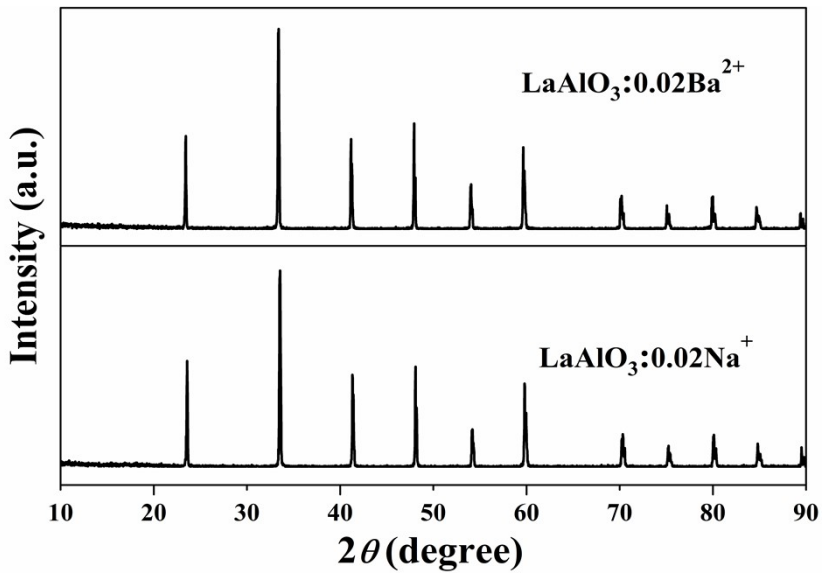

Fig. S2 XRD patterns of $LaAlO_3$:0.02Ba^{2+} and $LaAlO_3$:0.02Na^+.

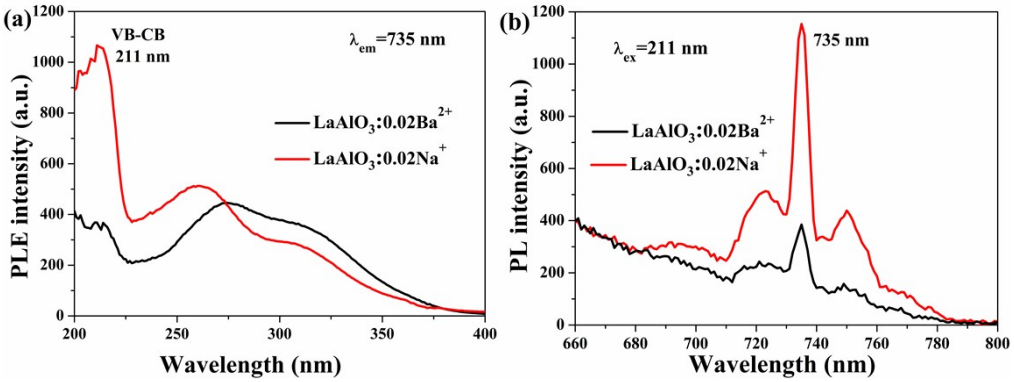

Fig. S3 PLE (a) and PL (b) spectra for $LaAlO_3:0.02Ba^{2+}$ and $LaAlO_3:0.02Na^{+}$ at room temperature.

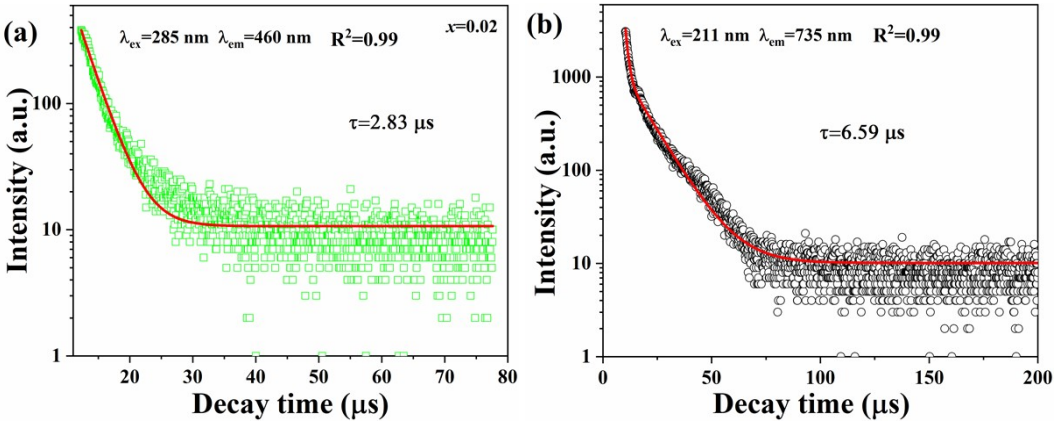

Fig. S4 PL decay curves of $LaAlO_3:0.02Pb^{2+}$.

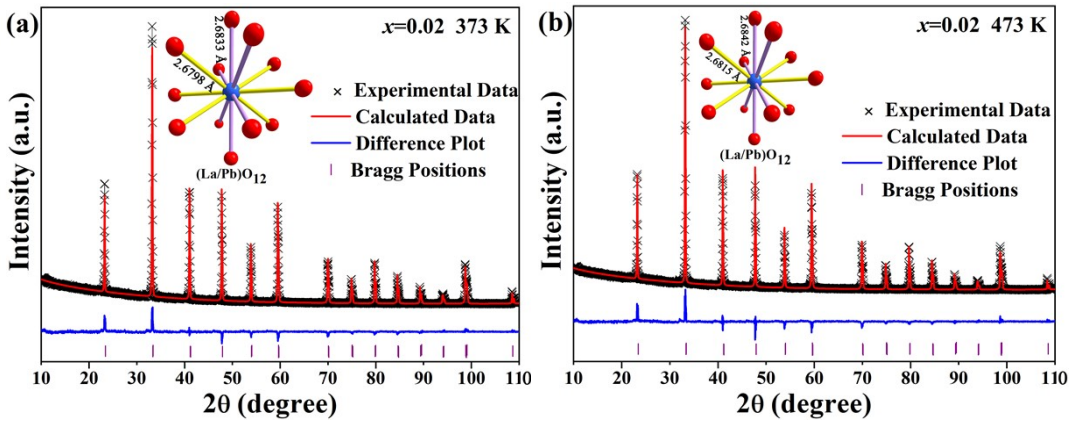

Fig. S5 Rietveld refinement of high temperature XRD patterns of $LaAlO_3:0.02Pb^{2+}$ sample at 373 K (a) and 473 K (b).

Table S2 Main parameters for Refinement of $LaAlO_3$:0.02Pb^{2+} sample at 298 K, 373 K and 473 K

Temperature (K)	a (Å)	β (°)	V (Å^3)	R_{exp}	R_{wp}	R_p	χ^2
298	3.7913(1)	90.086(1)	54.497(1)	6.90%	8.72%	5.08%	1.26
373	3.7923(1)	90.074(1)	54.541(1)	3.6%	7.34%	5.55%	2.04
473	3.7942(3)	90.057(6)	54.619(2)	3.62%	7.20%	5.41%	1.99