Supporting Information

An efficient and thermally stable near-infrared phosphor derives from $Ln_3ScInGa_3O_{12}:Cr^{3+}$ (Ln=La, Gd, Y, and Lu) garnet family

Zurong Liao[a], Chaojie Li[a], Jiyou Zhong[a,*], Yang Li[b], and Weiren Zhao[a,c*]

[a]School of Physics and Optoelectronic Engineering, Guangdong University of Technology, Guangzhou 510006, China. E-mail:zhongjiyou@126.com; zwren123@126.com.

[b]School of Basic Medical Sciences Guangzhou Medical University Guangzhou, Guangdong, 510182, China.

[c]School of Chemical Engineering and Light Industry Guangdong University of Technology, Guangzhou, 510006, China.

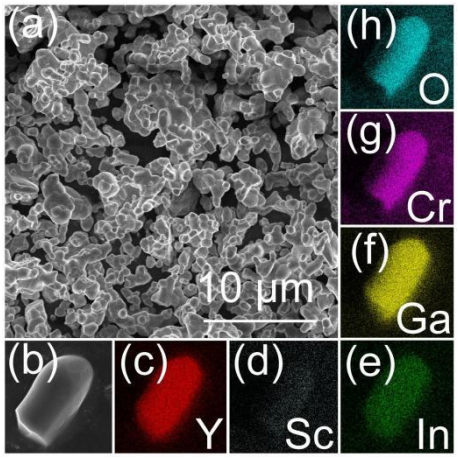

Fig. S1. (a) SEM image and (b-h) EDS elemental mapping on a single particle of $Y_3Sc_{0.97}In_{0.97}Cr_{0.06}Ga_3O_{12}$ sample.

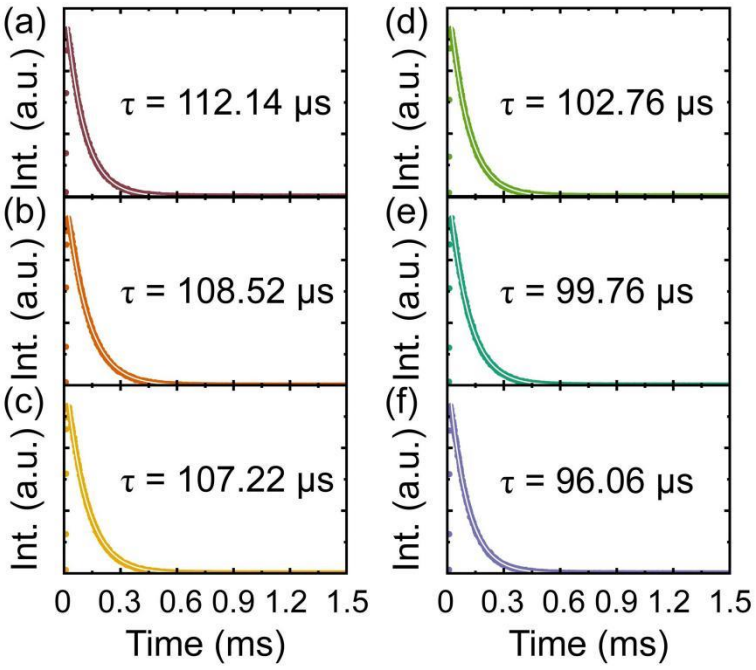

Fig. S2. (a-f) Decay curves fitted by single-exponential function of $Y_3Sc_{1-x/2}In_{1-x/2}Ga_3O_{12}$:$xCr^{3+}$ (x = 0.01-0.10) samples.

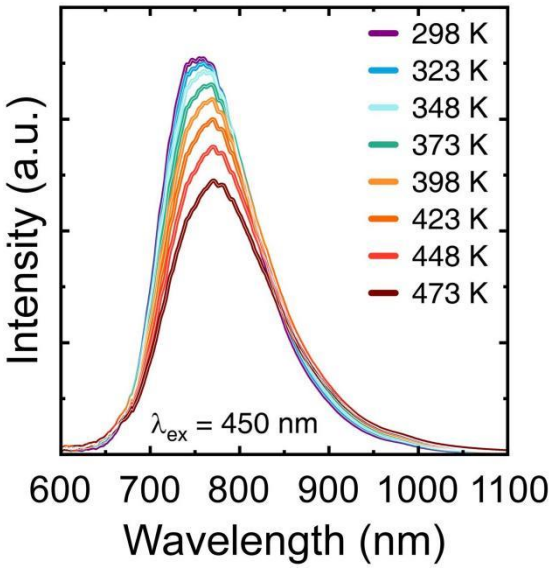

Fig. S3. Temperature-dependent emission spectra of $Y_3Sc_{0.97}In_{0.97}Ga_3O_{12}$:0.06$Cr^{3+}$ samples excited by 450 nm.

Table S1 The refined atomic positions of $Y_3ScInGa_3O_{12}$ host.

atom	Wyck. position	Occ.	*x*	*y*	*z*
Y(1)	24*c*	1	0.12500(0)	0	0.25000(0)
Sc	16*a*	0.5	0	0	0
In	16*a*	0.5	0	0	0
Ga(1)	24*d*	1	0.37500(0)	0	0.25000(0)
O(1)	96*h*	1	0.09580(4)	0.18990(3)	0.27852(3)

Table S2. The detailed input and output parameters for $Y_3Sc_{0.97}In_{0.97}Ga_3O_{12}$:0.06$Cr^{3+}$-containing device.

Current (mA)	Total input power (mW)	Total output power (mW)	Blue light output power (mW)	NIR output power (mW)	NIR photoelectric efficiency (%)
25	65.89	12.28	3.98	8.30	12.59
50	135.10	24.07	7.81	16.26	12.04
75	207.30	35.21	11.40	23.81	11.49
100	282.40	46.01	14.94	31.07	11.00
125	359.30	56.30	18.29	38.01	10.58
150	438.90	65.90	21.34	44.56	10.15
175	520.50	75.23	24.33	50.90	9.78
200	603.30	84.11	27.20	56.91	9.43
225	687.70	93.41	30.36	63.05	9.17
250	775.40	101.10	32.77	68.33	8.81
275	863.70	108.90	35.28	73.62	8.52
300	953.10	116.20	37.61	78.59	8.25
325	1045.00	124.40	40.38	84.02	8.04
350	1138.00	131.20	42.55	88.65	7.79