ELECTRONIC SUPPLEMENTARY INFORMATION

Sn-P-F Containing Glass Matrix for the Fabrication of Phosphor-in-Glass for Use in high power LEDs

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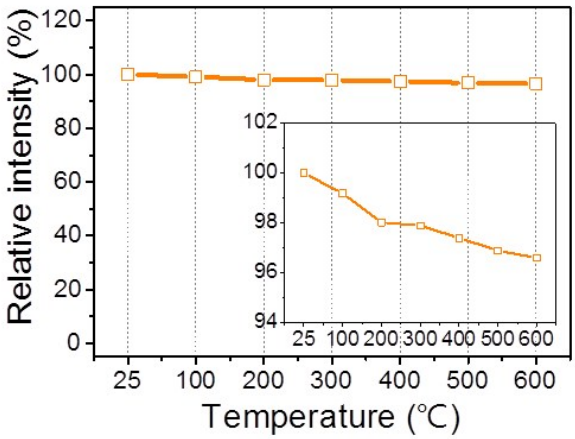
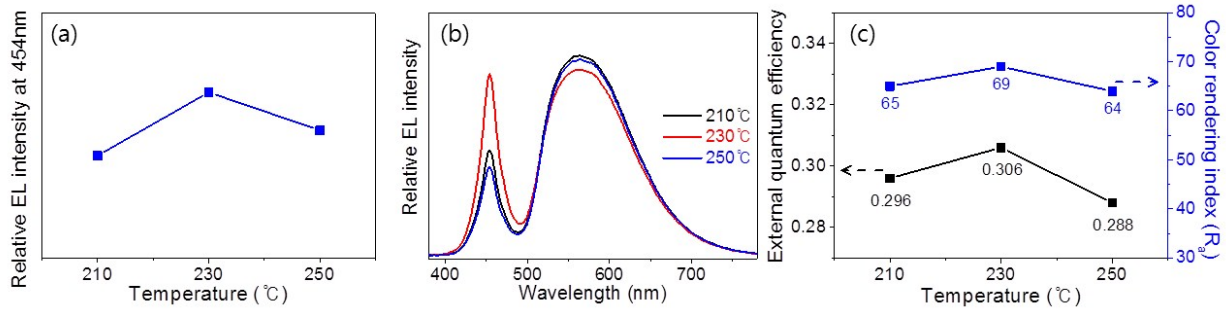


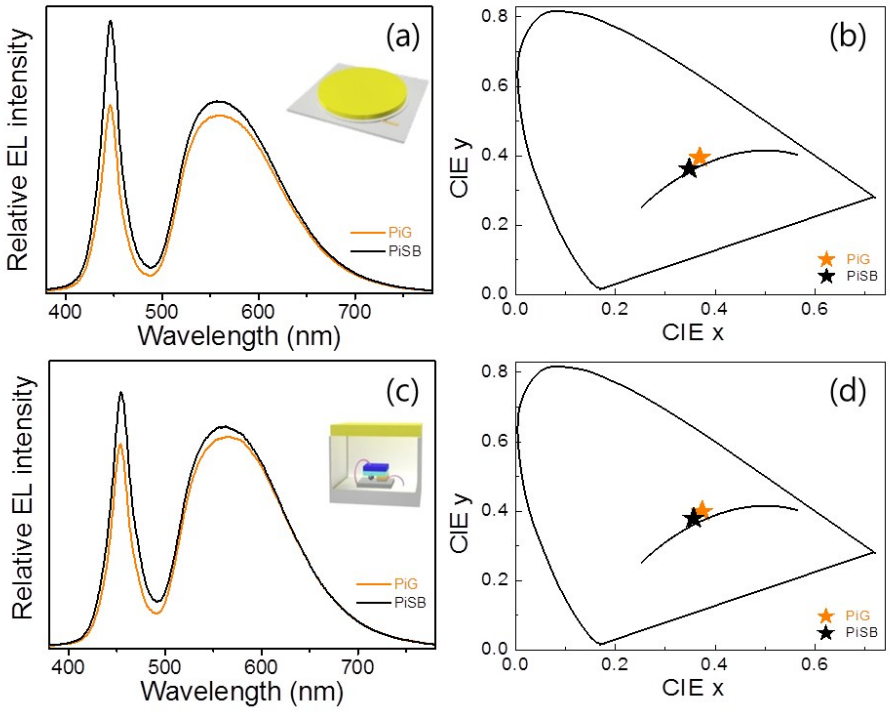
FigureS1. PL intensity of the YAG phosphor after a heat treatment at 25 to 600 °C for 1 hour at each indicated temperature



FigureS2. EL intensity of (a) bare glass plate at 454nm (b) PiG and additional EL data of (c) PiG with different sintering temperature

TableS1. EL data of bare glass plate and PiG with different sintering temperature.

	Temperature(℃)	CCT	CIE x	CIE y	LE (lm/W)	LER (lm/W_{opt})	EQE	CRI
Bare glass plate	210	-	0.149	0.040	16.8	50.3	0.33	-
	230	-	0.148	0.040	18.1	50.1	0.36	-
	250	-	0.148	0.040	17.3	50.1	0.34	-
PiG plate	210	3920	0.401	0.441	114	383	0.296	65
	230	4385	0.370	0.393	108	354	0.306	69
	250	3845	0.408	0.449	112	387	0.288	64

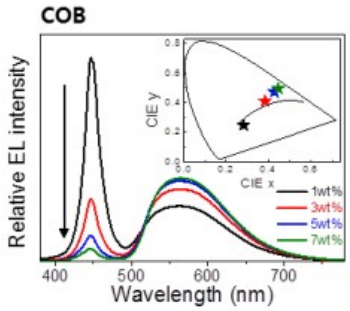


FigureS3.

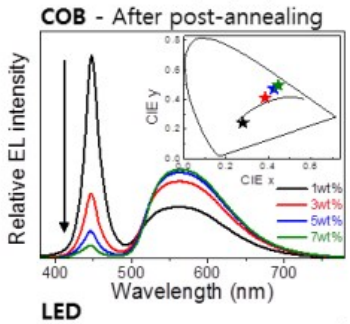
(a), (b) EL spectra and color coordinates of PIG after post-annealing and PiSB on COB at 36V. (c), (d) EL spectra and color coordinates of PIG after post-annealing and PiSB on a high-power LED at 350mA. The PiGs were sintered at 230 °C for 45sec.

TableS2. EL data of (a) PiG on COB, (b) PiSB on COB, (c) PiG on high-power LED, and (d) PiSB on high-power LED after post-annealing

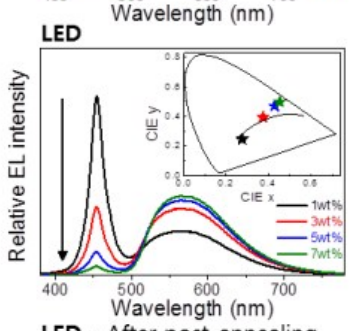
	CCT	CIE x	CIE y	LE (lm/W)	LER (lm/W_{opt})	EQE	CRI
PiG on COB	4370	0.369	0.394	110	363	0.303	64
PiSB on COB	4900	0.348	0.362	114	342	0.333	67
PiG on LED	4275	0.374	0.399	118	358	0.330	68
PiSB on LED	4670	0.357	0.379	124	346	0.358	70



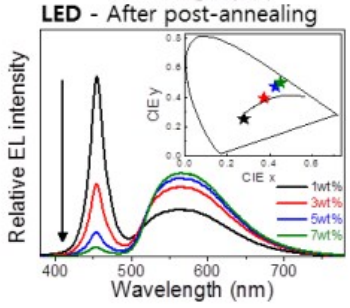
Weight percentage (wt%)	CCT	CIE x	CIE y	LE (lm/W)	LER (lm/W_{opt})	EQE	CRI
1	13330	0.282	0.248	90	256	0.35	79
3	4090	0.384	0.410	110	371	0.30	64
5	3600	0.427	0.472	119	410	0.29	60
7	3440	0.445	0.495	121	423	0.29	58



Weight percentage (wt%)	CCT	CIE x	CIE y	LE (lm/W)	LER (lm/W_{opt})	EQE	CRI
1	15250	0.278	0.243	81	251	0.32	79
3	4095	0.384	0.412	112	373	0.30	63
5	3615	0.426	0.472	122	410	0.30	59
7	3450	0.445	0.497	125	425	0.29	58

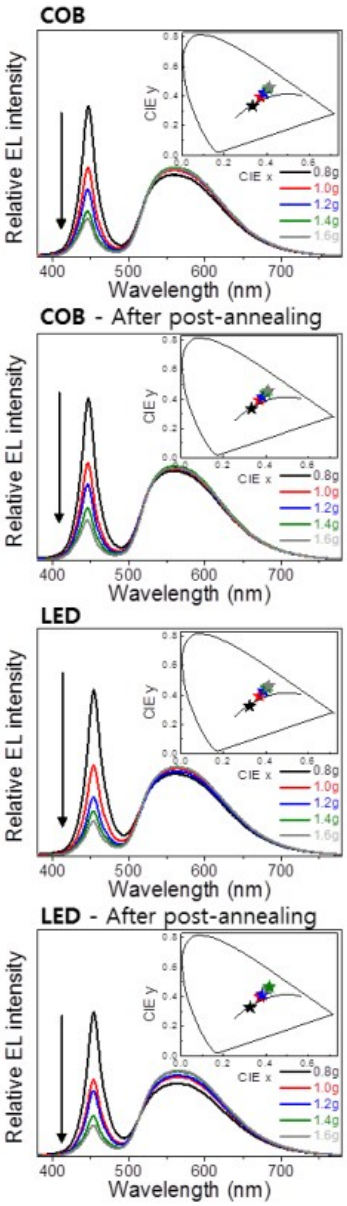


Weight percentage (wt%)	CCT	CIE x	CIE y	LE (lm/W)	LER (lm/W_{opt})	EQE	CRI
1	15305	0.275	0.246	74	249	0.30	84
3	4255	0.374	0.396	103	355	0.29	69
5	3570	0.428	0.471	112	401	0.28	62
7	3360	0.452	0.498	116	417	0.28	60



Weight percentage (wt%)	CCT	CIE x	CIE y	LE (lm/W)	LER (lm/W_{opt})	EQE	CRI
1	13035	0.279	0.253	81	256	0.32	85
3	4280	0.373	0.395	111	356	0.31	69
5	3580	0.428	0.472	121	403	0.30	62
7	3380	0.451	0.499	126	419	0.30	60

FigureS4. Optical properties before and after post-annealing on COB and LED samples with the weight percentages.



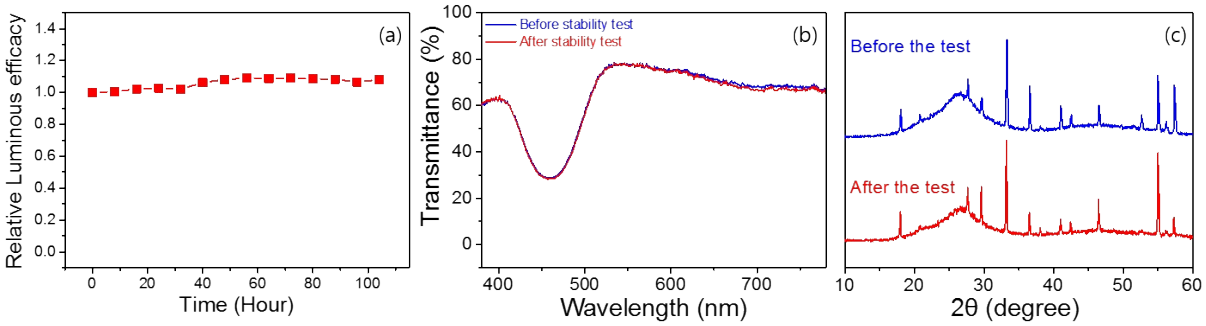
Weight (g)	CCT	CIE x	CIE y	LE (lm/W)	LER (lm/W_{opt})	EQE	CRI
0.8	5450	0.332	0.334	105	322	0.326	70
1.0	4355	0.370	0.395	108	364	0.299	64
1.2	4085	0.387	0.421	110	380	0.289	62
1.4	3560	0.405	0.449	111	397	0.280	60
1.6	3780	0.412	0.459	109	403	0.270	60

Weight (g)	CCT	CIE x	CIE y	LE (lm/W)	LER (lm/W_{opt})	EQE	CRI
0.8	5415	0.333	0.334	108	322	0.335	70
1.0	4370	0.369	0.394	111	363	0.303	64
1.2	4135	0.383	0.416	110	377	0.292	62
1.4	3885	0.402	0.444	111	394	0.279	61
1.6	3790	0.412	0.460	110	403	0.270	60

Weight (g)	CCT	CIE x	CIE y	LE (lm/W)	LER (lm/W_{opt})	EQE	CRI
0.8	5890	0.324	0.325	114	309	0.369	78
1.0	4380	0.369	0.394	116	354	0.333	69
1.2	4030	0.391	0.426	113	375	0.301	66
1.4	3860	0.405	0.448	118	388	0.304	65
1.6	3765	0.414	0.462	118	396	0.298	64

Weight (g)	CCT	CIE x	CIE y	LE (lm/W)	LER (lm/W_{opt})	EQE	CRI
0.8	5740	0.326	0.327	111	310	0.358	78
1.0	4275	0.374	0.399	118	358	0.330	68
1.2	4110	0.384	0.414	120	369	0.325	67
1.4	3810	0.408	0.451	124	390	0.318	64
1.6	3720	0.417	0.465	125	398	0.314	63

FigureS5. Optical properties before and after post-annealing on COB and LED samples with the PiG weights.



FigureS6. Long-term stability of the PiG based DC-WLED on a high power LED at 350mA up to 100 hours (a) Relative luminous efficacy of PiG based DC-WLED, (b) Transmittance of the PiG, and (c) XRD patterns of the PiG before –and -after the long-term stability test.