Electronic Supplementary Information (ESI)

Near-ideal color rendering white solid-state lighting device copackaged with two color-separated Cu–X–S (X = Ga, In) quantum dot emitters

Jong-Hoon Kim,[a‡] Bu-Yong Kim,[a‡] Eun-Pyo Jang,[a] Chang-Yeol Han,[a] Jung-Ho Jo,[a] Young Rag Do[b] and Heesun Yang*[a]

[a] Department of Materials Science and Engineering, Hongik University, Seoul 121-791, Republic of Korea. *E-mail: hyang@hongik.ac.kr

[b] Department of Chemistry, Kookmin University, Seoul 136-702, Republic of Korea

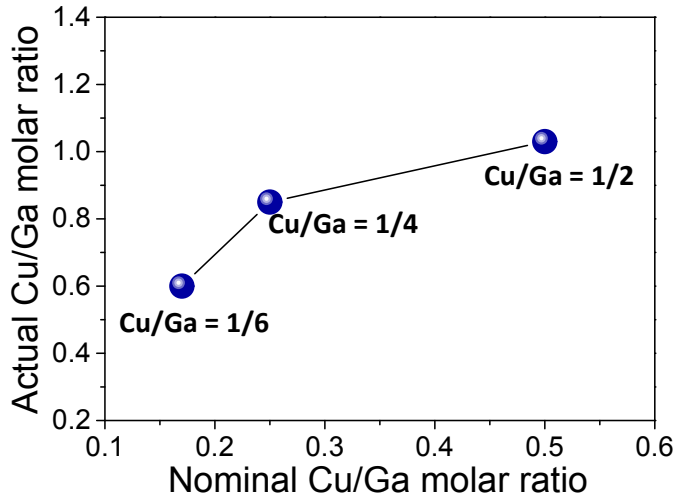

Fig. S1 Nominal *versus* actual Cu/Ga ratios of a series of CGS/ZnS QDs.

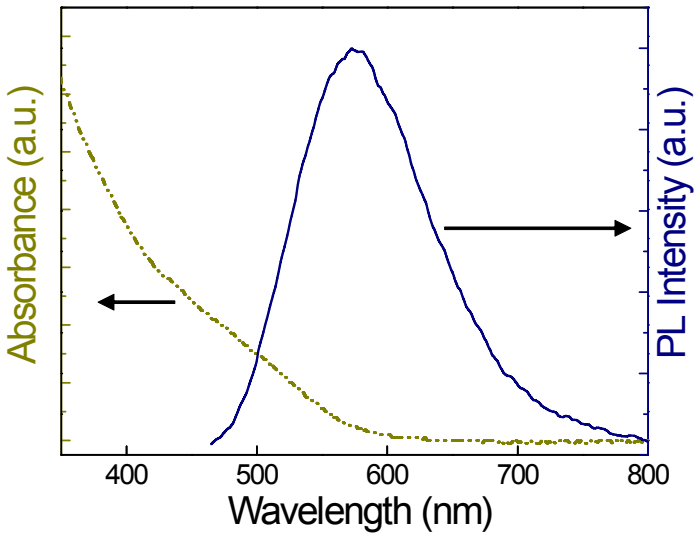

Fig. S2 Absorption and PL spectra of CIS/ZnS QDs obtained after triple ZnS shelling was applied.

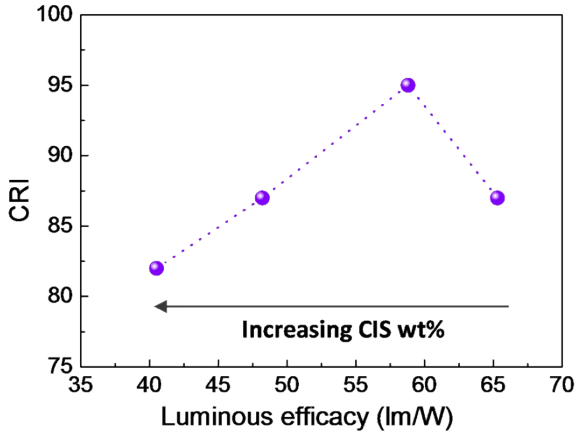

Fig. S3 Device efficacy–CRI relation replotted from Fig. 3(c).

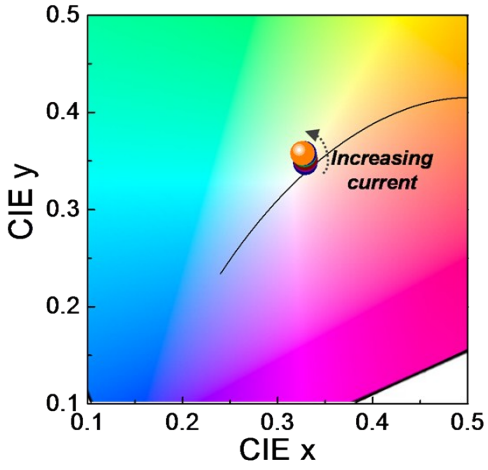

Fig. S4 Variation of CIE color coordinates of 2.9 wt% CIS-based white QD-LED with increasing applied current from 20 to 300 mA.

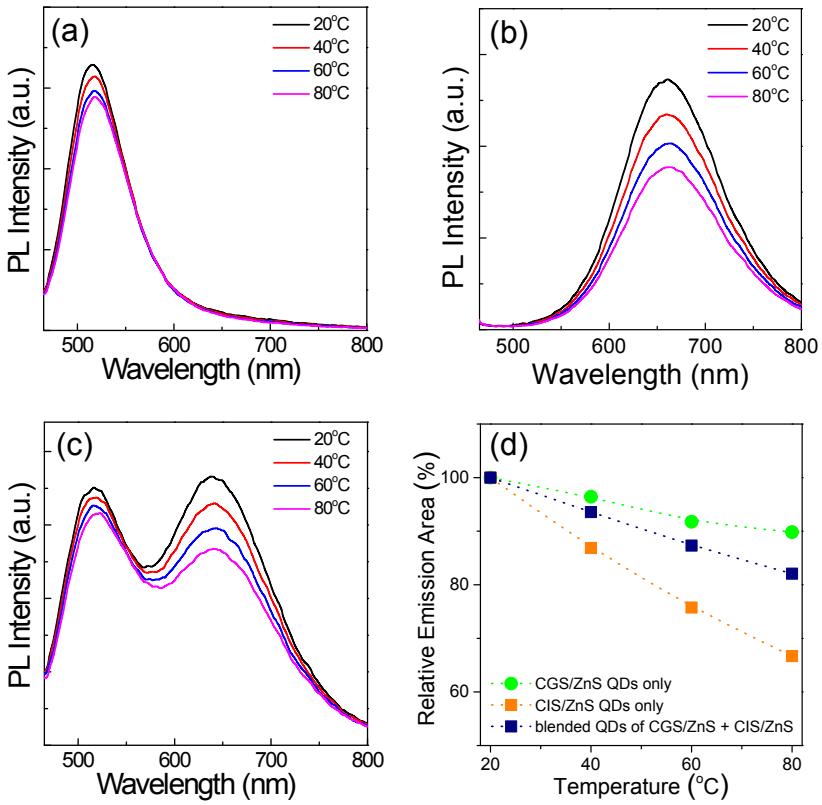

Fig. S5 Changes of PL intensity of QD-resin mixture on glass substrate with increasing heating temperature from 20 to 100°C: (a) CGS/ZnS QDs only, (b) CIS/ZnS QDs only, and (c) blended QDs of CGS/ZnS + CIS/ZnS. (d) Summarized thermal quenching plot for the respective samples.

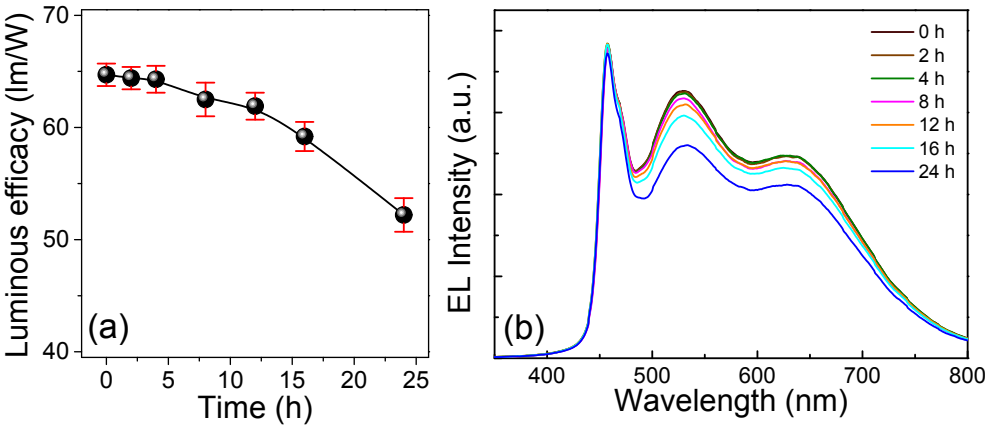

Fig. S6 (a) Device operational time-dependent variation in luminous efficacy and (b) temporal evolution of EL spectra of 2.9 wt% CIS-based white QD-LED under 60 mA driving current. The error bars in (a) represent repeated measurements of three devices.

Table S1. Variations of luminous efficacy, CIE color coordinates, CRI, and CCT of white QD-LEDs fabricated with different weight ratios between CGS and CIS QDs at an operating current of 100 mA.

Sample	Luminous efficacy (lm/W)	CIE x	CIE y	CRI	CCT (K)
2 wt% CIS	65.3	0.290	0.349	87	7582
2.9 wt% CIS	58.8	0.329	0.353	95	5654
3.8 wt% CIS	48.2	0.349	0.340	87	4810
4.8 wt% CIS	40.5	0.355	0.330	82	4486

Table S2. Driving current-dependent variations of luminous efficacy, CIE color coordinates, CRI, and CCT of 2.9 wt% CIS-based white QD-LED.

Current (mA)	Luminous efficacy (lm/W)	CIE x	CIE y	CRI	CCT (K)
20	68.8	0.329	0.348	94	5654
60	64.9	0.329	0.351	94	5651
100	58.8	0.329	0.353	95	5654
150	53.7	0.328	0.356	96	5686
200	50.2	0.328	0.357	96	5686
250	47.2	0.328	0.358	96	5719
300	43.1	0.326	0.358	97	5752