Electronic Supplementary Material (ESI) for RSC Advances.

Silica-Coated Gradient Alloy Quantum Dots with High luminescence for Converter Materials in White Light-Emitting Diodes

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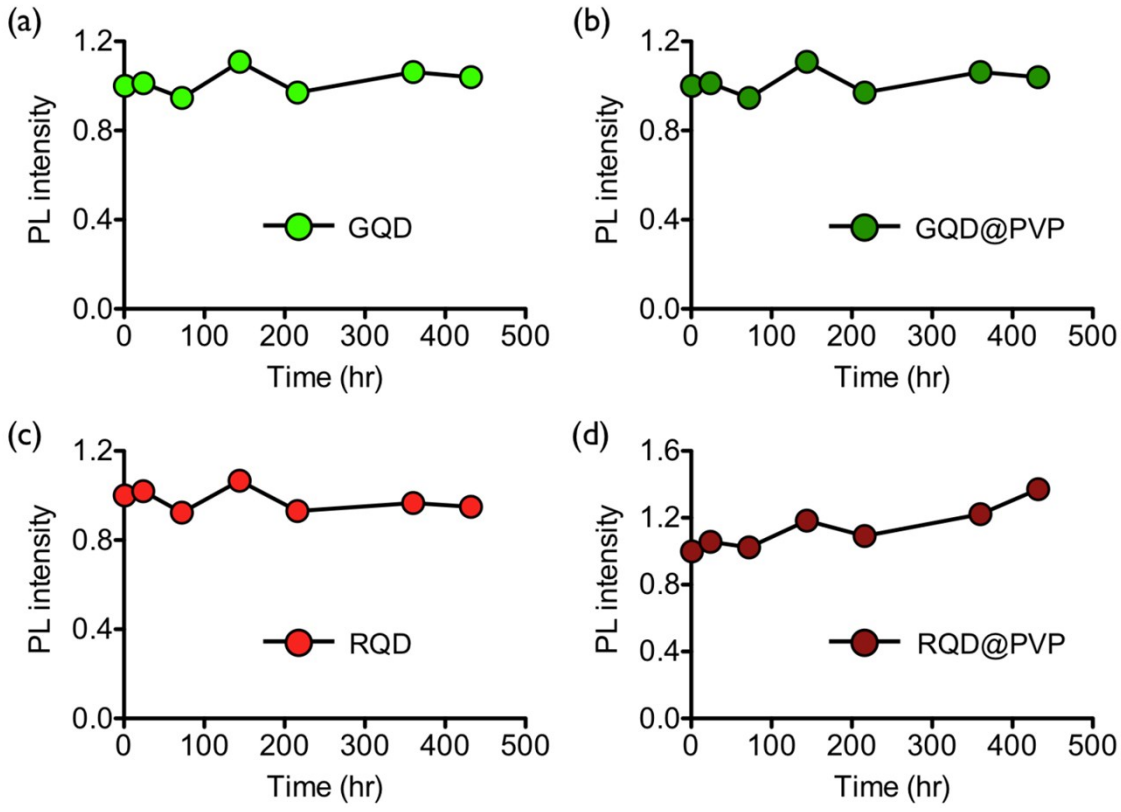

Fig. S1 PL intensities of the QDs and QD@PVP were determined after dispersing in chloroform as times. The intensities were normalized at 540 nm (GQD and GQD@PVP) and 620 nm (RQD and RQD@PVP).

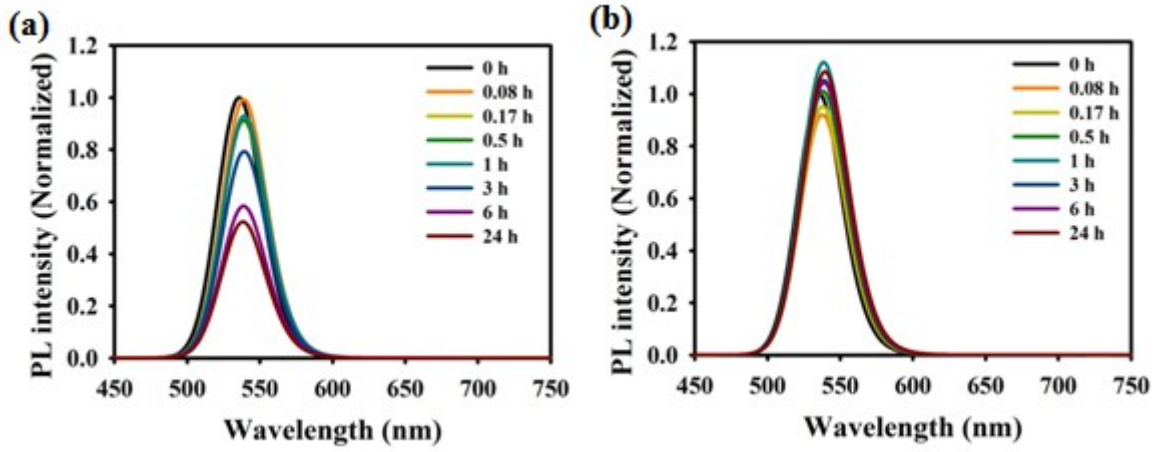

Fig. S2 PL spectra of the prepared GQD@PVP in ethanol with different base catalyst (NH_4OH: a, DMA: b) were determined as times.

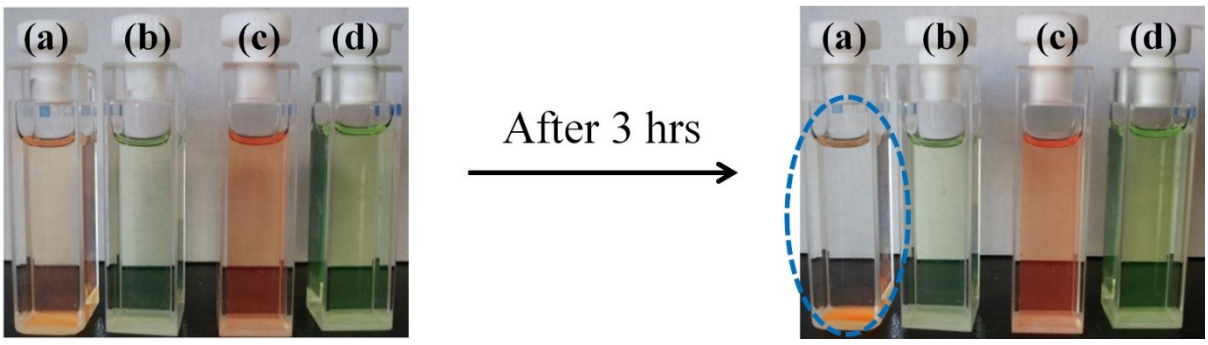

Fig. S3 RQD@PVP (a and c) and GQD@PVP (b and d) particle dispersed in ethanol with different base catalysts. (NH_4OH: a and b, DMA: c and d). The particle solution with DMA base were revealed higher solubility then NH_4OH contained solution. Especially, RQD@PVP solution with NH_4OH was completely precipitated within 3 hr.

Table S1 Quantum yields of QD solutions.

Sample	Solvent	Quantum yield (%)
GQD	Hexane	46.3
GQD@PVP	$CHCl_3$	48.3
GQD@SiO_2	EtOH	47.7
RQD	Hexane	55.9
RQD@PVP	$CHCl_3$	37.7
RQD@SiO_2	EtOH	32.1

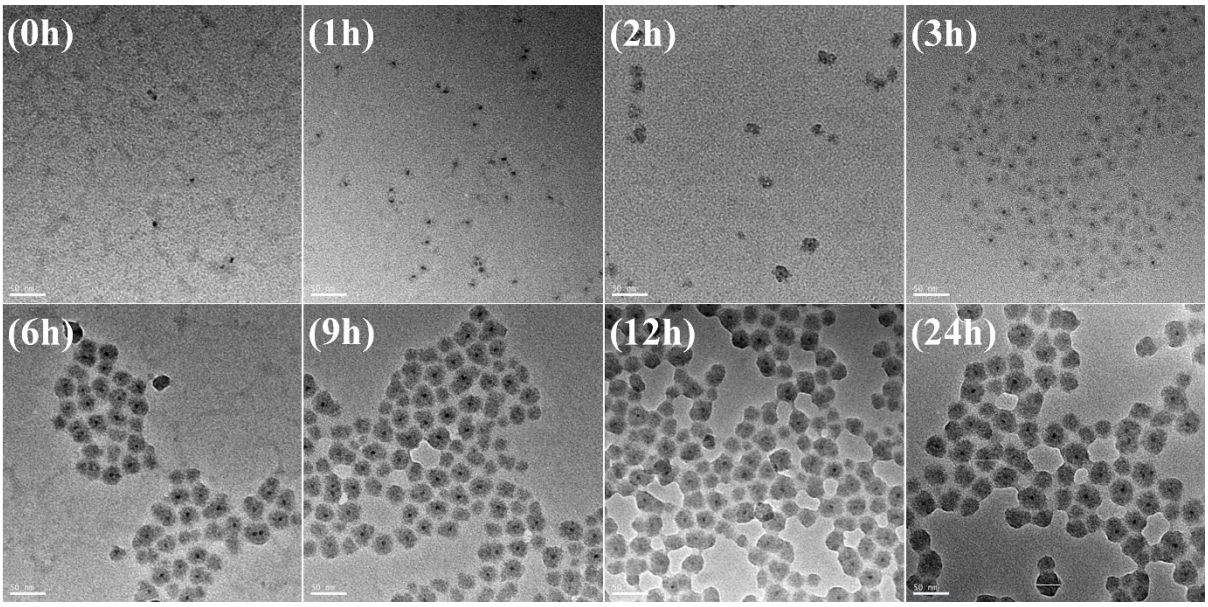

Fig. S4 TEM images for GQD@SiO_2 nanoparticle with different reaction times. (Scale bar: 50 nm)

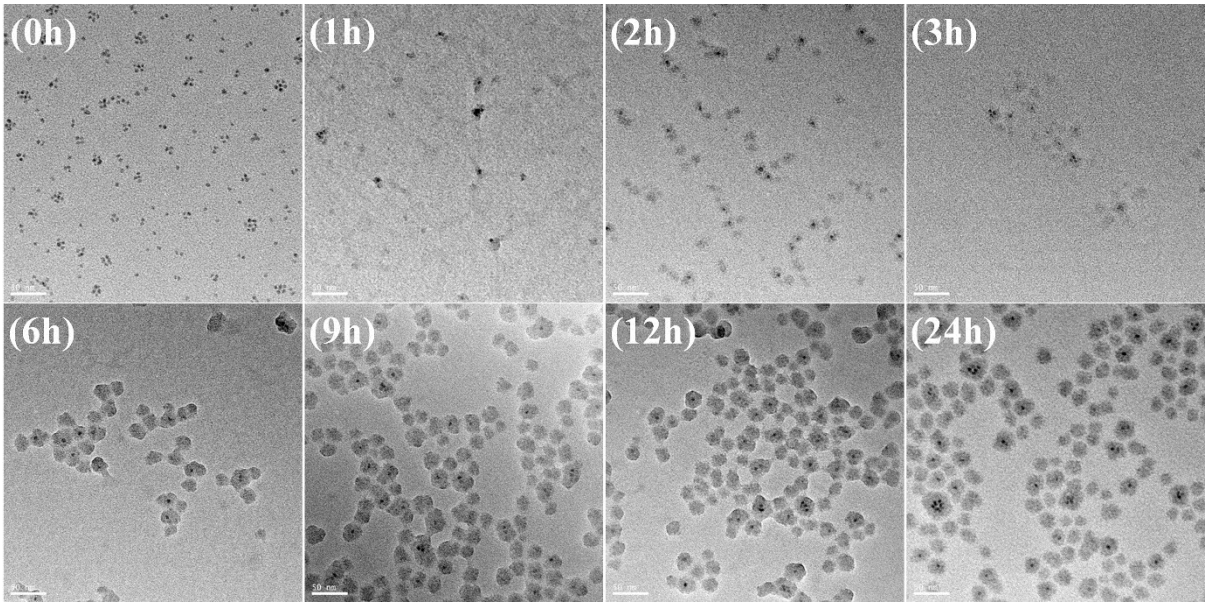

Fig. S5 TEM images for RQD@SiO_2 nanoparticle with different reaction times. (Scale bar: 50 nm)

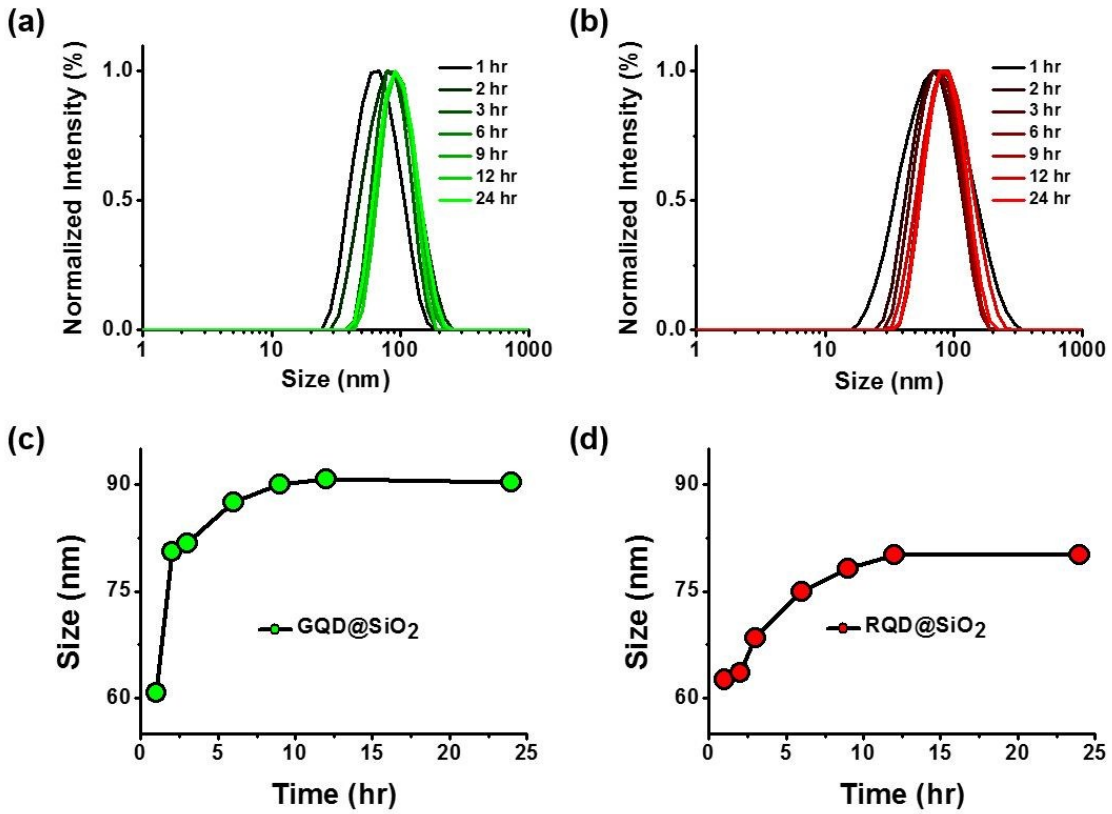

Fig. S6 Size distribution and average size of GQD@SiO_2 (a and c) and RQD@SiO_2 (b and d) in EtOH as function of the reaction time measured by DLS.

Table S2 Monitoring of size of QD@SiO_2 nanoparticles in ethanol solution as the reaction times by DLS.

Time (hr)		1	2	3	6	9	12	24
Mean size (nm)	GQD@SiO_2	60.8±0.9	80.6±1.0	81.8±0.3	87.5±1.0	90.0±0.3	90.7±0.9	90.3±0.6
	RQD@SiO_2	62.6±0.9	63.6±0.6	68.5±0.3	75.0±0.6	78.2±0.4	80.1±1.0	80.1±0.2

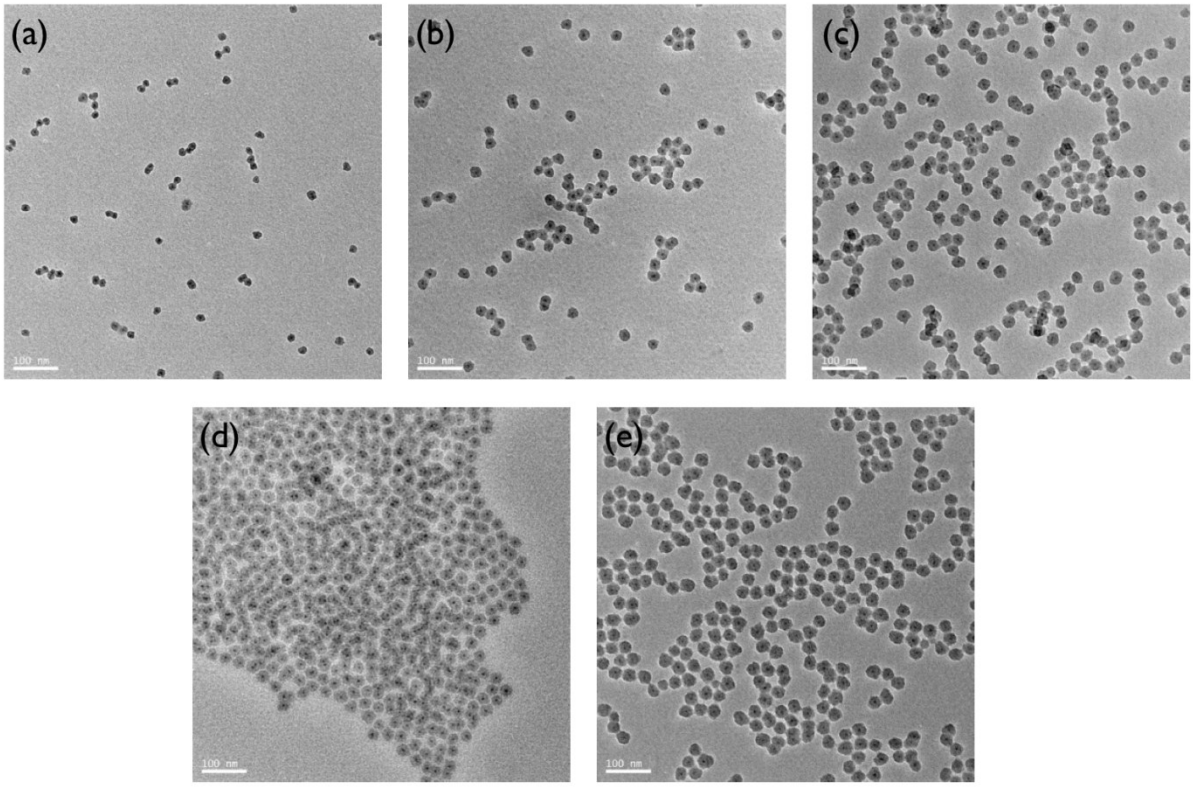

Fig. S7 Low magnification TEM images for gradient alloy GQD@SiO_2 nanoparticle with different shell thickness (a: 4.3, b: 7.0, c: 9.6, d: 11 and e: 14 nm for silica shell thickness). The thickness of silica shell was proportion to the increasing of TEOS concentration.

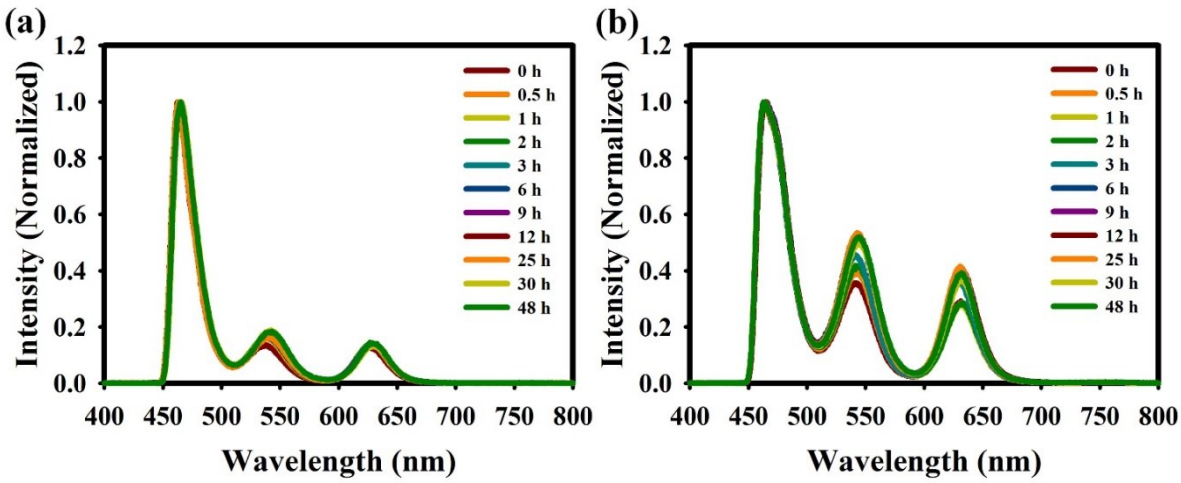

Fig. S8 PL spectra of QD@SiO_2-based WLED that operating power was for 0.5 W (a) and 1 W (b).