Electronic Supplementary Material (ESI) for Nanoscale.

Supplementary Information

Wafer-scale Patterning of High-resolution Quantum Dot Films with a Thickness over 10 μm for Improved Color Conversion

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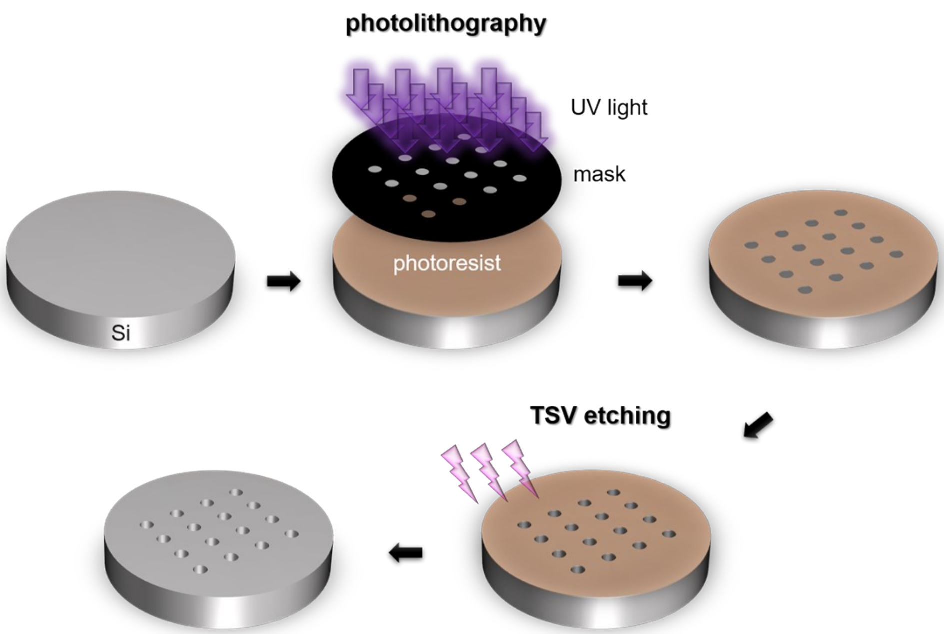

Fig. S1 Schematic of fabrication process of patterned intaglio Si masters.

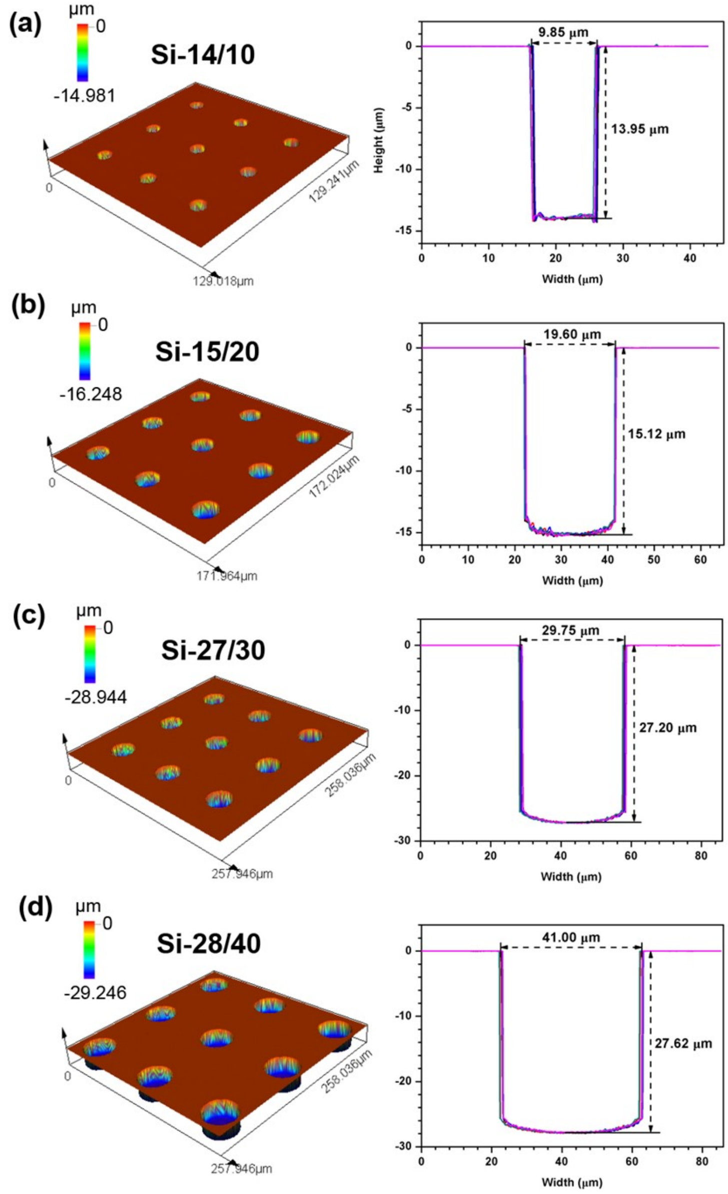

Fig. S2 3D LCM images and corresponding profile curves of fabricated (a) Si-14/10, (b) Si-15/20, (c) Si-27/30, and (d) Si-28/40 templates.

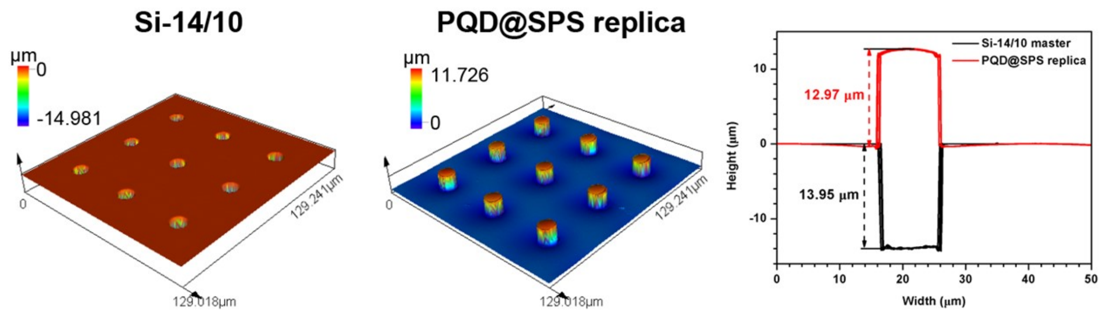

Fig. S3 3D LCM pictures of Si-14/10 template and resulted PQD@SPS replica (from left to right), and their corresponding profile curves collected in five random areas.

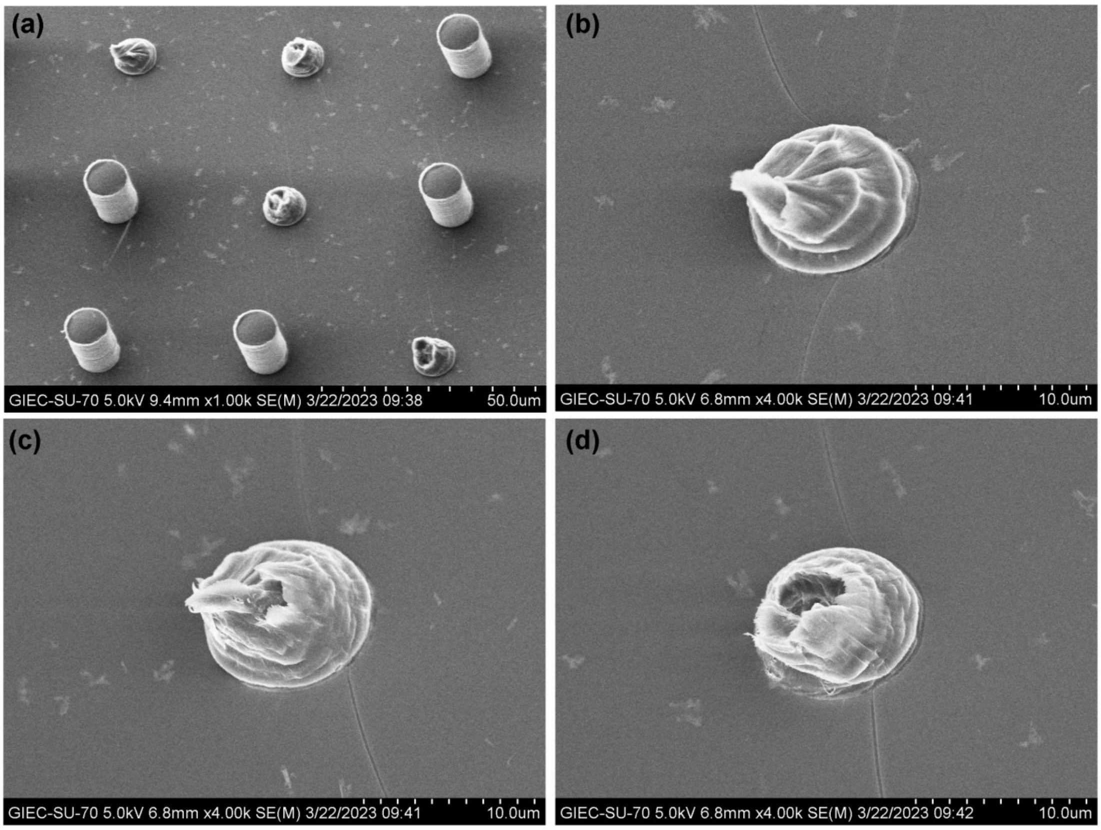

Fig. S4 (a) Magnified SEM images of the resulted PQD@PS replica fabricated by Si-14/10 template, and further magnified (b-d) SEM images of different irregular fracture surfaces.

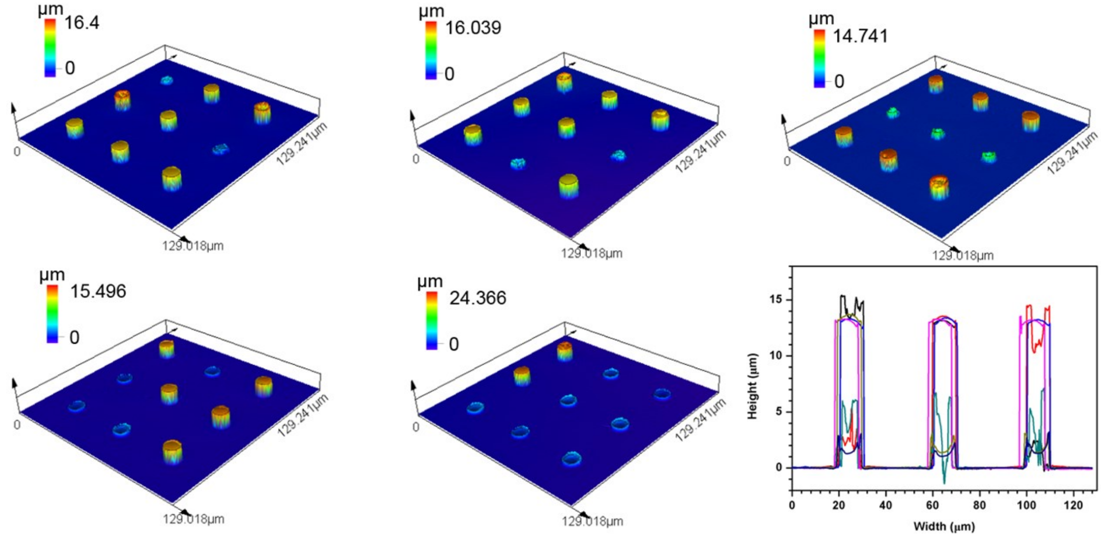

Fig. S5 3D LCM pictures of five random areas in resulted PQD@PS replica fabricated by Si-14/10 template, and their corresponding profile curves.

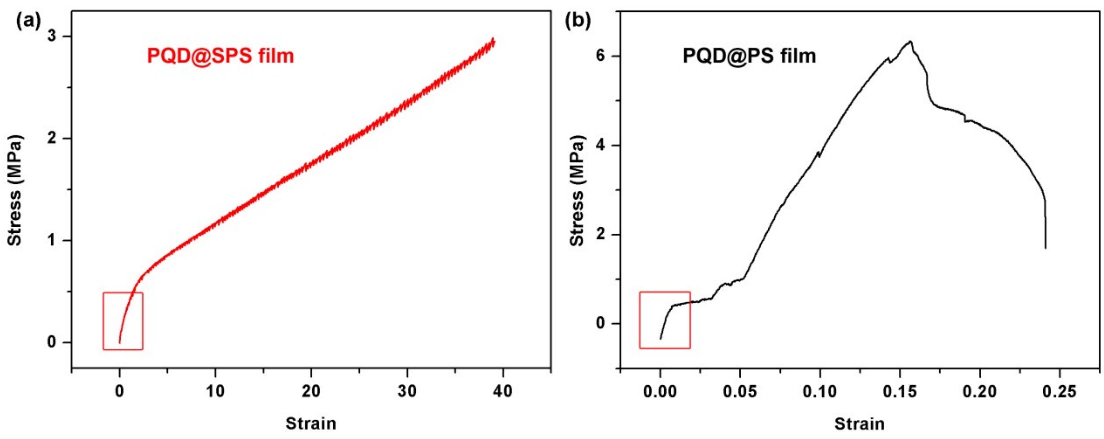

Fig. S6 Stress-strain curves of (a) PQD@SPS film and (b) PQD@PS film, the elastic regions are marked by the red boxes.

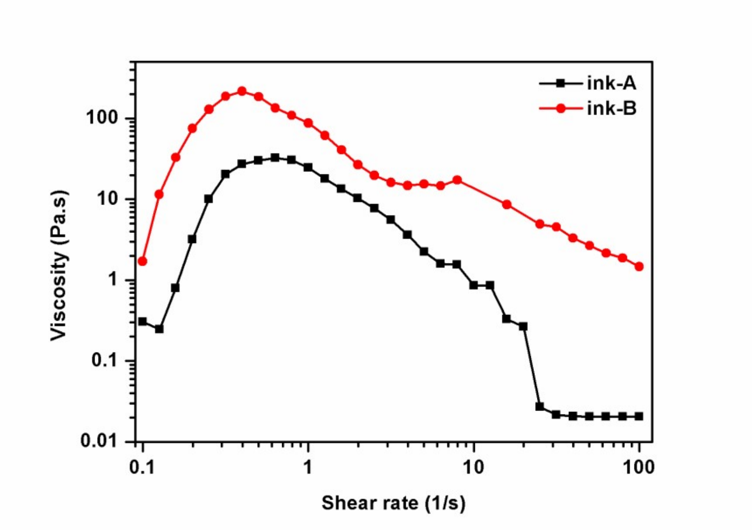

Fig. S7 The viscosity-shear rate curves of synthesized PQD@SPS ink-A and ink-B.

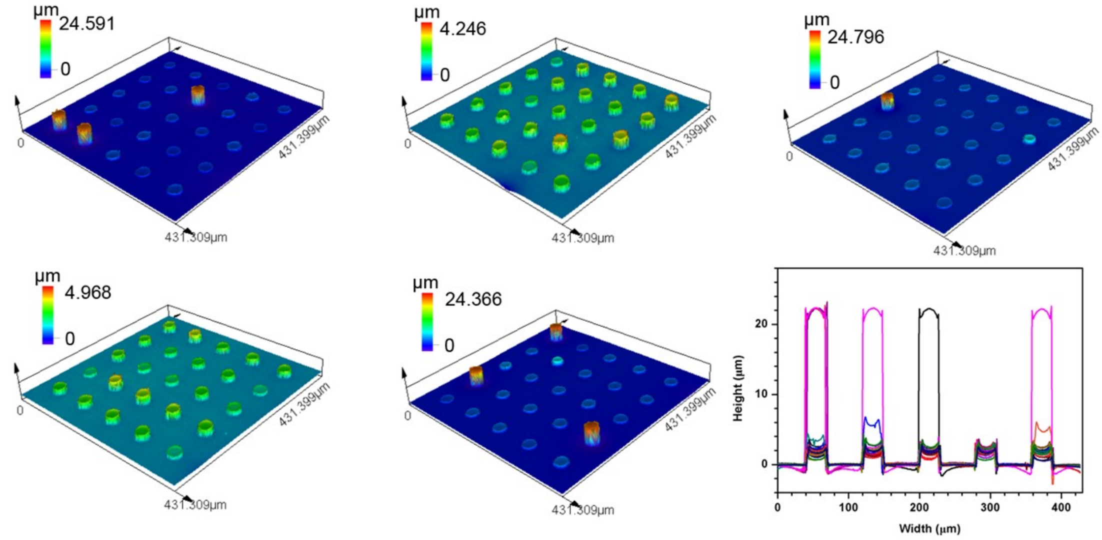

Fig. S8 3D LCM pictures of ink-B fabricated PQD@SPS pillar arrays in five random areas based on Si-27/30 template, and their corresponding profile curves.

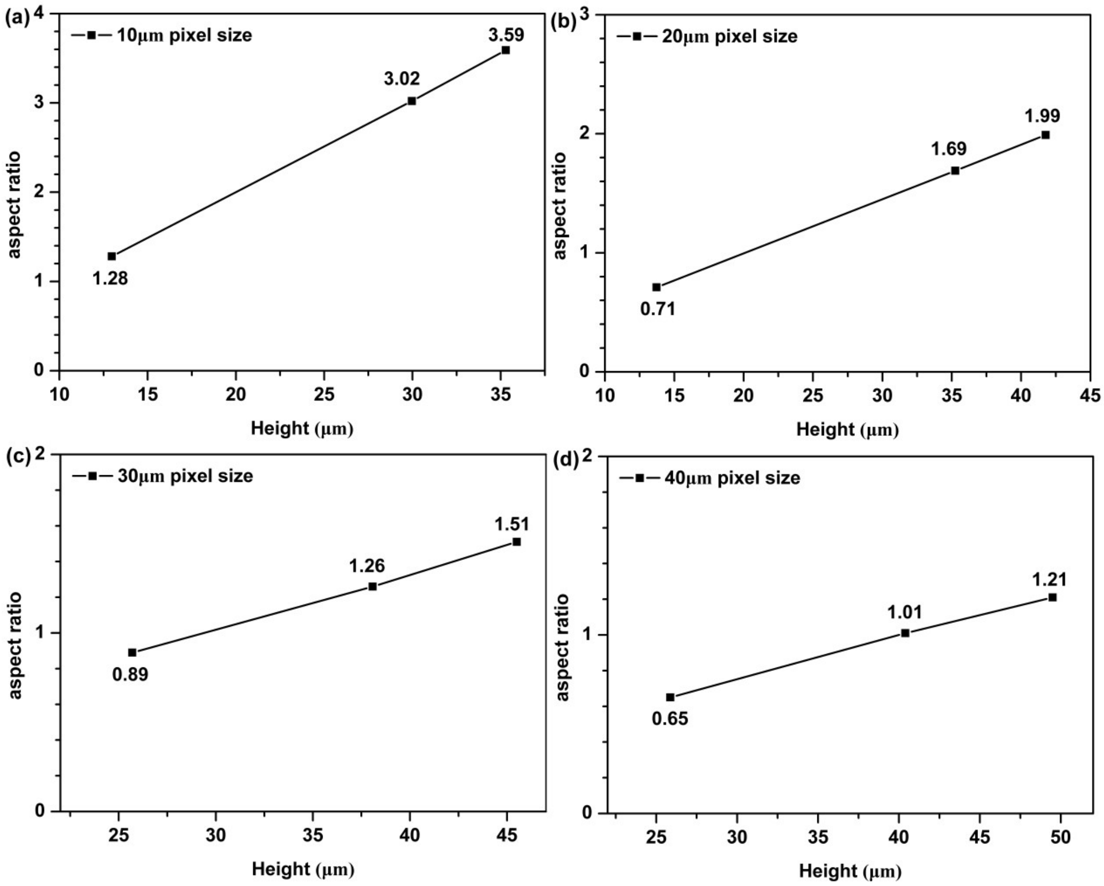

Fig. S9 Aspect ratios of fabricated PQD@SPS replicas with an average pixel size of (a) 10 μm, (b) 20 μm, (c) 30 μm, and (d) 40 μm.

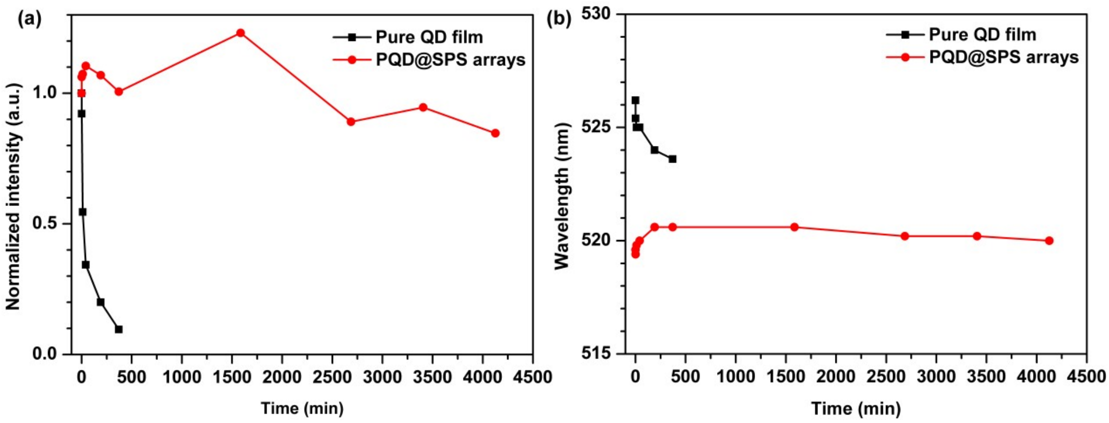

Fig. S10 (a) Relative PL intensity and (b) emission wavelength of the samples against water treatment.

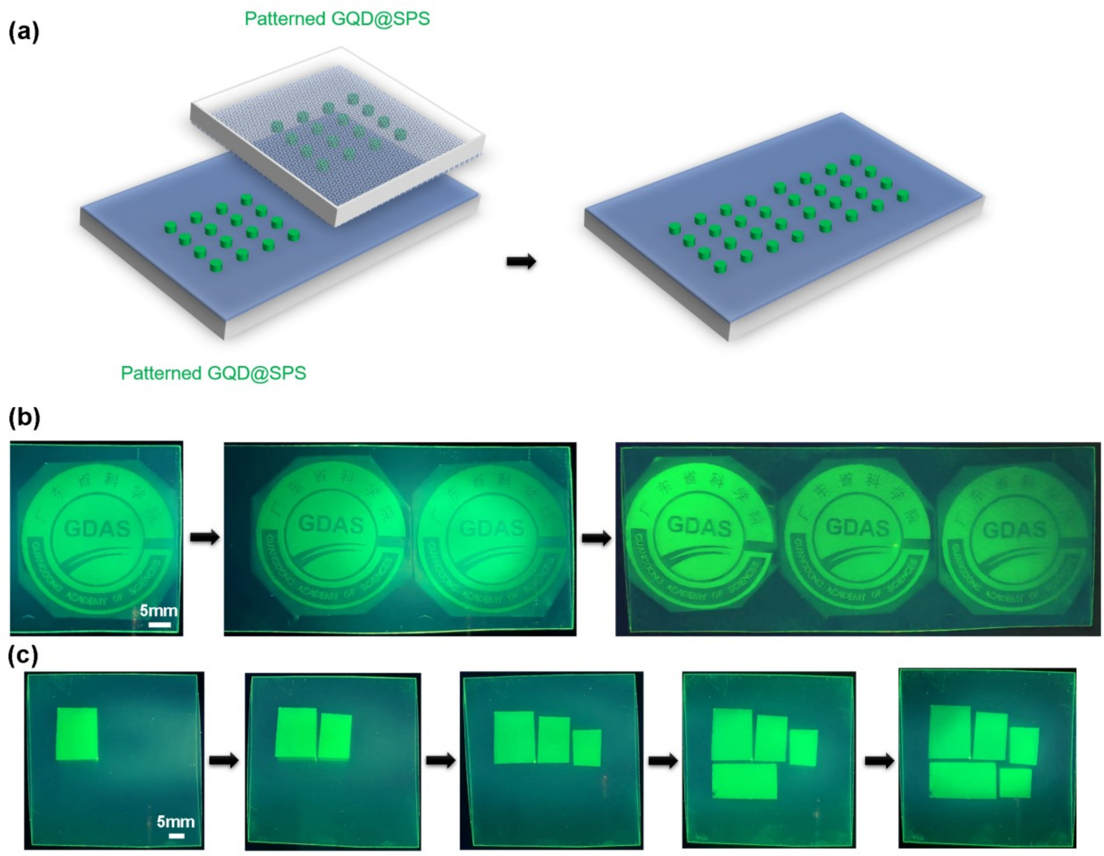

Fig. S11 (a) Schematic illustration of sequentially integrating two etched green-emitting GQD@SPS pillars side by side to one clean substrate. (b) PL emission images of fabricated Guangdong Academy of Sciences macroscopic logo on a large substrate during the integration process. (c) PL emission images of fabricated patterns with different sizes and shapes on a same substrate during the integration process.

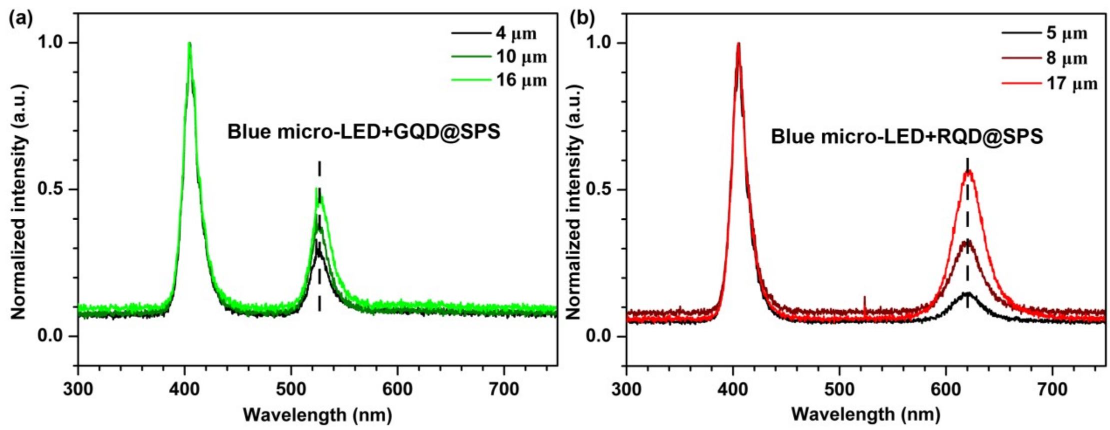

Fig. S12 PL emission spectra of (a) GQD@SPS and (a) RQD@SPS films with different thicknesses on top of the blue micro-LED device.

Table S1 Thickness comparison of recently reported QD patterns fabricated by various patterning methods.

references	Patterning method	Thickness of QD patterns
This work	RM-PE-TP technique	19.74 μm
1	Direct in situ photolithography	10.4 μm
2	Photo-patterning method based on a light-driven ligand crosslinker	4.1 μm
3	Photolithography of QD/siloxane ink containing secondary thiol monomer	10 μm
4	Direct patterning via thermally activated ligand chemistry	13.2 μm
5	Cavity filling of prepatterned quartz substrates	7 μm
6	Inkjet Printing into prepatterned banks	9.8 μm

Table S2 The detailed linearly fitting results of the stress-strain curves of PQD@SPS and PQD@PS films.

PQD@SPS film			
Equation	y = a + b*x		
Weight	No Weighting		
Residual Sum of Squares	0.00123		
Adj. R-Square	0.99358		
		Value	Standard Error
stress	Intercept	$-6.06e^{-4}$	$4.55e^{-4}$
stress	Slope	0.93167	0.00602

PQD@PS film			
Equation	y = a + b*x		
Weight	No Weighting		
Residual Sum of Squares	0.00234		
Adj. R-Square	0.99493		
		Value	Standard Error
stress	Intercept	-0.32153	0.00458
stress	Slope	130.80527	2.03652

Table S3 Average width shrinkages of pillars in PQD@SPS replicas and cavities in corresponding Si masters.

Width [μm]	**Si-28/40**	**Si-27/30**	**Si-15/20**	**Si-14/10**
Si master (W_1)	41.00	29.75	19.60	9.85
PQD@SPS replica (W_2)	40.10	28.77	19.40	10.11
Shrinkage (W_1-W_2/W_1)	2.2%	3.3%	1.0%	-2.6%

References

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