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Supporting information

Towards full-colour tunable photoluminescence of monolayer MoS_2/carbon quantum dots ultrathin films

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§ 1 TEM of CQDs

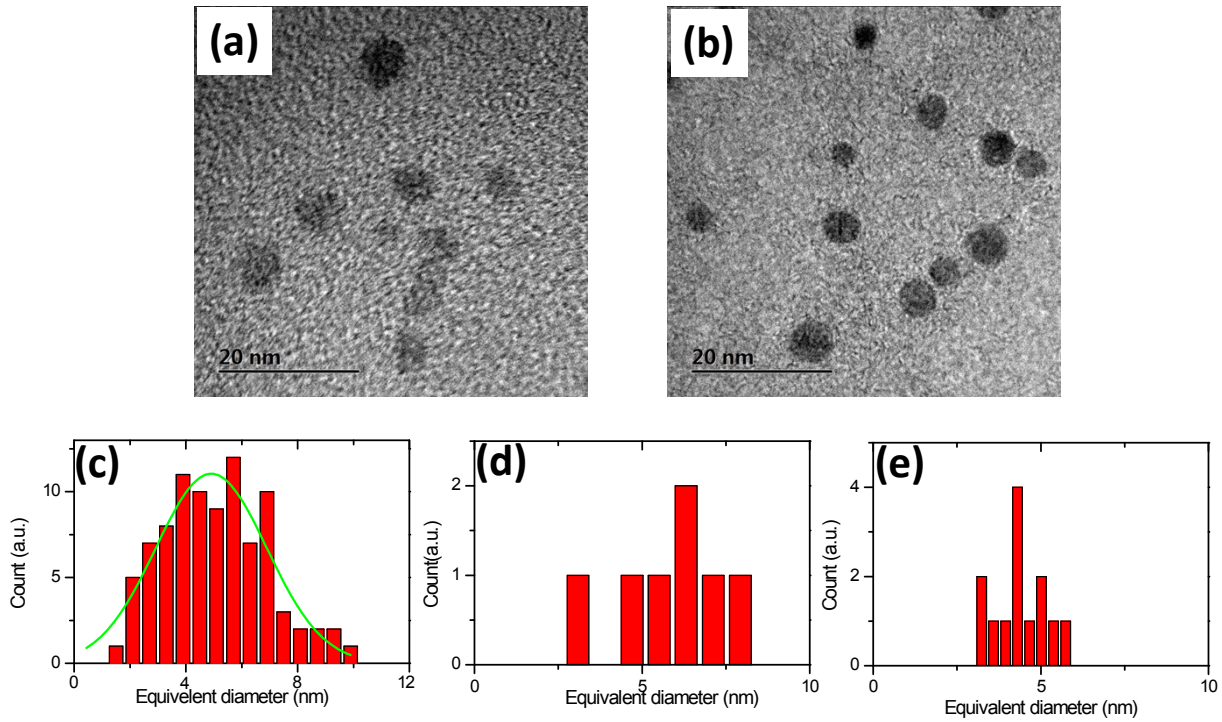

Fig.S1 TEM of YCQDS(a)and BCQDs(b). (c)-(e): Equivalent diameters of RCQDs, YCQDs and BCQDs respectively.

§ 2 AFM image of RCQDs

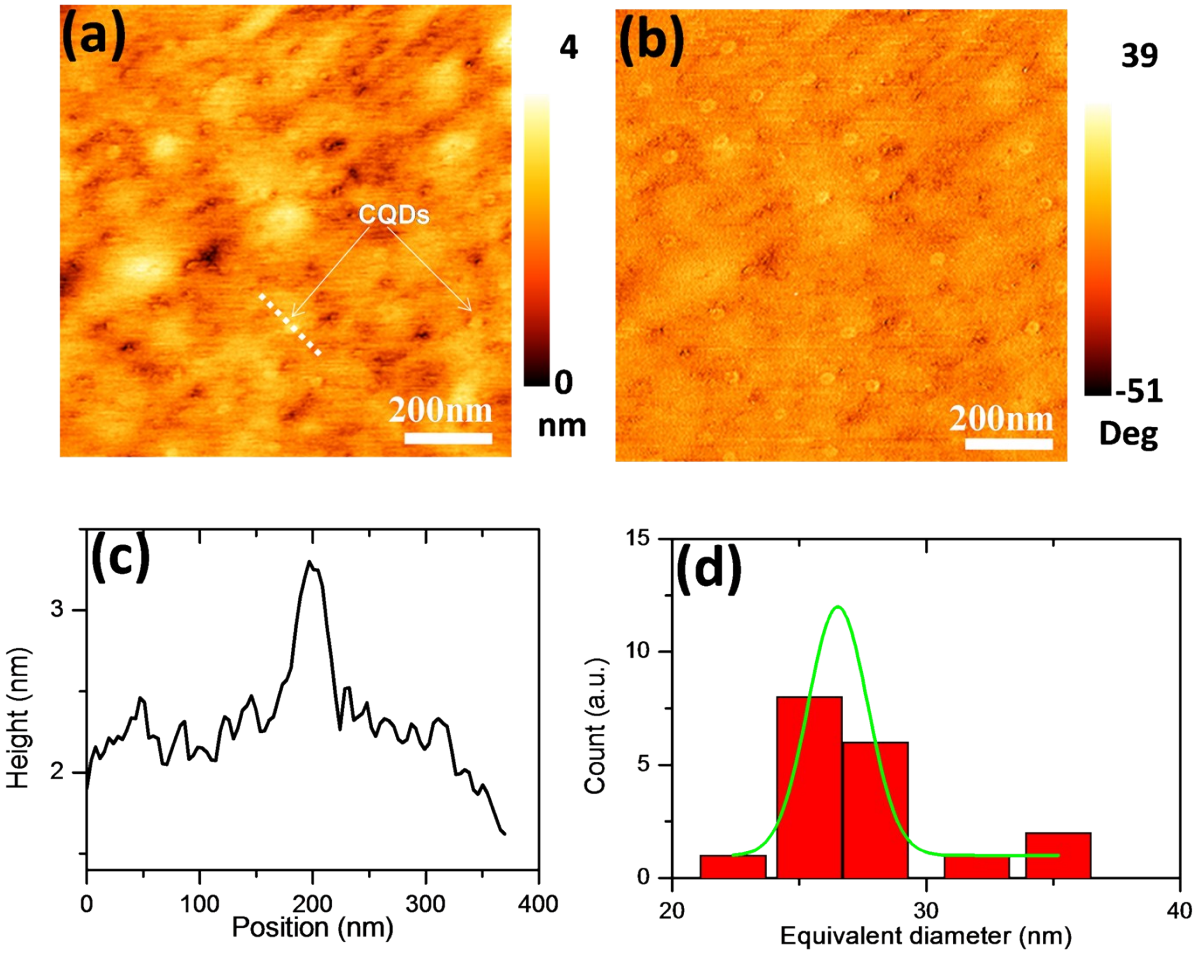

Fig.S2 (a) AFM topographic image and (b)Phase image of RCQDs on glass; (c) Height profiles along marked line in Fig.S2(a); (d) Equivalent diameter distribution of RCQDs in (a).

§ 3 XRD and FTIR analysis

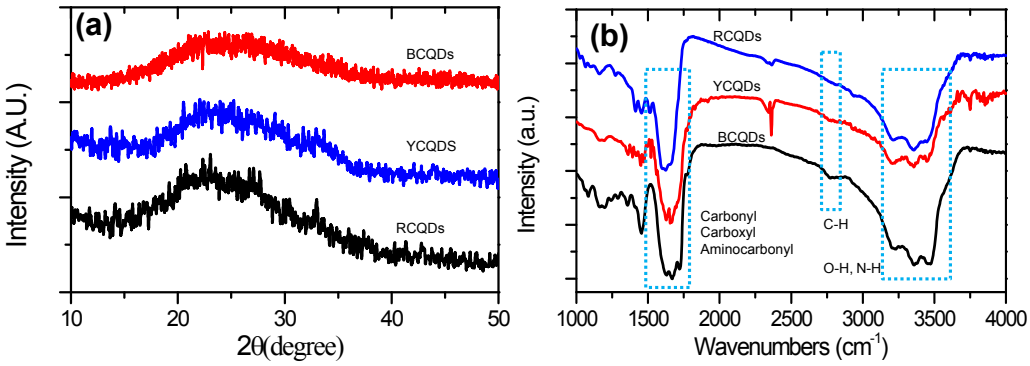

Fig.S3 XRD(a) and FTIR(b) of RCQDs, YCQDs and BCQDs.

Table S1 Tentative peak assignment of FTIR spectra of RCQDS, YCQDs and BCQDs

Possible groups	Peak position	BCQDs	YCQDs	RCQDs
OH（Stretching）	3444	Strong	Strong	Strong
NH	3367	Strong	Strong	Strong
NH	3201	Strong	Strong	Strong
CH	2773	Weak	--	--
C=O in carboxyl	1728	Strong	Weak	--
CONH	1670	Strong	Strong	Strong
C=O in carbonyl	1624	Strong	Strong	Strong

§ 4 PL intensity comparison of different CQDs in red light

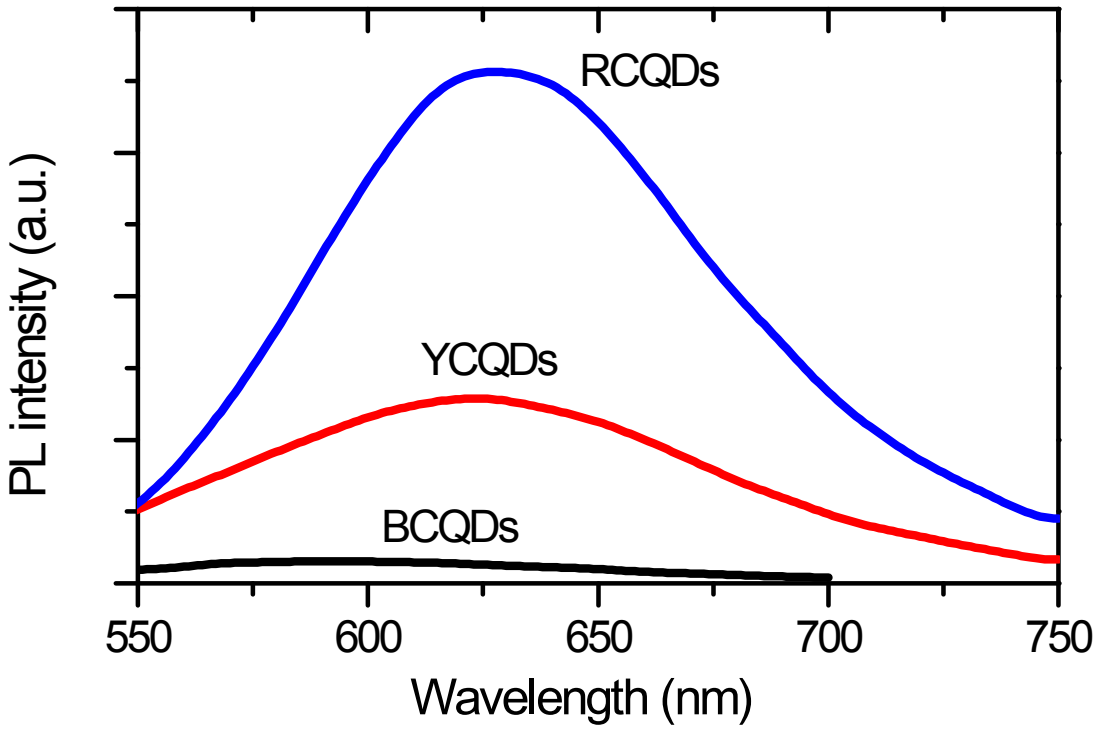

Fig. S4 comparison of PL intensity of different CQDs excited with 532nm.

§ 5 Optical images of RCQDs on 1L-MoS_2 and AFM image of pristine 1L-MoS_2.

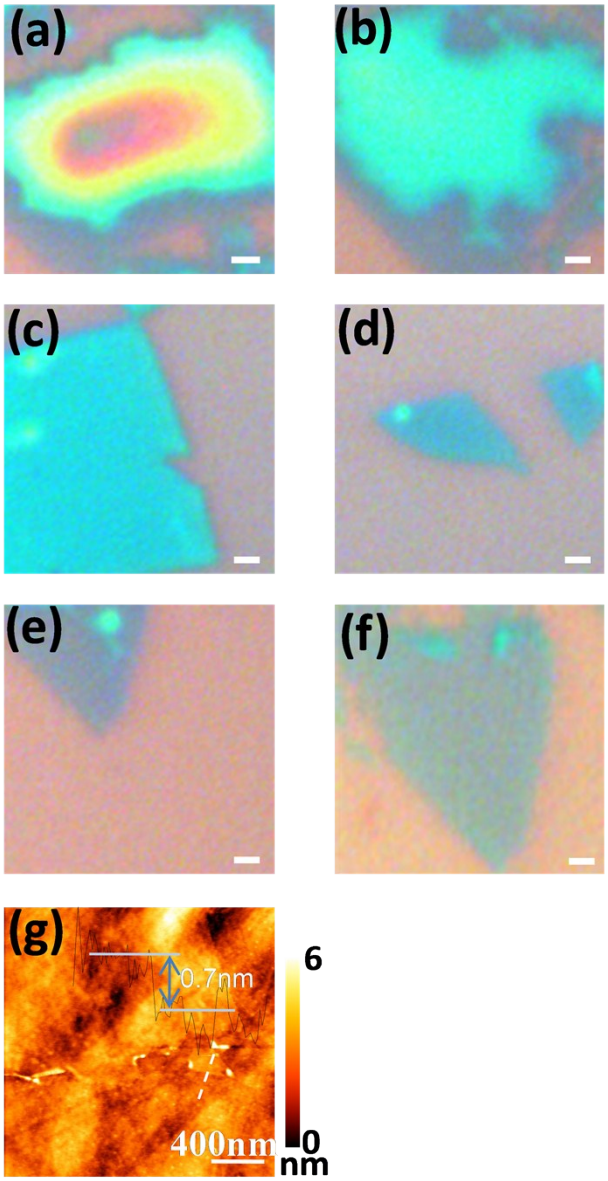

Fig. S5, Optical images of 1L-MoS_2 coated with different film thickness of RCQDS. (a), RT1; (b), RT2; (c) RT3; (d)RT4 (e), RT5. (f) an optical image of a 1L-MoS_2 without CQDs is shown for comparison; (g), AFM topographic image of a different pristine 1L-MoS_2. Note the scale bars in (a)-(e) are 5μm while is 3μm in (f). In (g), a height profile is show along the marked dashed line in S5(g).

§ 6 Line profile of thinnest CQDs on 1L-MoS_2

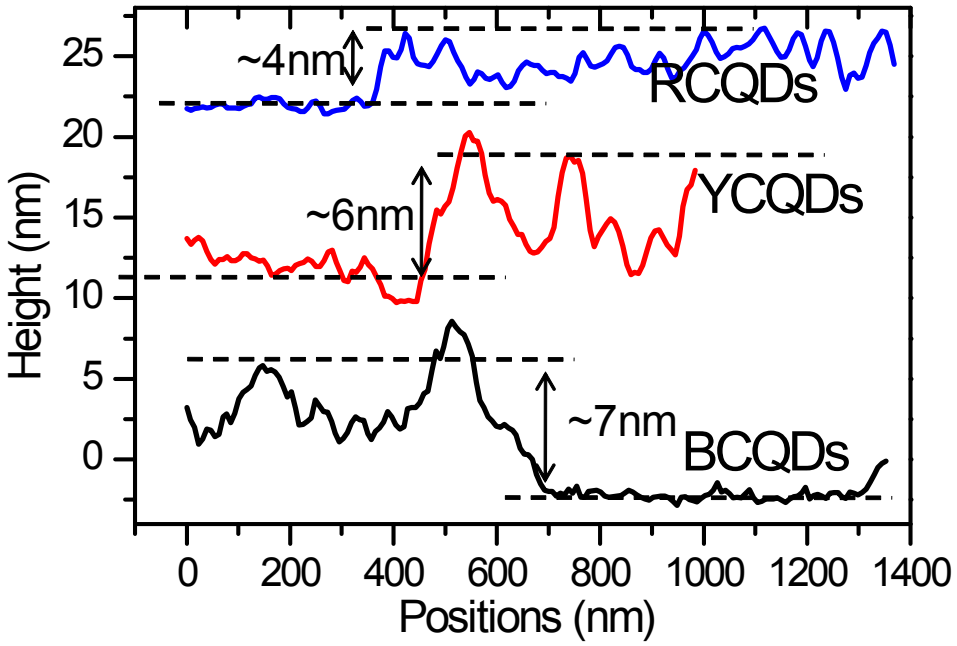

Fig.S6, Line profile of thinnest CQDs on 1L-MoS_2

§ 7 PL of 1L-MoS_2 coated with different film thickness of CQDs

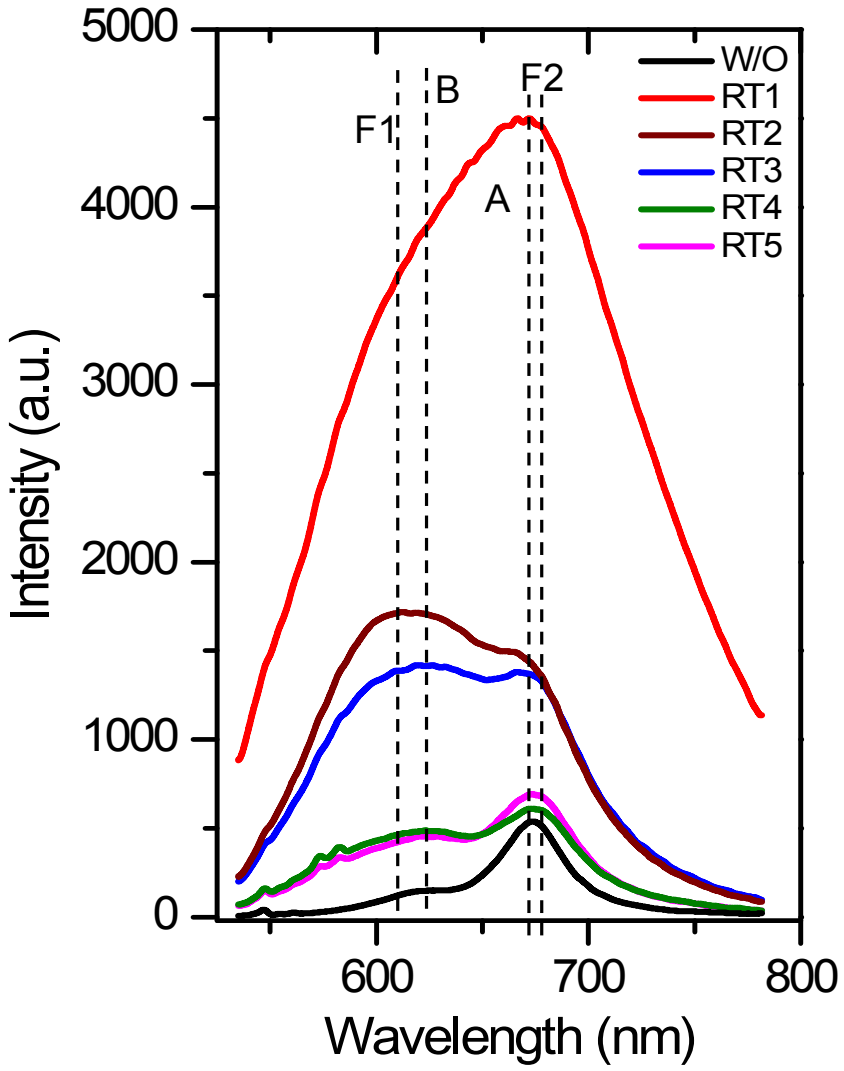

Fig. S7 Micro-PL spectra of 1L-MoS_2 coated with different film thickness of RCQDs. Note the excitation wavelength is 532nm, RT1-RT5 refer to flakes in Fig.S5. PL spectra of pristine 1L-MoS_2 (W/O) are also shown for comparison.

§ 8 Fitting of PL of 1L-MoS_2 coated with different film thickness of CQDs

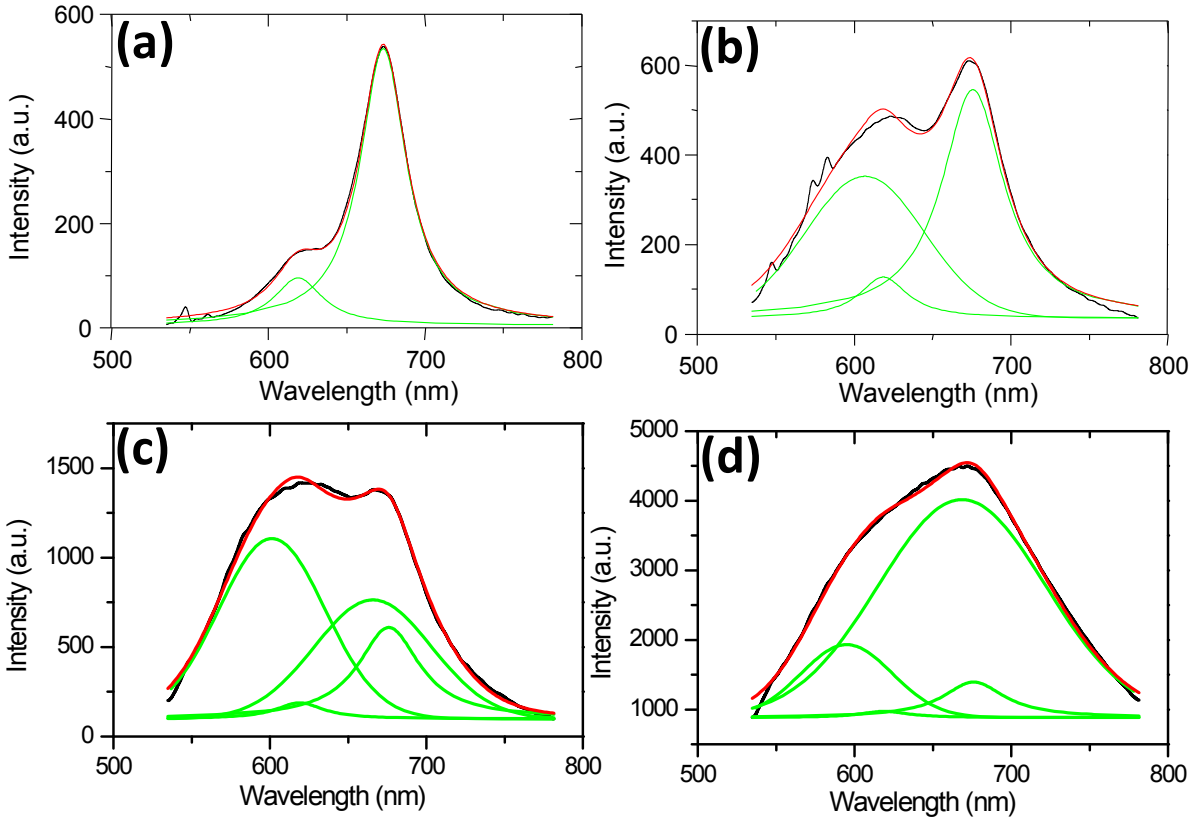

Fig. S8 Fitting of PL spectra of (a) 1L-MoS_2, (b) 1L-MoS_2/RCQDs(4nm), (c) 1L-MoS_2/RCQDs(14nm), (d)1L-MoS_2/RCQDs(30nm)

§ 9 Characterization of GOQDs on 1L-MoS_2

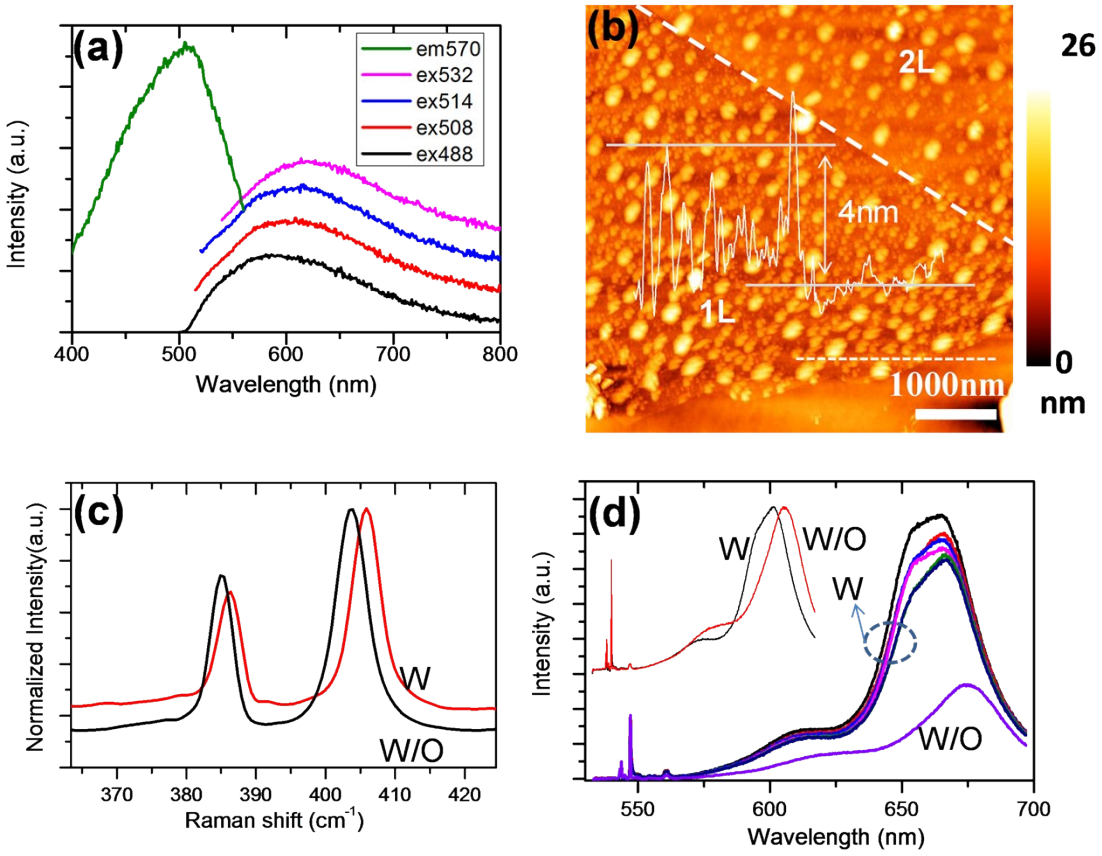

Fig. S9 (a) excitation and emission of GOQDs; (b) AFM topographic image of GOQDs on 1L-MoS_2 flake; (c), Raman spectrum of 1L-MoS_2/GOQDs sample; (d), PL and normalized PL(inset) of 1L-MoS_2/GOQDs sample in (b). A height profile along dotted line in (b) is shown as insets of (b). The height of GOQD film is 4nm. Note in (c) and (d), 1L-MoS_2 samples without GOQDs coated are marked as "W/O", while with GOQDs are marked as "W". The excitation laser wavelength of Raman(S9(c))and PL(S9(d)) is 532nm.

§ 10 PL spectra CQDs on 1L MoS_2 with 325nm excitation

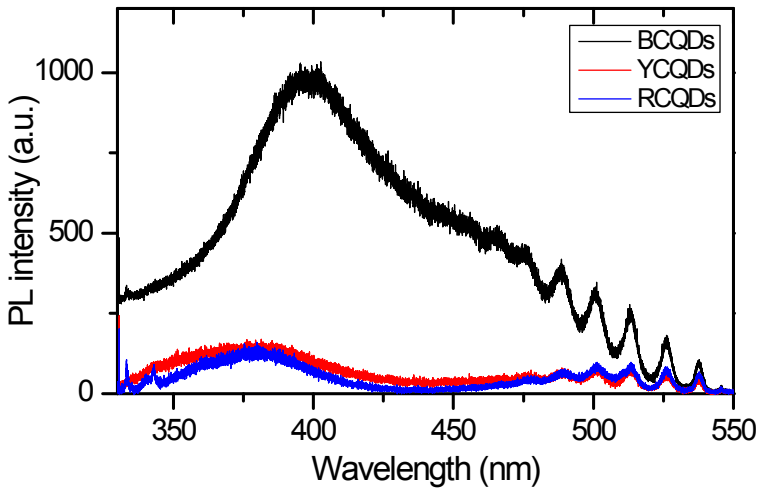

Fig. S10 PL spectra of different 1L-MoS_2/CQDs samples excited with 325nm laser.