Electronic Supplementary Material (ESI) for Journal of Materials Chemistry B.
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Electronic Supplementary Materials

MoS_2 quantum dots as a unique fluorescent "turn-off-on" probe for simple and rapid determination of adenosine triphosphate

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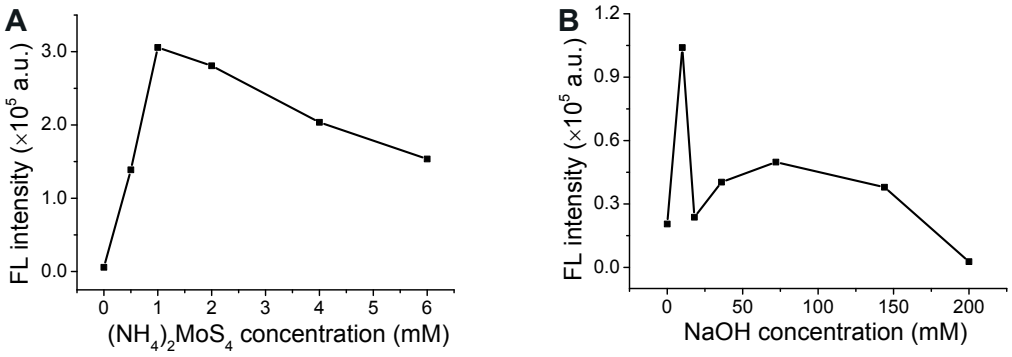

Figure S1. The fluorescence intensity of prepared MoS_2 QDs at 506 nm with excitation at 400 nm under different (A) $(NH_4)_2MoS_4$) concentration (0-6 mM) and (B) NaOH concentration (0-200 mM).

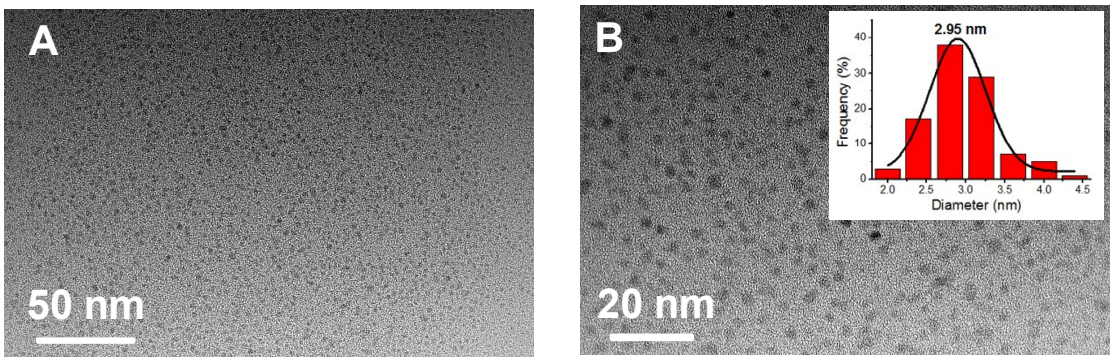

Figure S2. HRTEM images of MoS_2 QDs at a scale bar of (A) 50 nm and (B) 20 nm. Inset of B shows the particle size distributions of MoS_2 QDs.

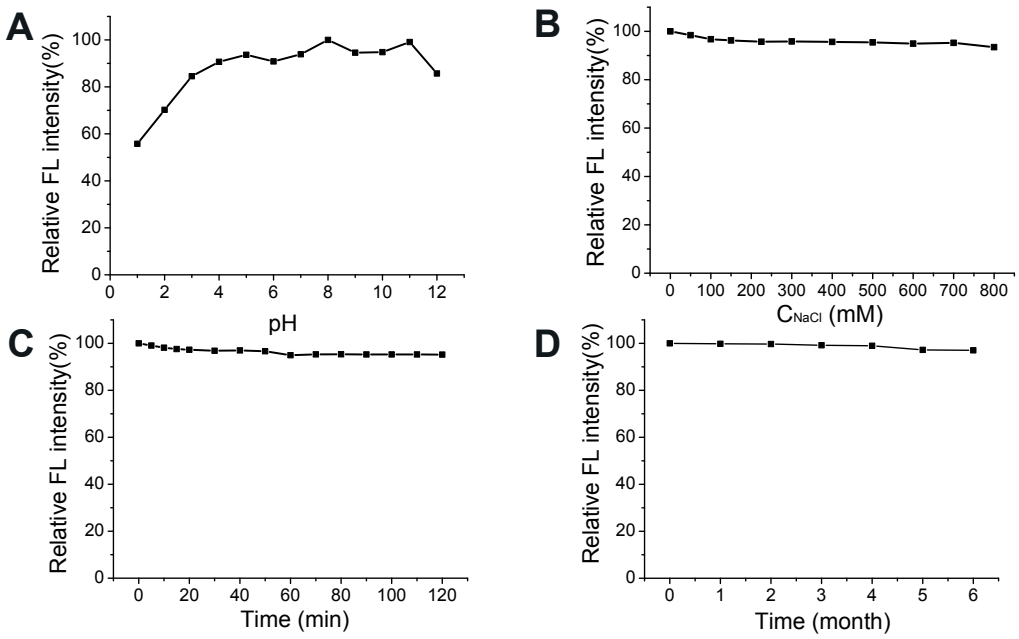

Figure S3. The stability of MoS_2 QDs under (A) different pH range (1-12), (B) different NaCl concentration (0-800 μM)，(C) continuous UV light illumination (0-2 h), and (D) different storage time (0-6 month).

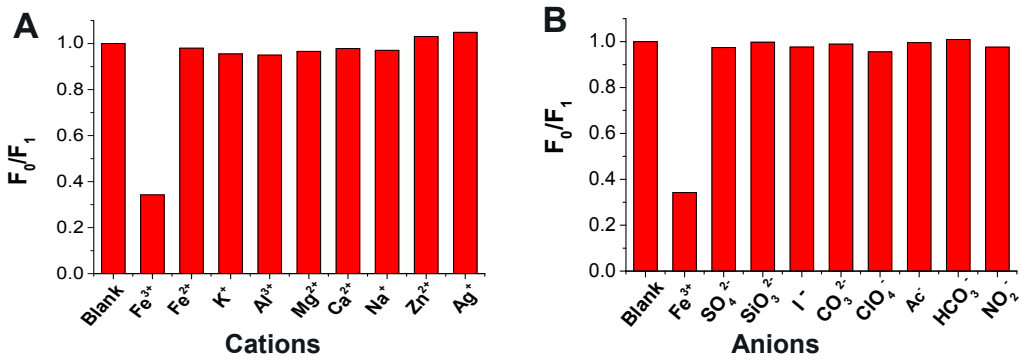

Figure S4. The quenching effect of different (A) cations and (B) anions toward MoS_2 QDs. The concentrations of Fe^{3+} was 0.35 mM and other cations and anions were all 0.5 mM. The fluorescence intensities of MoS_2 QDs in the absence or presence of different interfering substances are denoted by F_1 and F_0.

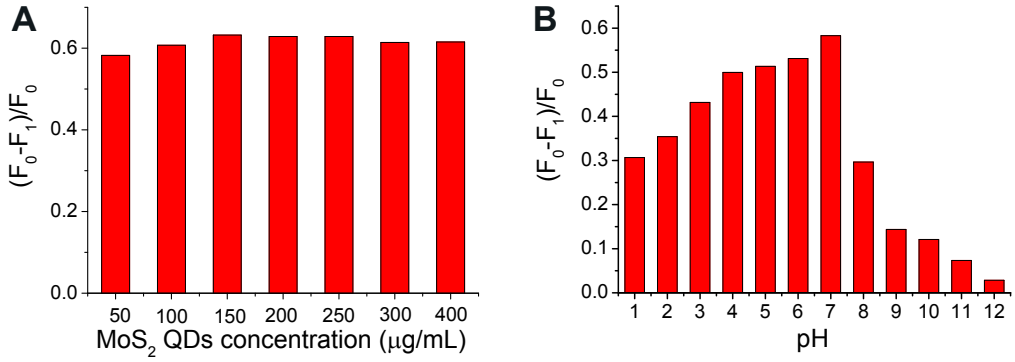

Figure S5. The effect of (A) MoS_2 QDs concentration and (B) pH on the fluorescence quenching of MoS_2 QDs in the presence of 0.35 mM Fe^{3+}. The fluorescence intensities of MoS_2 QDs in the absence or presence of Fe^{3+} are denoted by F_1 and F_0.

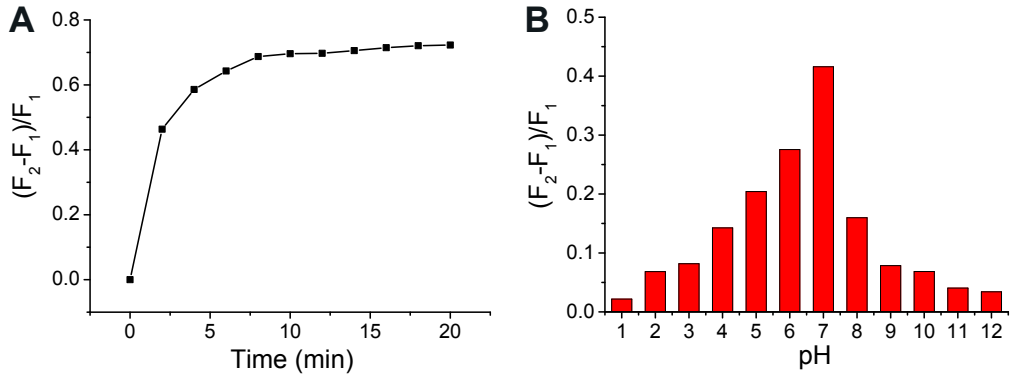

Figure S6. The influence of (A) reaction time and (B) reaction pH on the fluorescence restoration of MoS_2 QDs/Fe^{3+} system by the addition of ATP. The fluorescence intensities of MoS_2 QDs/Fe^{3+} in the absence or presence of (A) 90 μM ATP, and (B) 30 μM ATP are denoted by F_2 and F_1.

Table S1. Comparison of performance of the new method with other reported fluorescent methods for detection of ATP.

Method	Probe	Detection limit (μM)	Linear range	Detection condition	Ref.
FL	GO/MB	0.5	10 μM to 3 mM	RT for 30 min	21
FL	CdTe QDs	2.07	5-50 μM	RT for 20 min	22
FL	NR	0.1	0.1-10 μM	/	23
FL	SNC	0.033	0.1-10 μM	RT for30 min	24
FL	G-Q	0.14	0.5-50 μM	(1) 20°C for 70 min (2) 40°C for 5 min	25
FL	Ag@SiO_2	8	0-500 μM	45°C for 30 min	26
FL	SNC	0.0916	1.0-7.0μM	(1) RT for 2 h (2) 4°C for 30 min	27
FL	GNC	28	50-100 μM	RT for 15 min	28
FL	MoS_2 QDs	5 (lowest detectable concentration)	0-140 μM	RT for 10 min	This work

*Abbreviation: Graphene Oxide (GO), Naphthalimide-rhodaminecompound (NR), Silver nanoclusters (SNC), G-quadruplex (G-Q), gold nanoclusters (GNC), carbon nanoparticles (CNP)

Table S2. The maximum fluorescence excitation and emission wavelength as well as sensing models of other reported MoS_2 QDs.

Sensing model	Excitation wavelength (nm)	Emission wavelength (nm)	Ref.
Turn-on	400	480	1
Turn-off/Turn-on	360	428	2
Turn-off-on	315	412	3
Turn-off-on	360	440	4
Turn-off	375	450	5
Turn-off	267	380	6
Turn-off	315	412	7
/	370	461	8
Turn-on	330	410	9
Turn-off	340	425	10
Turn-off	340	423	11
Turn-off	308	402	12
Turn-off-on	330	400	13
Turn-off	360	454	14
/	460	530	15
/	560	594	16
/	440	510	17
Turn-on	310	418	18
/	340	410	19

Turn-on	300	410	20
Turn-off-on	400	506	This work

Table S3. Effect of co-existing substances on the FL intensity of MoS_2 QDs/Fe^{3+} with 100 μM ATP.

Coexisting substances	Concentration (μM)	Change of the fluorescence intensity (%)	Coexisting substances	Concentration (μM)	Change of the fluorescence intensity (%)
K^+	500	3.9	Asparagine	100	2.5
Na^+	500	1.9	Glutamine	100	2.4
Zn^{2+}	500	4.0	Isoleucine	100	1.8
Ca^{2+}	500	2.8	Alanine	100	1.5
Al^{3+}	500	1.9	Proline	100	1.0
Ag^+	500	3.8	Serine	100	3.1
Mg^{2+}	500	4.6	Aspartic acid	100	2.5
SO_4^{2-}	500	3.5	Leucine	100	2.3
SiO_3^{2-}	500	3.7	Tyrosine	100	1.0
CO_3^{2-}	500	4.0	Methionine	100	1.3
ClO_4^-	500	4.8	Histidine	100	0.9
HCO_3^-	500	3.4	Cystine	100	2.1
NO_2^-	500	3.5	Valine	100	1.8
Ac^-	500	4.5	Tyrosine	100	2.4
AA	500	1.0	Phenylalanine	100	1.5
GSH	500	3.5	Lysine	100	3.7
Glucose	500	3.0	Glutamic acid	100	1.8
H_2O_2	500	2.5	Threonine	100	2.0
Arginine	100	1.9	Glycine	100	3.5

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