Electronic Supplementary Material (ESI) for Analytical Methods.

MoS_2 Quantum-dots as Label-free Fluorescent Nanoprobe for Highly Selective Detection of Methyl Parathion Pesticide

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The quantum yield(QY) of MoS_2 QDs is determined relative to reference quinine sulfate of known QY (0.546). The QY for the MoS2 QDs sample can be calculated as[1]

$$QY = QY_{ref}\frac{\eta^2 \quad I \quad A_{ref}}{\eta_{ref}^2 I_{ref} \quad A}$$

where QY_{ref} is the quantum yield of the reference compound, η and η_{ref} are the refractive index of the sample and reference solution, I and I_{ref} are the integrated intensities (areas) of sample and standard spectra, and A and A_{ref} represent the absorbance of sample and standard.

Table S1. Quantum yield of MoS2 QDs

sample	Integrated Emission Intensity	Absorbance at 324 nm	Refractive Index of Solvent (η)	Quantum Yield
Quinine sulfate	29180.25	0.01412	1.33	0.546[2]
MoS_2 QDs	1385.1	0.01437	1.33	0.025

Figure S1

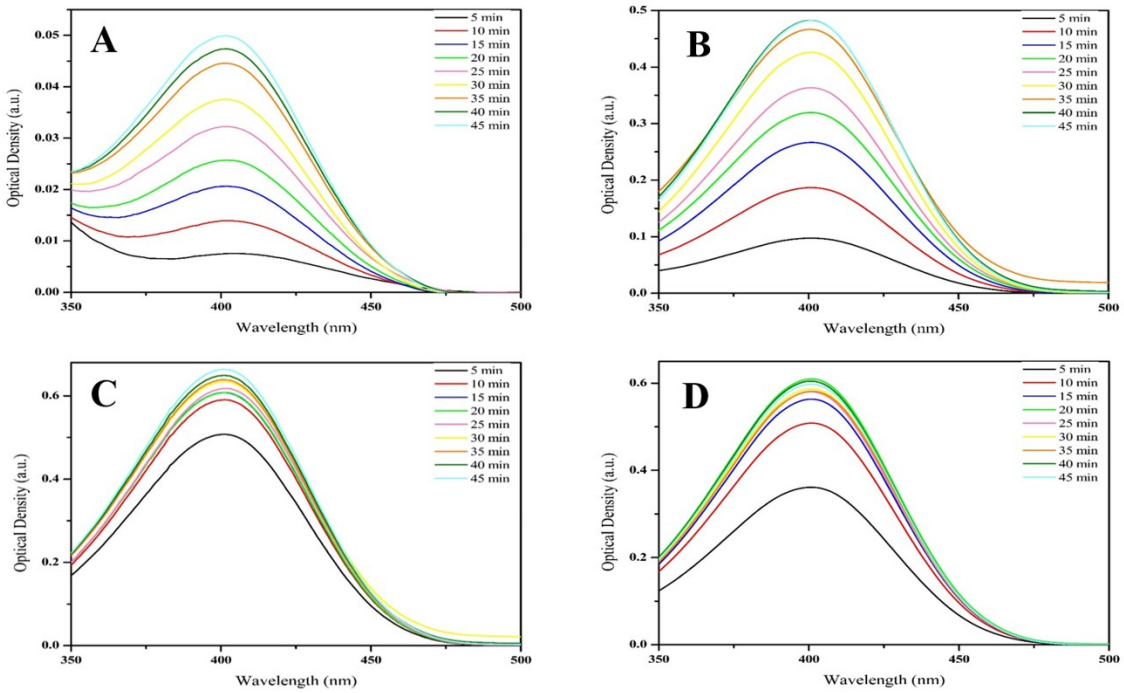

Figure S1 UV-Vis spectra of hydrolyzed MP (5 µg.mL^{-1}) at time intervals of 5 min at A) 25˚C B) 50˚C C) 75˚C D) 95˚C.

Figure S2

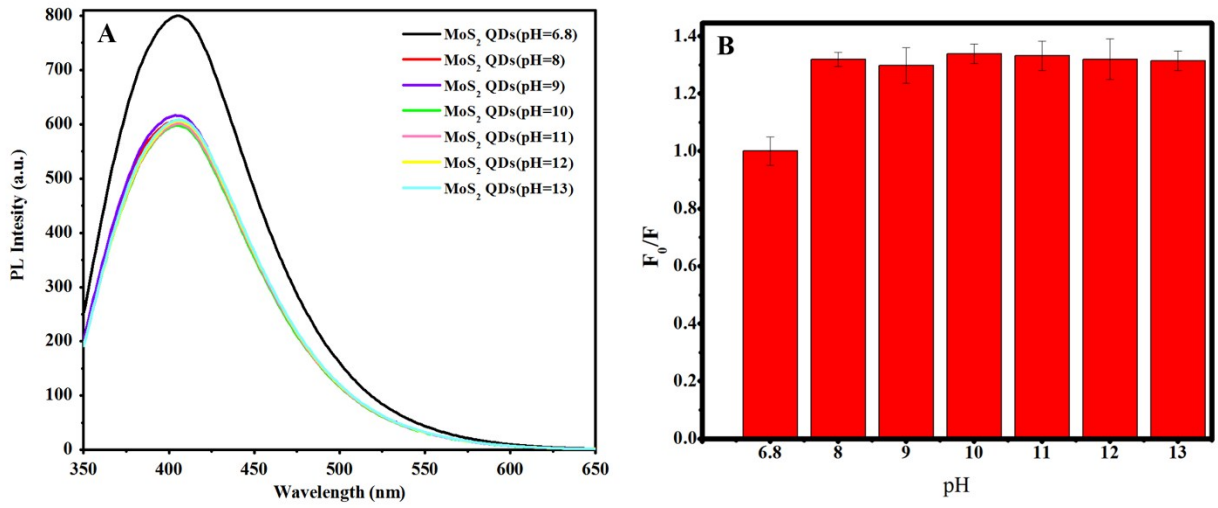

Figure S2 A) PL spectra of MoS_2 QDs in different pH and B) corresponding ratio of Original MoS_2 QDs PL intensity to MoS_2 QDs PL intensities at different pHs (415 nm). A decrease in PL intensities of MoS_2 QDs is observed with an increase pH. However, MoS_2 QDs are stable with Variation of pH in the range of 8 to 13.

Figure S3

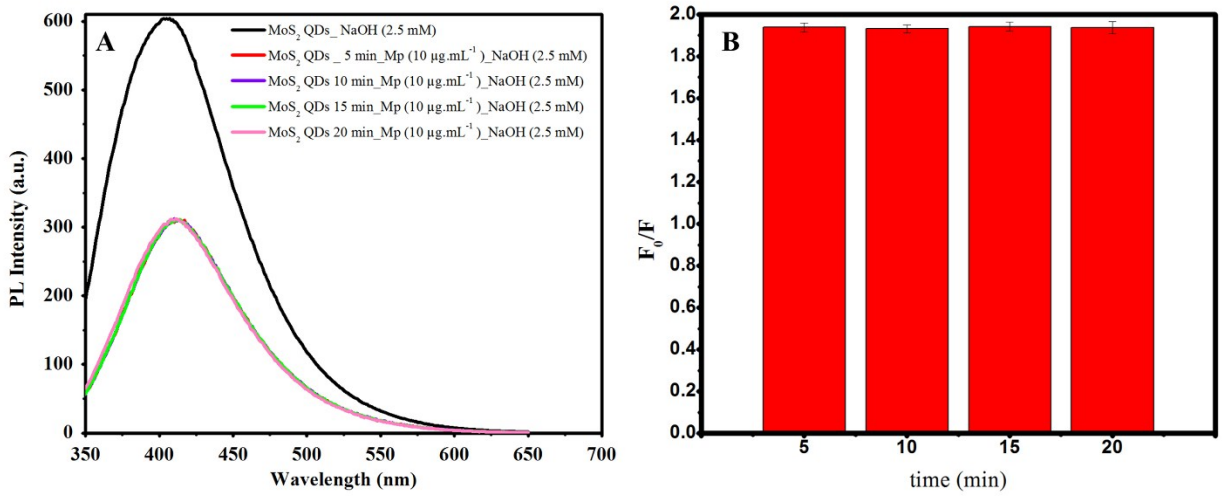

Figure S3 Effect of time on sensor PL response in presence of 10 µg.mL^{-1} MP and 2.5 mM hydroxide ions.

Figure S4

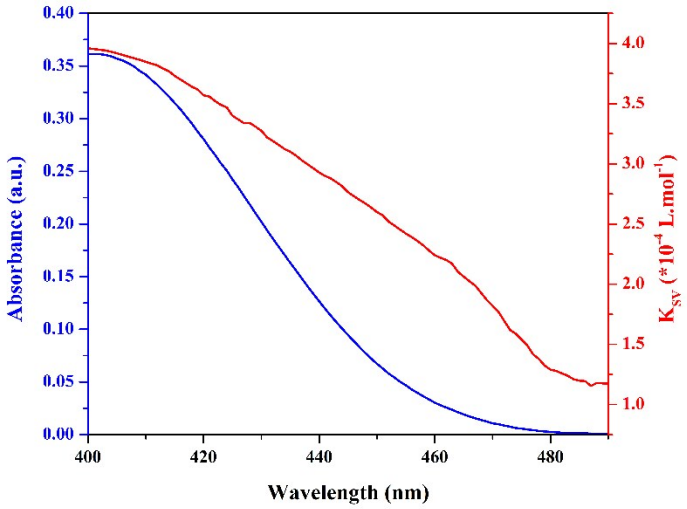

Figure S4 Plot of Stern−Volmer constants for p-NP quenching of MoS_2 QDs against emission wavelengths, and UV−vis spectra of p-NP in the 400−500 nm wavelength region.

Figure S5

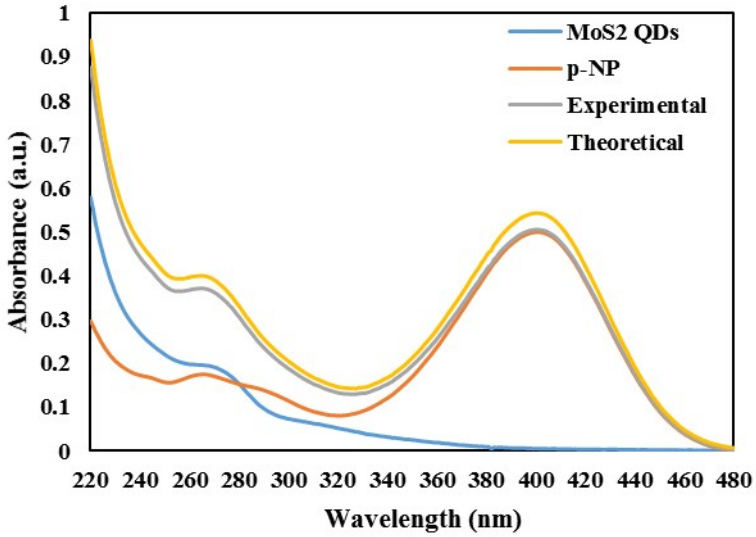

Figure S5 UV−vis spectra of MoS_2 QDs and p-NP, as well as the theoretical and experimental profiles based on the sum of the MoS_2 QDs and p-NP spectra.

Figure S6

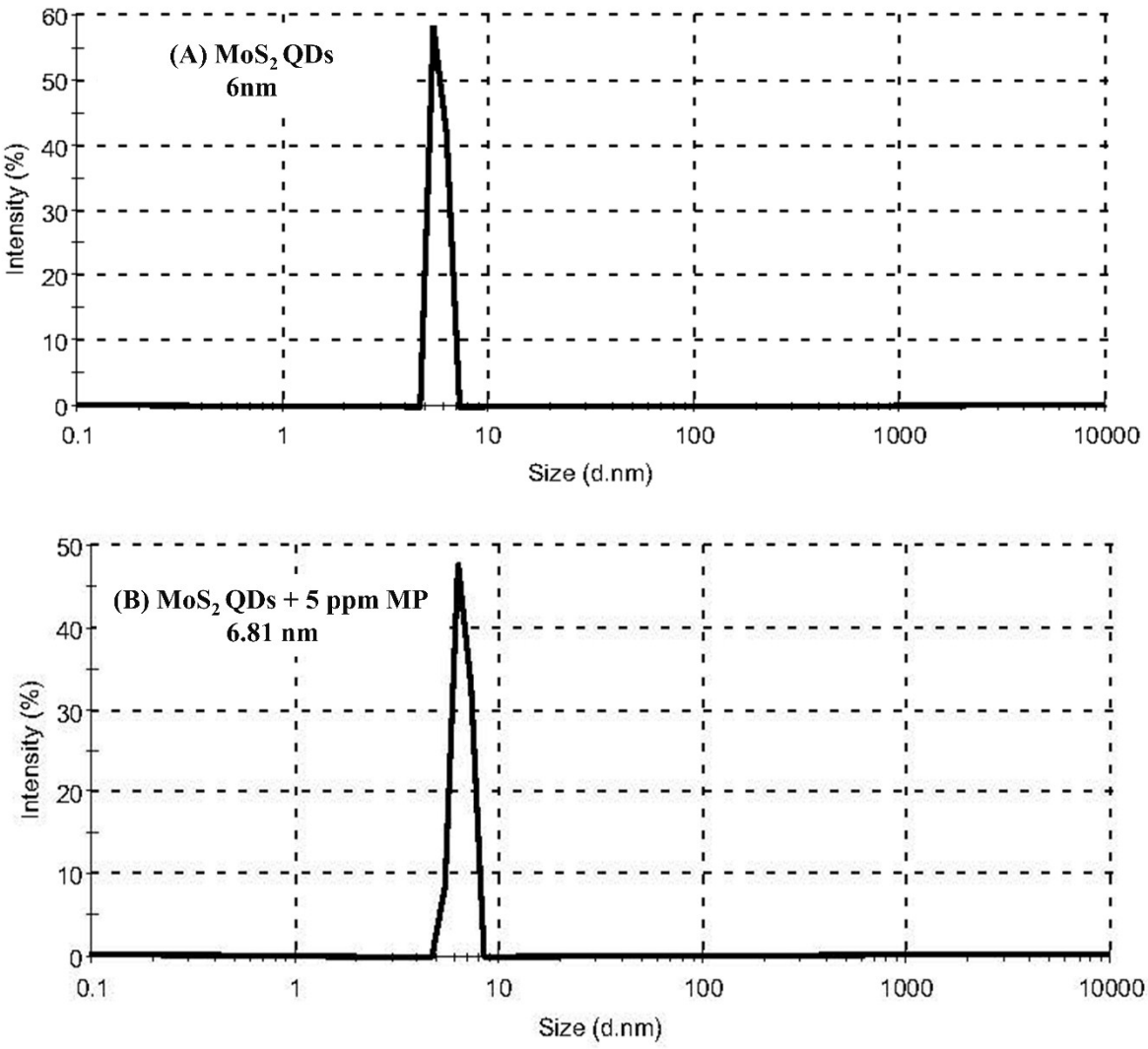

Figure S6 The hydrodynamic diameter of Synthesized MoS_2 QDs (A) and MoS_2 QDs in the presence of p-NP (B) measured by DLS method.

Figure S7

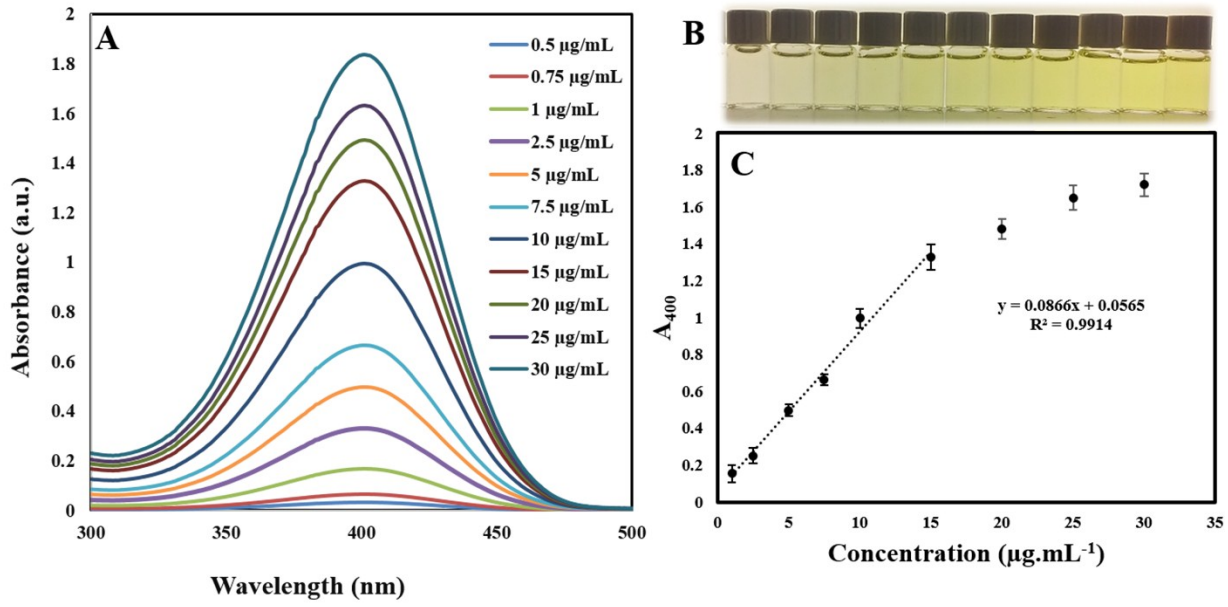

Figure S7 Colorimetric determination of MP. A) UV-Vis Spectra of p-NP formed through hydrolysis reaction of MPs at optimum condition by varying concentration of p-NP (hydrolyzed product pf MP) B) Digital images of solutions at t = 30 min according to increasing concentration of MPs. C) Calculated calibration curve for determination of MP showing a linear pattern at concentration ranges 1 $\mu g.mL^{-1}$ to 15 $\mu g.mL^{-1}$.

REFERENCES

(1) Eaton, D. F. Pure Appl. Chem. 1988, 60, 1107–1114.

(2) Brouwer, A. M. Pure Appl. Chem. 2011, 83, 2213–2228