Supporting Information

Ratiometric Photoluminescence Sensing based on Ti_3C_2 MXene Quantum Dots for the Intracellular pH Sensor

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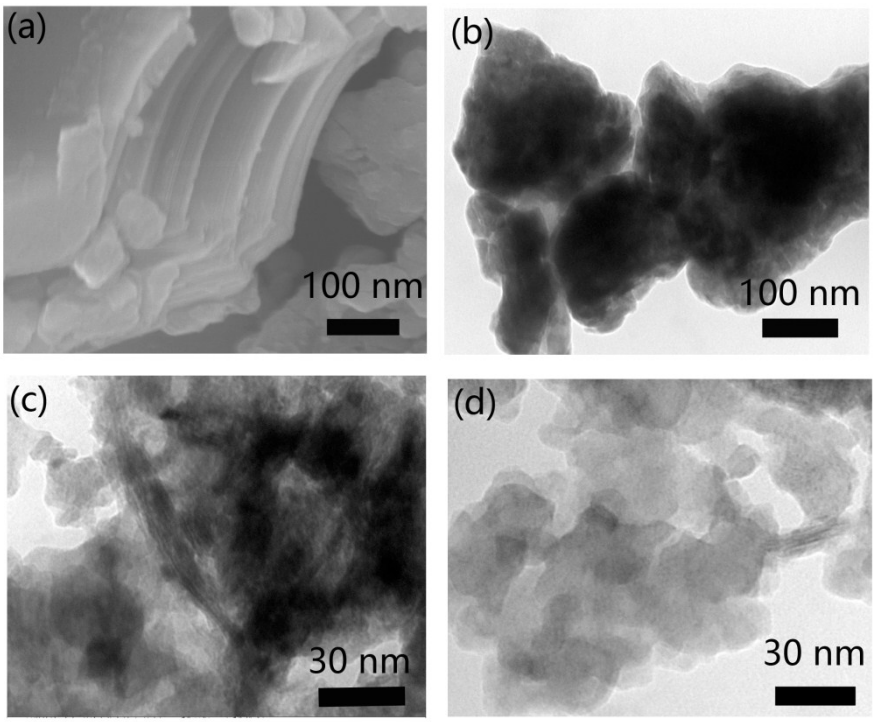

Figure S1. (a) SEM images of Ti_3AlC_2. (b) TEM images of Ti_3AlC_2; (c,d) TEM images of $Ti_3C_2T_X$ film, and Ti_3C_2 NPs, respectively.

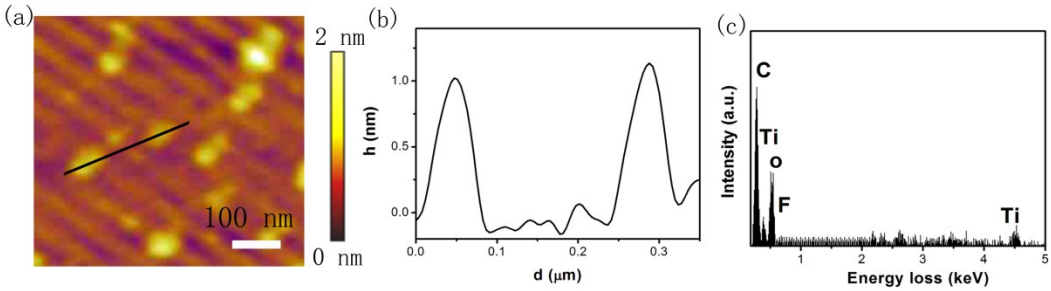

Figure S2. (a) AFM topography image of Ti_3C_2 QD. (b) Height profile along the line in (a). (c) Energy-dispersive X-ray (EDX) analysis of Ti_3C_2 QDs.

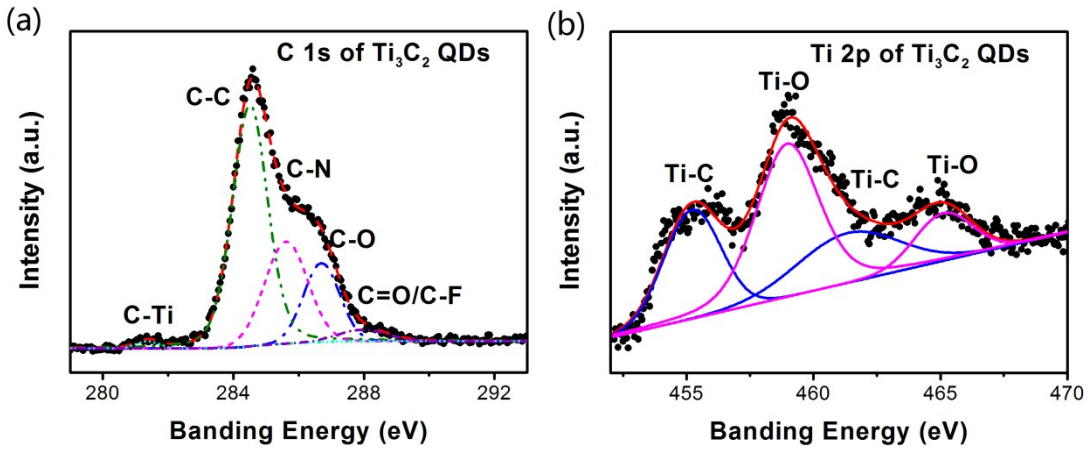

Figure S3. (a) C 1s XPS spectra of Ti_3C_2 QDs. (b) Ti 2p XPS spectra of Ti_3C_2 QDs.

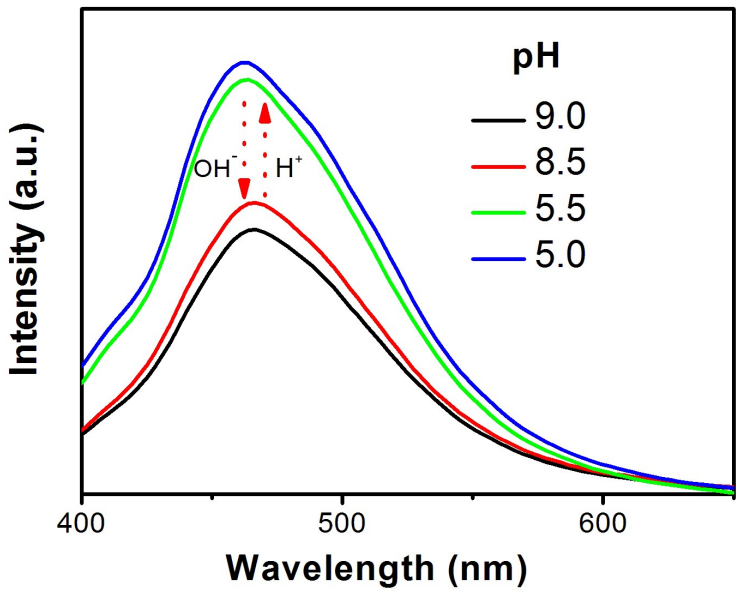

Figure S4. pH reversibility study of Ti_3C_2 QDs between 5 and 9.

Table S1. The decay time constants with the pH variation, τ_1 and τ_2 are the slower and faster decay time constants, τ *is* the average lifetime, f_1 and f_2 is the ratio of τ_1 and τ_2, respectively.

pH	τ_1 (ns)	τ_2 (ns)	f_1	f_2	τ (ns)
3	1.27	8.54	44.73	55.27	7.79
5	1.25	8.31	45.32	54.68	7.53
7	1.27	7.86	49.41	50.59	6.96
9	1.41	5.24	53.61	46.39	4.33

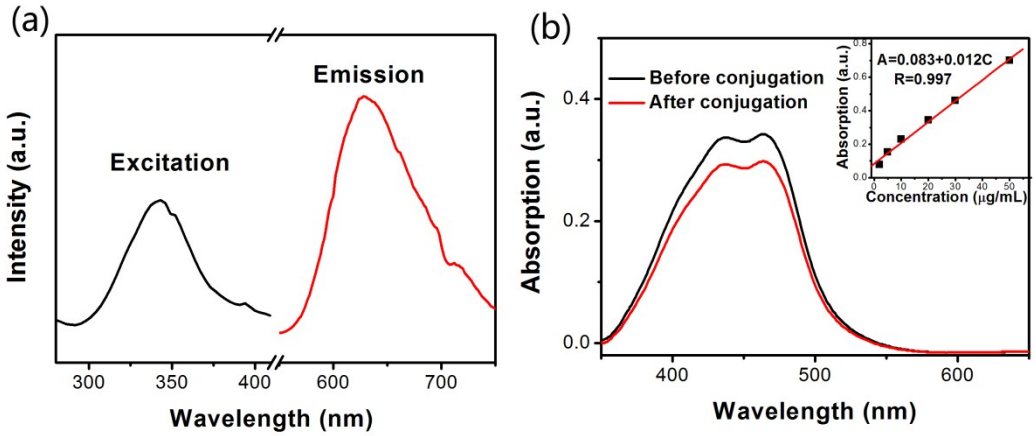

Figure S5. (a) The excitation and emission spectra of $[Ru(dpp)_3]Cl_2$. (b) the absorption spectra of $[Ru(dpp)_3]Cl_2$ before and after conjugation of Ti_3C_2 QDs and $[Ru(dpp)_3]Cl_2$. Inset was calibration curve of $[Ru(dpp)_3]Cl_2$.

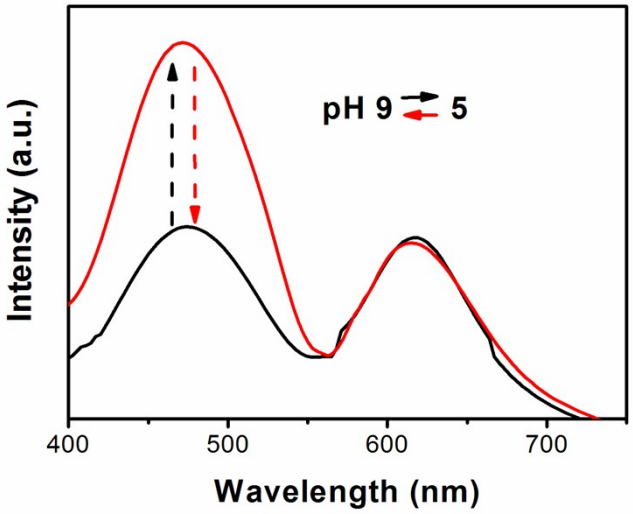

Figure S6. pH reversibility study of Ti_3C_2 QDs and $[Ru(dpp)_3]Cl_2$ between 5 and 9.

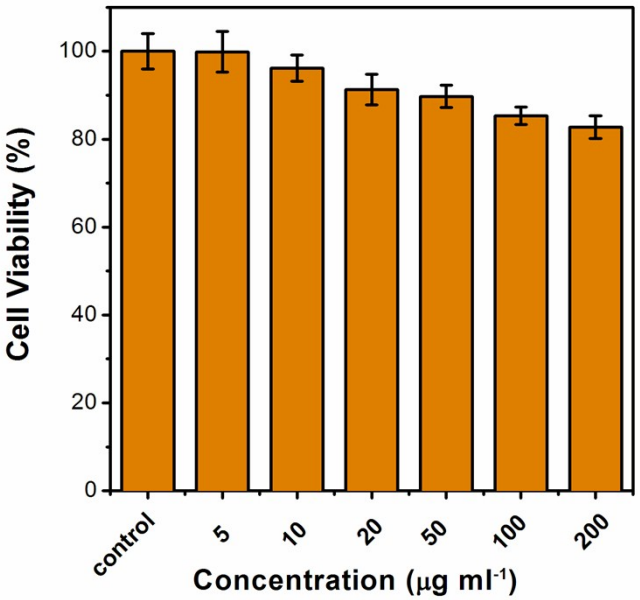

Figure S7. Cell viability after incubation with Ti_3C_2 QDs for 24 h.

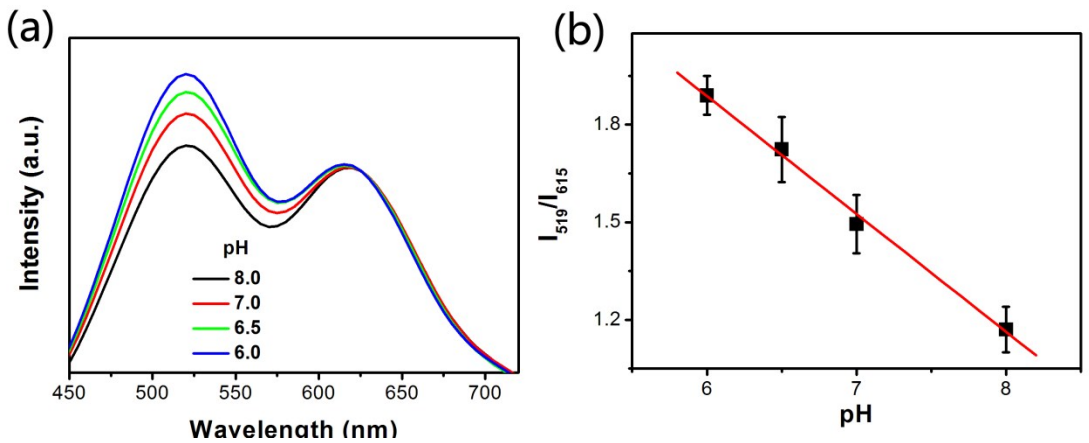

Figure S8. (a) Intracellular pH-dependent spectra of Ti_3C_2 QDs and $[Ru(dpp)_3]Cl_2$ under 405 nm light excitation; (b) Intracellular pH calibration curve of the average fluorescence intensity ratio between Ti_3C_2 QDs and $[Ru(dpp)_3]Cl_2$.