# Electronic supplementary information

# $MnO_2$ nanosheets-mediated CRISPR/Cas12a for detection of organophosphorus pesticide in environment water†

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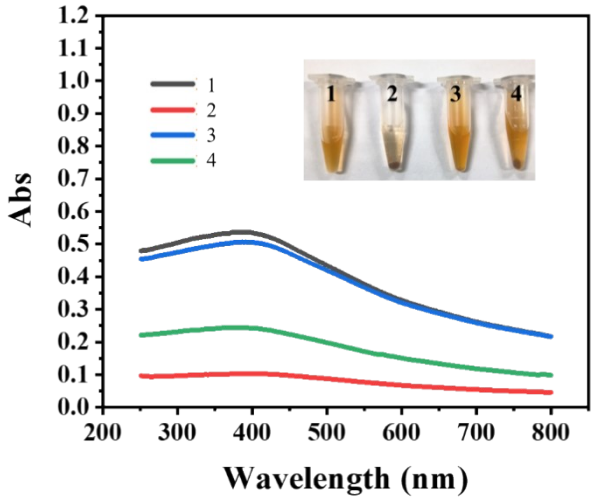


**Fig. S1.** The UV-vis spectra of $MnO_2$ nanosheets under different conditions: (1), $MnO_2$ nanosheets in ultra-pure water; (2), $MnO_2$ nanosheets in NaCl solution; (3), $MnO_2$-activator in NaCl solution; (4), $MnO_2$ nanosheets + activator in NaCl solution. Insert is the corresponding photograph.

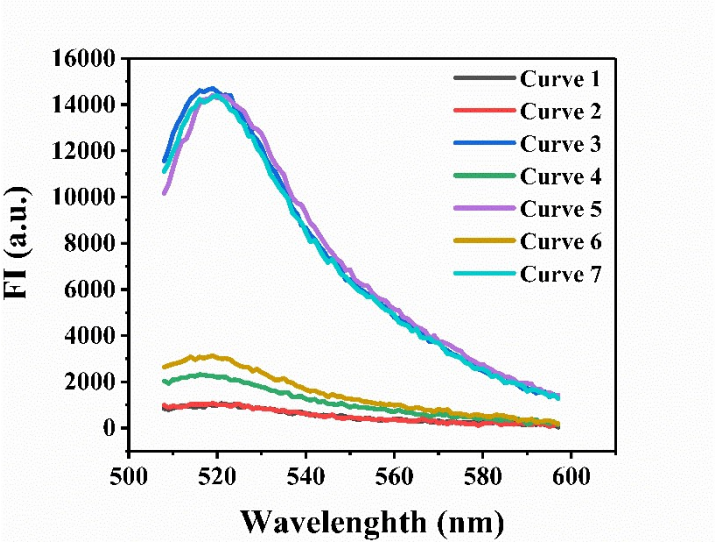


**Fig. S2.** The fluorescence spectra of different samples: Curve 1, FQ reporter; Curve 2, Cas12a/crRNA + FQ reporter; Curve 3, Activator + Cas12a/crRNA + FQ reporter; Curve 4, $MnO_2$-activator + Cas12a/crRNA + FQ reporter; Curve 5, AChE + ATCh + $MnO_2$-activator + Cas12a/crRNA + FQ reporter; Curve 6, AChE + ATCh + $MnO_2$-activator + Cas12a/crRNA + FQ reporter + DDVP; Curve 7, Activator + Cas12a/crRNA + FQ reporter + DDVP.
DDVP: 50 μg $mL^{-1}$.

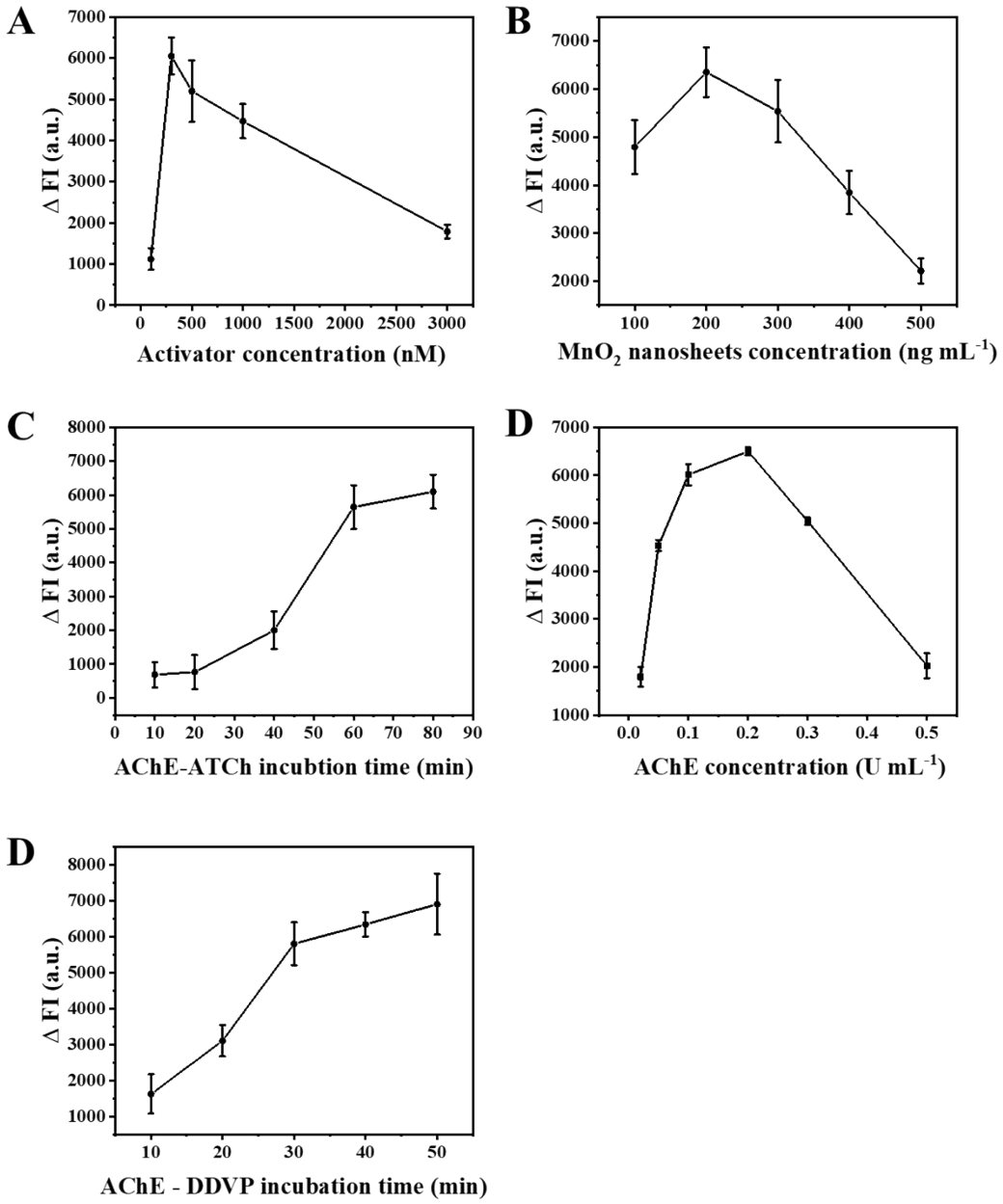


**Fig. S3.** (A) Effect of activator concentration on the sensing performance; (B) Effect of $MnO_2$ nanosheets concentration on the sensing performance; (C) Effect of AChE-ATCh incubation time on the sensing performance; (D) Effect of AChE concentration on the sensing performance; (E) Effect of AChE-DDVP incubation time on the sensing performance.

**Table S1**. Sequences of oligonucleotides used in this study.

| Name | Sequence (5'-3') |
|---|---|
| Activator | GCT TAG AGT ATA GTA GTT GAT CG |
| crRNA | UAA UUU CUA CUA AGU GUA GAU AUC AAC UAC UAU ACU CUA A |
| FQ reporter | FAM-TTATT-BHQ1 |
| Non-specific ssDNA for FAGE | CGC ACC TCG GAA TGT CGC GCA TGG TGC GCA |

**Table S2.** Comparison between this method and other $MnO_2$ nanosheets-mediated sensors for DDVP detection.

| Detect method | Linear range | LOD | References |
|---|---|---|---|
| Colorimetry | 7–600 ng $mL^{-1}$ | 2.3 ng $mL^{-1}$ | [1] |
| Colorimetry | 5–60 μM | 0.65 μM | [2] |
| Colorimetry | 0.25–1.0 mM | 42.94 μM | [3] |
| Fluorescence | 10–1000 ng $mL^{-1}$ | 3 ng $mL^{-1}$ | [4] |
| Fluorescence | 137–2740 ng $mL^{-1}$ | 0.406 ng $mL^{-1}$ | [5] |
| Fluorescence | 5–1000 ng $mL^{-1}$ | 0.135 ng $mL^{-1}$ | This work |

**References**

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