Supplementary Information (SI) for Nanoscale.

Ultrasensitive non-enzymatic electrochemical detection of paraoxon-ethyl in fruit samples using a 2D $Ti_3C_2T_x$/MWCNT-OH

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Electronic Supporting Information

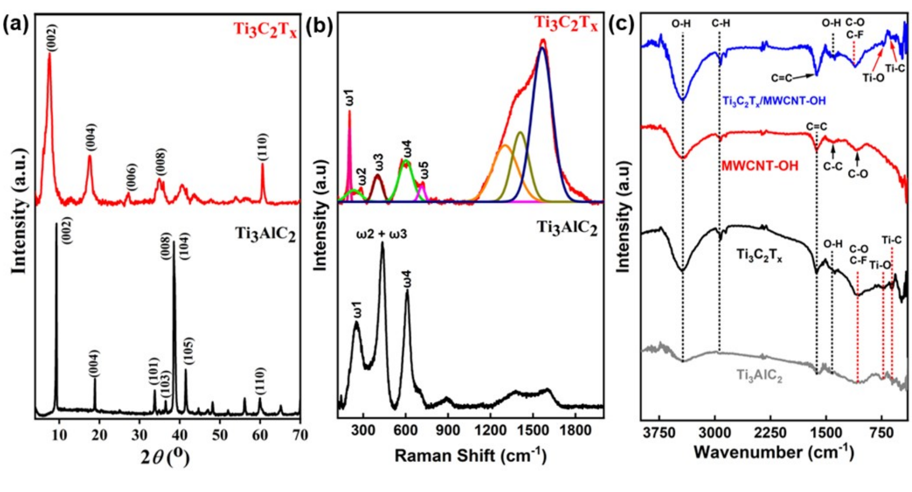

Figure S1. (a) FTIR Spectra of Ti_3AlC_2, $Ti_3C_2T_x$, MWCNT-OH, and $Ti_3C_2T_x$/MWCNT-OH, (b) XRD Spectra of $Ti_3C_2T_x$, and Ti_3AlC_2, (c) Raman Spectra of Ti_3AlC_2, and $Ti_3C_2T_x$.

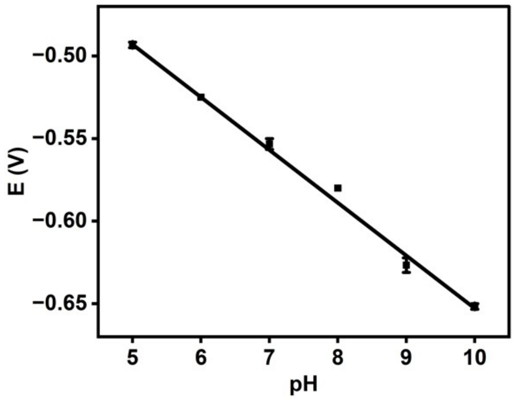

Figure S2. The linear relationship between the reduction potential of ethyl paraoxon and pH variations.

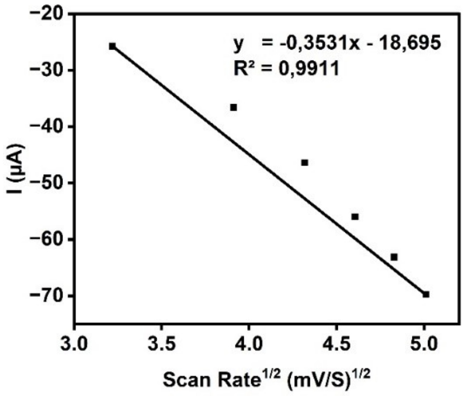

Figure S3. The linear correlation between the reduction current of ethyl paraoxon and the scan rate indicates a diffusion-controlled electrochemical process.

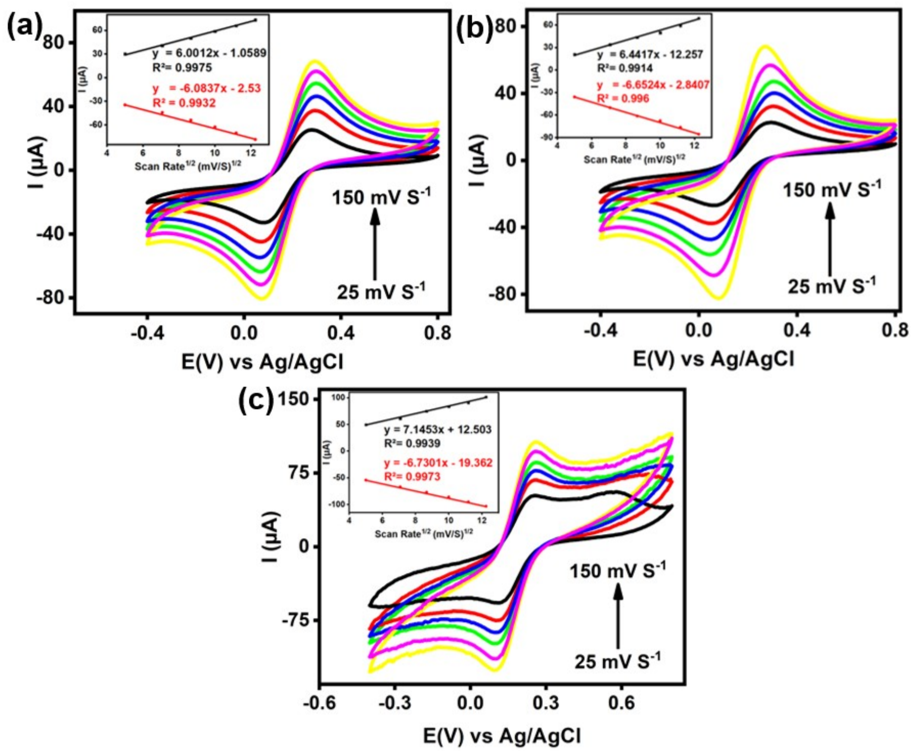

Figure S4. Cyclic voltammogram (insets: curve plot of scan rate analysis) of 1 mM $K_3[Fe(CN)_6]$ in 0.1 M pH 8 phosphate buffer measured with (a) bare GCE, (b) $Ti_3C_2T_x$/GCE-modified GCE, and (c) $Ti_3C_2T_x$/MWCNT-OH modified GCE

Equation S1. Cottrell equation

$$I(t) = \frac{nFAD^{1/2}C}{\pi^{1/2}t^{1/2}}$$

The relationship between $I(t)$ and $t^{1/2}$:

$$\frac{I(t)}{t^{1/2}} = \frac{nFAD^{1/2}C}{\pi^{1/2}}$$

Thus, the diffusion coefficient (D) is :

$$D^{1/2} = \frac{\frac{I}{t^{1/2}}\pi^{1/2}}{nFAC}$$

where $\frac{I(t)}{t^{1/2}}$ is derived based on the slope value (0.3191 x 10^{-7} μA $s^{1/2}$), *n* denotes the total number of electrons participating in the reaction, *D* represents the diffusion coefficient (cm^2/s), *F* is Faraday's constant, *A* is the electrode area (0.31cm^2, obtained through cyclic voltammetry as shown in Fig. S4, ESI), *C* denotes the concentration (mol/cm^3), and is assigned a value of 3.14.

$$D^{1/2} = \frac{0.3191\ \mu A\ s^{1/2}\ x\ 3.14^{1/2}}{4\ x\ 96500\ \ C/mol\ x\ 0.31\ cm^2\ x\ 0.0000001\ mol/cm^3}$$

$$D^{1/2} = \frac{(3.191\ x\ 10^{-7}\ A\ s^{1/2})\ x\ 3.14^{1/2}}{4\ x\ 96500\ \ C/mol\ x\ 0.31\ cm^2\ x\ 0.0000001\ mol/cm^3}$$

$$D^{1/2} = \frac{5.656\ x\ 10^{-7}\ A.s^{1/2}}{0.011926\ C/cm}$$

$$D^{1/2} = \frac{5.656\ x\ 10^{-7}\ A.s^{1/2}}{0.011926\ A.s/cm}$$

$$D = (5.656\ x\ 10^{-5})^2\ cm^2/s$$

$$D = 3.19\ x\ 10^{-9}\ cm^2/s$$