Electronic Supplementary Material (ESI) for Environmental Science: Nano.

Supporting Information:

A highly efficient photoelectrochemical sensor for detection of chlorpyrifos based on 2D/2D β-Bi_2O_3/g-C_3N_4 heterojunctions

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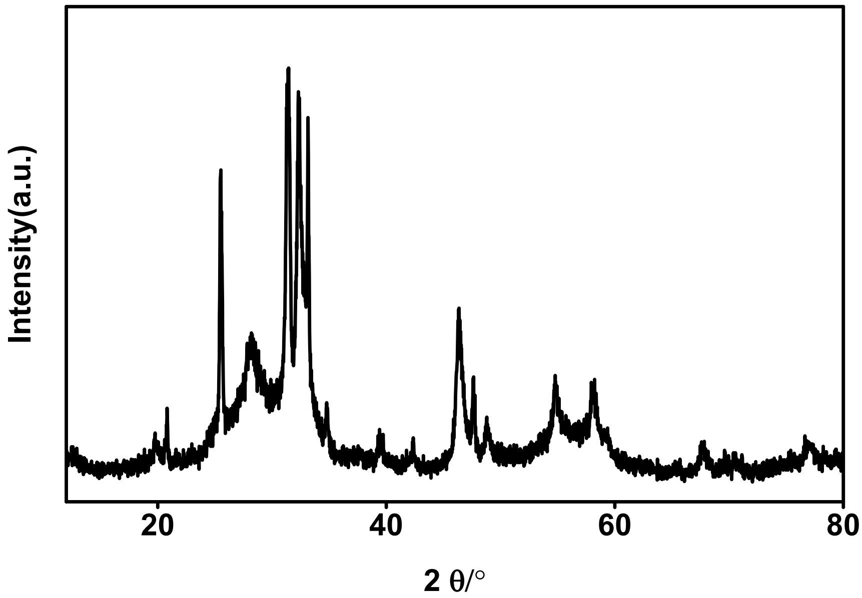

Fig.S1 XRD pattern of the product without the addition of I^- ions.

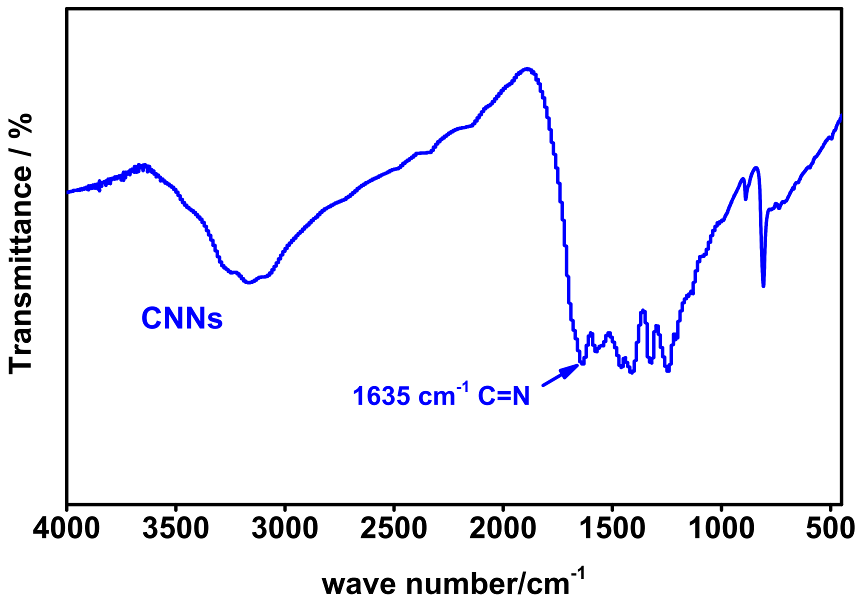

Fig.S2 FT-IR spectra of CNNs.

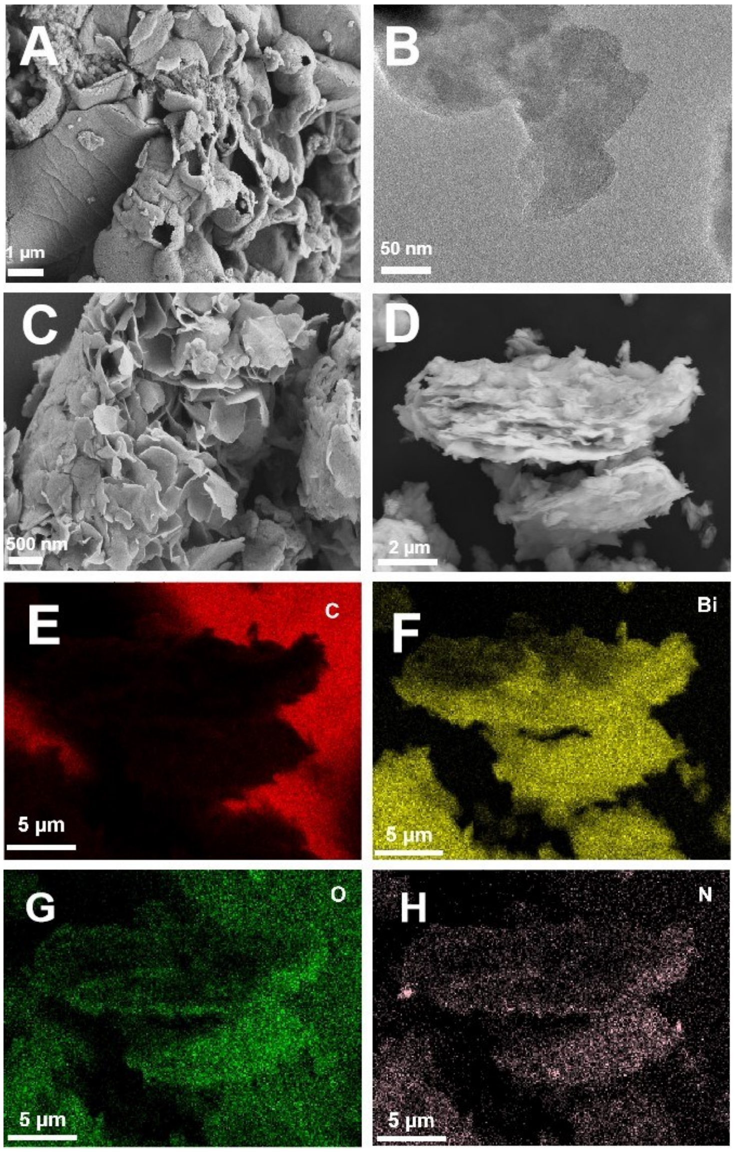

Fig.S3 SEM images of CNNs (A), β-Bi_2O_3 (C) and TEM images of CNNs 2% (B). Elemental EDX mapping images of β-Bi_2O_3/CNNs composites (D-H).

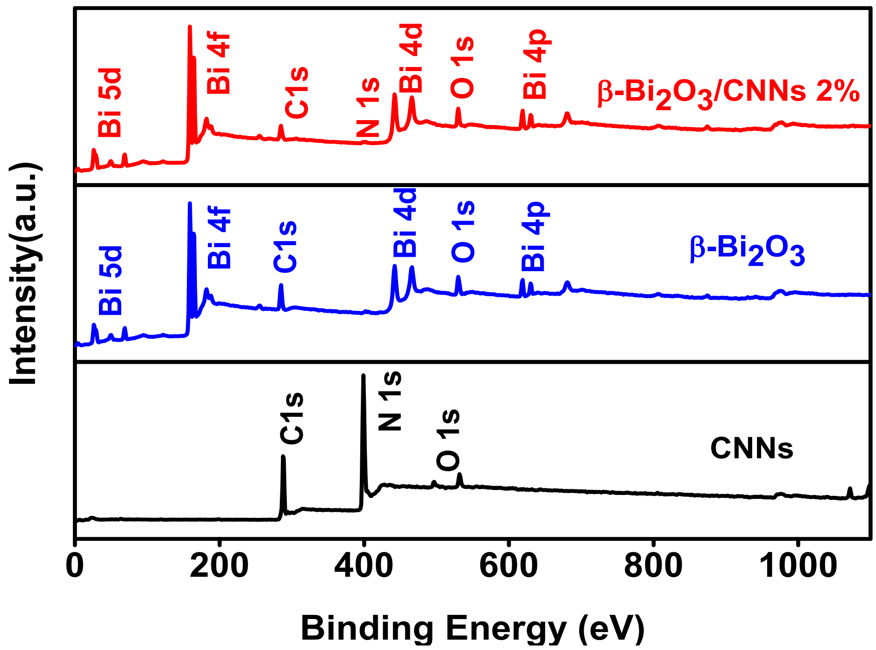

Fig. S4 The wide scan XPS survey spectra of CNNs , β-Bi_2O_3 , β-Bi_2O_3/CNNs 2%.

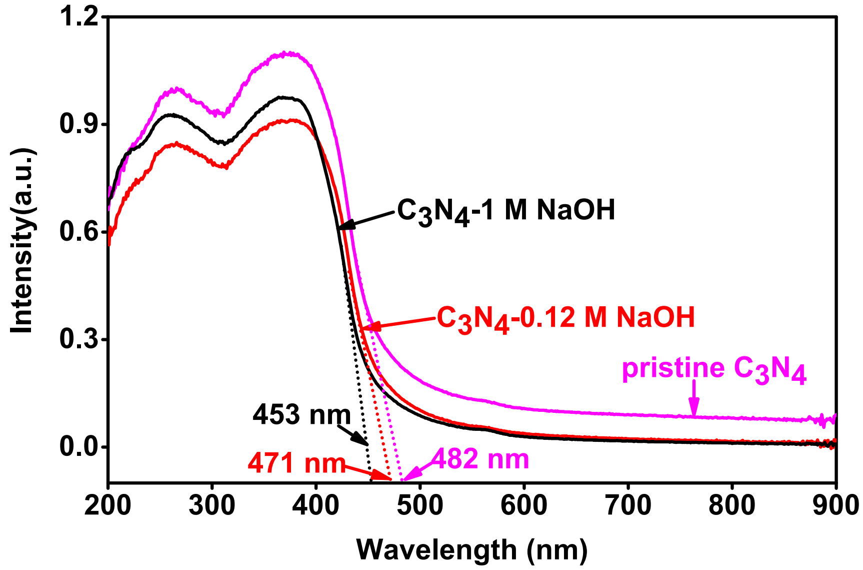

Fig. S5 UV-vis absorption spectra of CNNs obtained after hydrothermal treatment with different concentrations of NaOH.

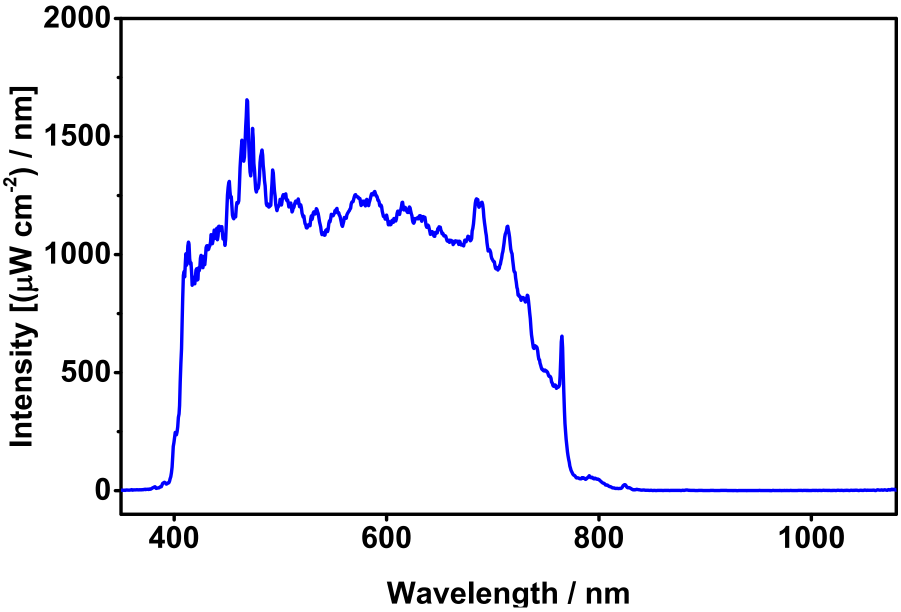

Fig. S6 The intensity spectrum of visible light**.**

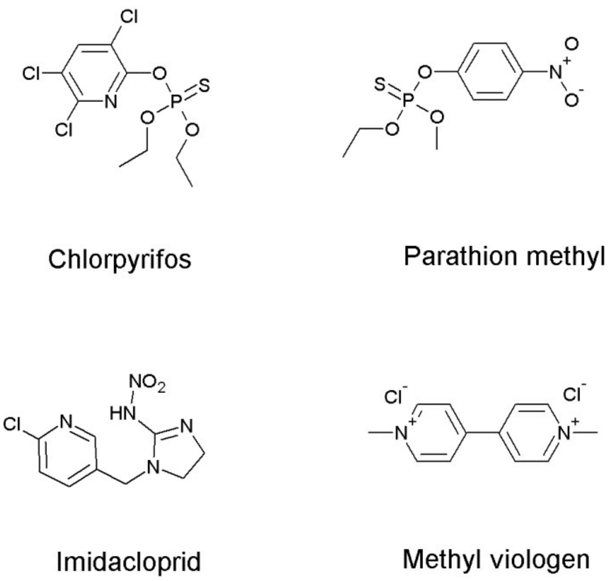

Fig. S7 Chemical structural formulas of Chlorpyrifos, parathion-methyl, imidacloprid and acetamiprid.

Table S1. Energy band levels of β-Bi_2O_3 and CNNs (E vs. NHE).

Samples	Eg (eV)	E_{CB} (eV)	E_{VB} (eV)
β-Bi_2O_3	**2.19**	**0.827**	**3.017**
CNNs	**2.51**	**-1.093**	**1.417**

Table S2. Calculation of the absorbed photo numbers in each semiconductor.

sample	CNNs	β-Bi_2O_3	β-Bi_2O_3/CNNs 2%
absorbed photon number $R^a{}_p$(quanta/cm^2/sec)	**2.68×10^{14}**	**1.70×10^{16}**	**1.71×10^{16}**

The absorbed photo numbers in each semiconductor was calculated by the following equation:

$$R^a{}_p = \int_{400}^{800} S \times \alpha \times I$$

Where S = 0.19 cm^2 is the area of the electrode, α is the light absorption and I is the light intensity at each wavelength.[1]

Table S3. Comparison of analytical parameters for chlorpyrifos detection in literatures.

Method	**Detection limit (ng mL^{-1})**	**Linear range (ng mL^{-1})**	**references**
LC-tandem MS	**0.5**	**0.5-100**	2
Surface-enhance-Raman spectra	**10**	**10-50**	3
PEC	**3.5**	**70-5600**	4
PEC	**0.03**	**0.1-50**	5
PEC	**0.02**	**0.05-80**	6
PEC	**0.03**	**0.01-80**	This work

Table S4. The relative standard deviation of three β-Bi_2O_3-/CNNs 2%-based photoelectrode

photoelectrode	First detection (μA)	Second detection (μA)	Third detection (μA)	Relative standard deviation (%)
β-Bi_2O_3/CNNs 2%	**-1.2**	**-1.17**	**-1.21**	
β-Bi_2O_3/CNNs 2%-10ng mL^{-1} chlorpyrifos	**-0.39**	**-0.303**	**-0.366**	**5.56**

Table S5. Determination results of Chlopyrifos in real sample by the PEC method (n = 3).

sample	Added(ng mL^{-1})	Detected(ng mL^{-1})	Recovery(%)	Relative standard deviation (%)
1	**0.05**	**0.052**	**104**	**1.04**
2	**0.2**	**0.2**	**100**	**1.4**
3	**1**	**1.09**	**109**	**4.9**
4	**10**	**9.8**	**98**	**4.4**
5	**20**	**20.4**	**102**	**5.1**

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