Electronic supplementary File:

Fabrication of Polypyrrole Sensitized Ag_3PO_4/g-C_3N_4 Z-Scheme Heterojunction for Photocatalytic and Antibacterial Activity.

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XRD: Figure S1 represents the XRD of pure Ag_3PO_4 and pure v g-C_3N_4 with respective card numbers. However, Figures S2 and S3 represents the XRD of binary and ternary nanocomposites respectively.

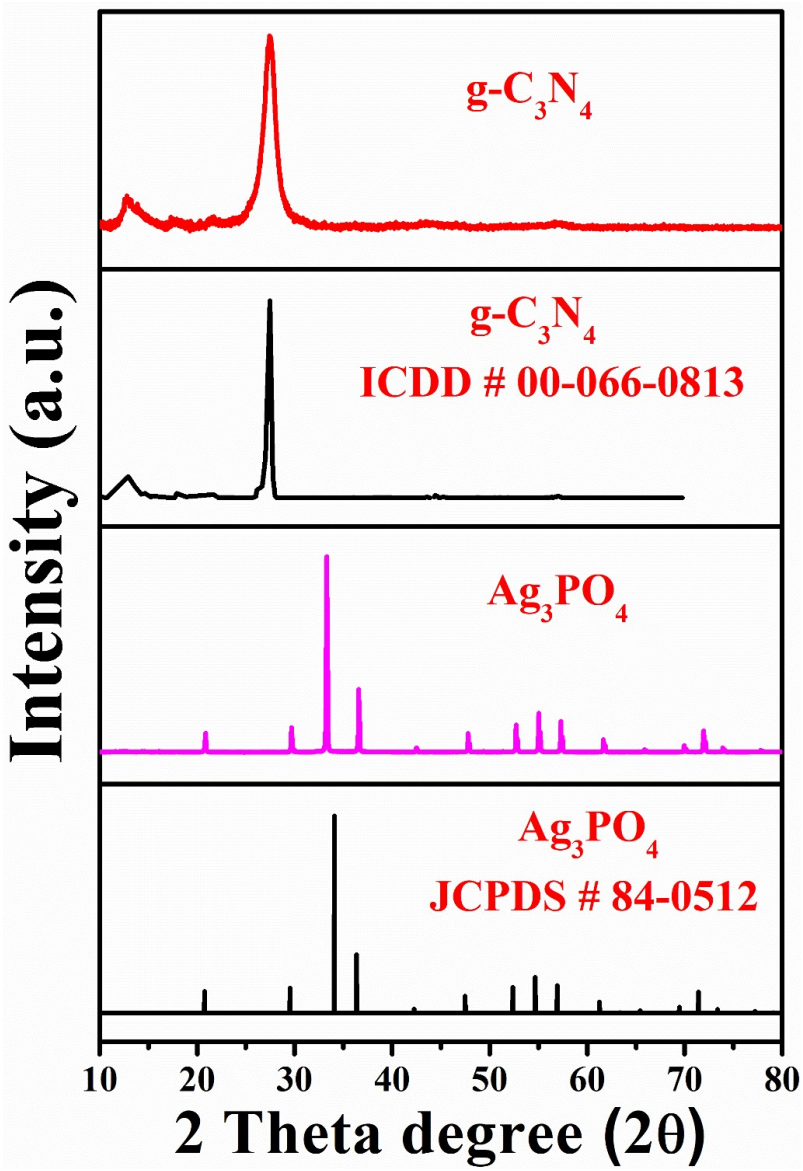

Figure S1. XRD spectrum of pure Ag_3PO_4 with JCPDS card number and pure g-C_3N_4 with ICDD card number.

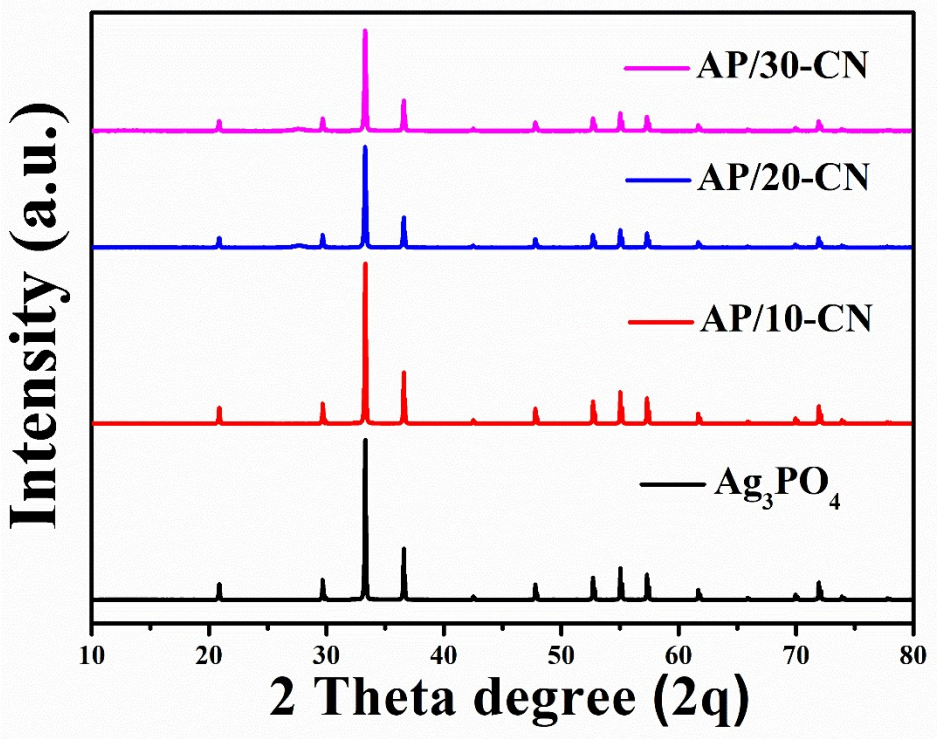

Figure S2. XRD spectrum of Ag_3PO_4 and binary nanocomposite with g-C_3N_4 weight ratio.

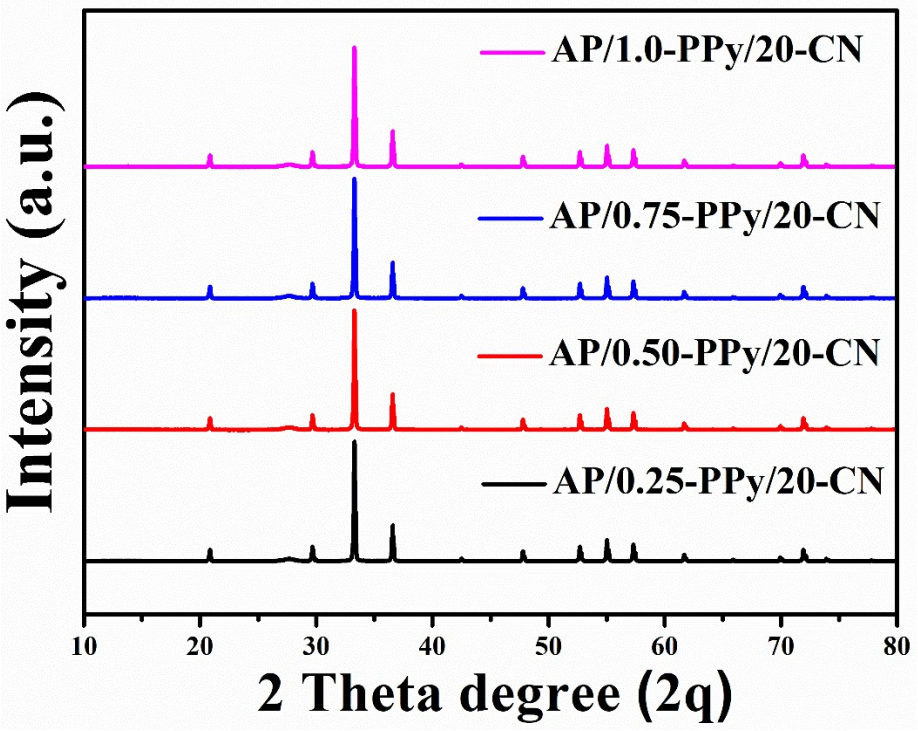

Figure S3. XRD spectrum of ternary nanocomposite with different weight ratio of PPy.

XPS spectra: XPS measurements were conducted to elucidate the elemental composition of the samples. Figure S4a demonstrates the survey spectrum of g-C_3N_4, Ag_3PO_4, and AP/0.5-PPy/20-CN photocatalysts.The elemental peaks of C, N, Ag, O, and P of pure g-C_3N_4, and Ag_3PO_4 are all present in the ternary nanocomposite AP/0.5-PPy/20-CN confirming the sucessful formation of ternary nanocomposite. The high resolution spectrum of C 1s (Figure S4b) and N 1s (Figure S4c) of AP/0.5-PPy/20-CN, reflects the negative shift in the binding energy relative to the pure g-C_3N_4 indicates the interaction between the individual materials to form the heterojunction material. However, the high resolution spectrum of Ag 3d (Figure S4d) and P 2p (Figure S4e) of AP/0.5-PPy/20-CN, imitates the positive shift in the binding energy as compared to the pure Ag_3PO_4 catalyst, which ocurs due to the migration of electrons from the CB of Ag_3PO_4 n-type semiconductor thruogh the π-conjugated system of PPy to the VB of g-C_3N_4 n-type semiconductor. This migration of electrons results in the reduction of recombination rate of electron/hole pairs and ultimatily enhences the photocatalytic rate of the ternary photocatalyst towords the photocatalytic reduction 4-Nitrophenol and photocatalytic degradation of TC.

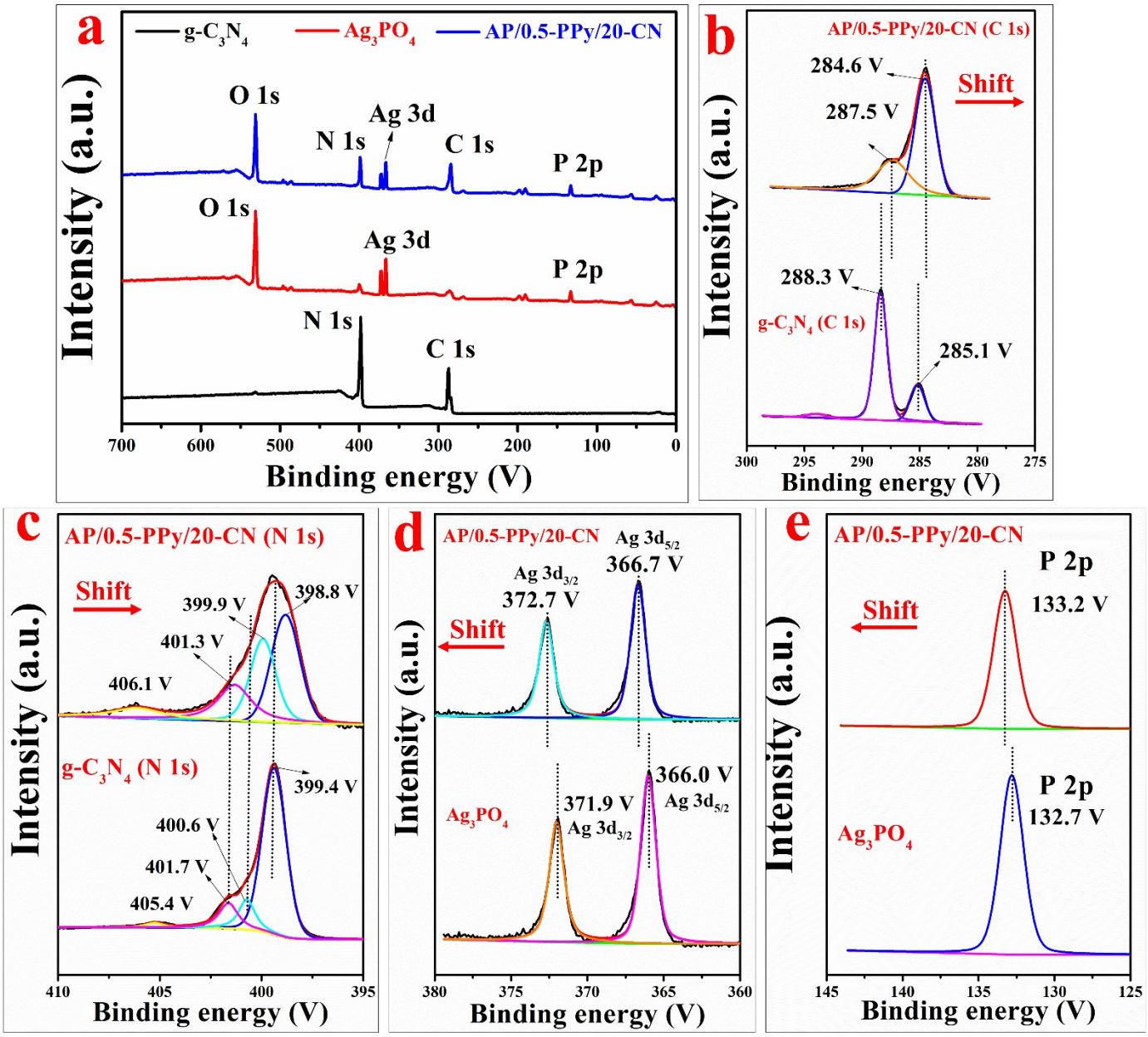

Figure S4. (a) XPS survey spectrum of g-C_3N_4, Ag_3PO_4 and AP/0.5-PPy/20-CN, (b) High resolution spectra of C 1s of CN and AP/0.5-PPy/20-CN, (c) High resolution spectra of N 1s of CN and AP/0.5-PPy/20-CN, (d) High resolution spectra of Ag 3d of AP and AP/0.5-PPy/20-CN, and (e) High resolution spectra of P 2p of AP and AP/0.5-PPy/20-CN.

FESEM: FESEM of binary nanocomposite (AP/30-CN), and ternary nanocomposites AP/0.75-PPy/20-CN, and AP/1.0-PPy/20-CN which shows the agglomeration of binary nanocomposite AP/30-CN (Figure S5), and ternary nanocomposites AP/0.75-PPy/20-CN (Figure S6a), and AP/1.0-PPy/20-CN (Figure S6b).

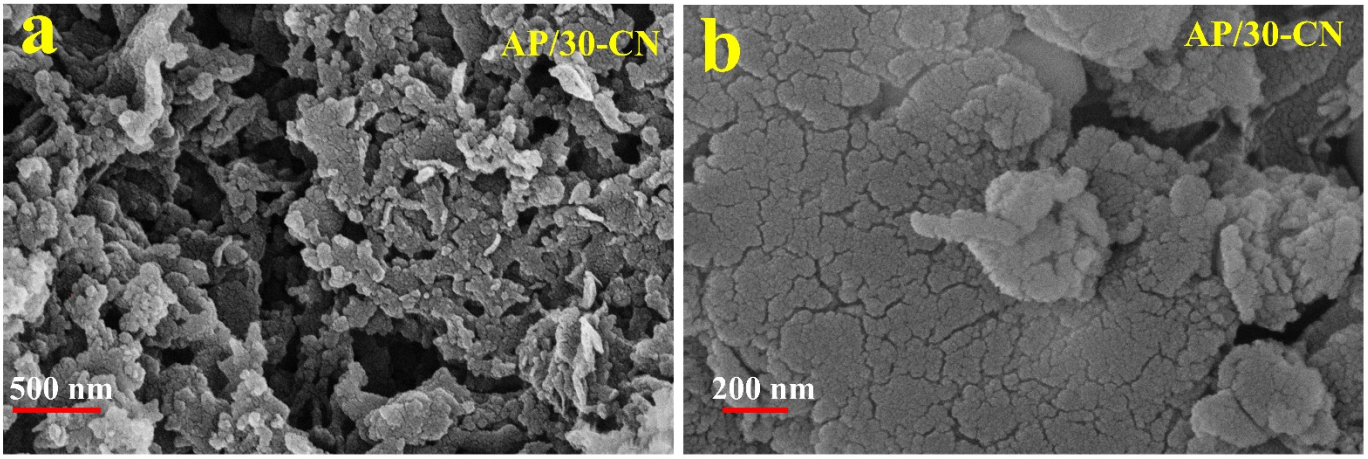

Figure S5. (a, b) FESEM images of AP/30-CN binary nanocomposite.

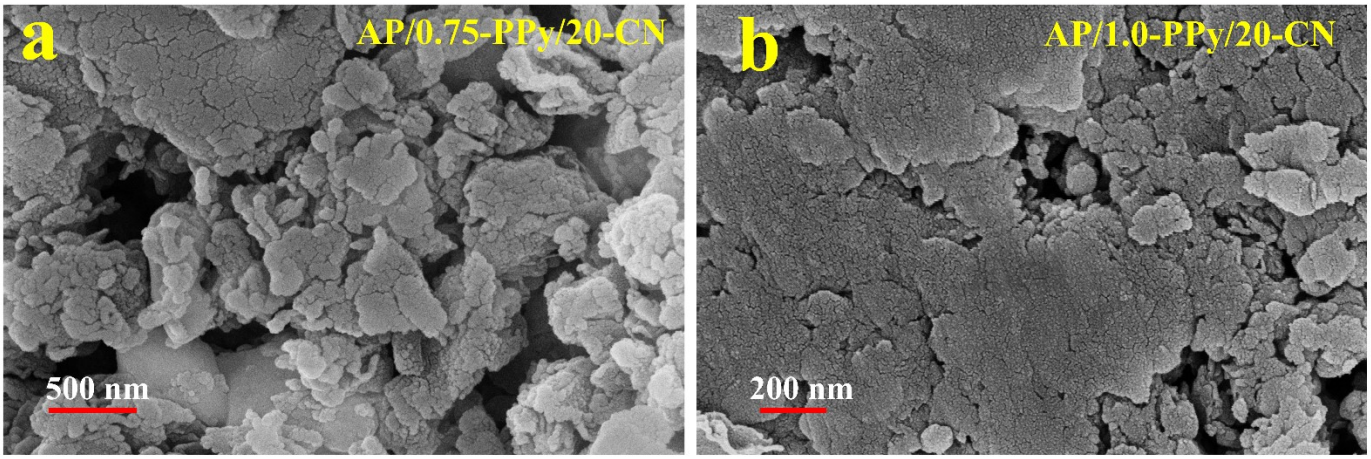

Figure S6. FESEM images of ternary nanocomposite (a) AP/0.75-PPy/20-CN, and (b) AP/1.0-PPy/20-CN.

Photoluminescence spectrum: Figure S7 manifestoes the PL spectrum of pure Ag_3PO_4 at an excitation wavelength of 300 nm. There appear four peaks in the PL spectrum of Ag_3PO_4 at 374 nm, 392 nm, 416 nm, and 444 nm., which is very consistent with the previous reports.

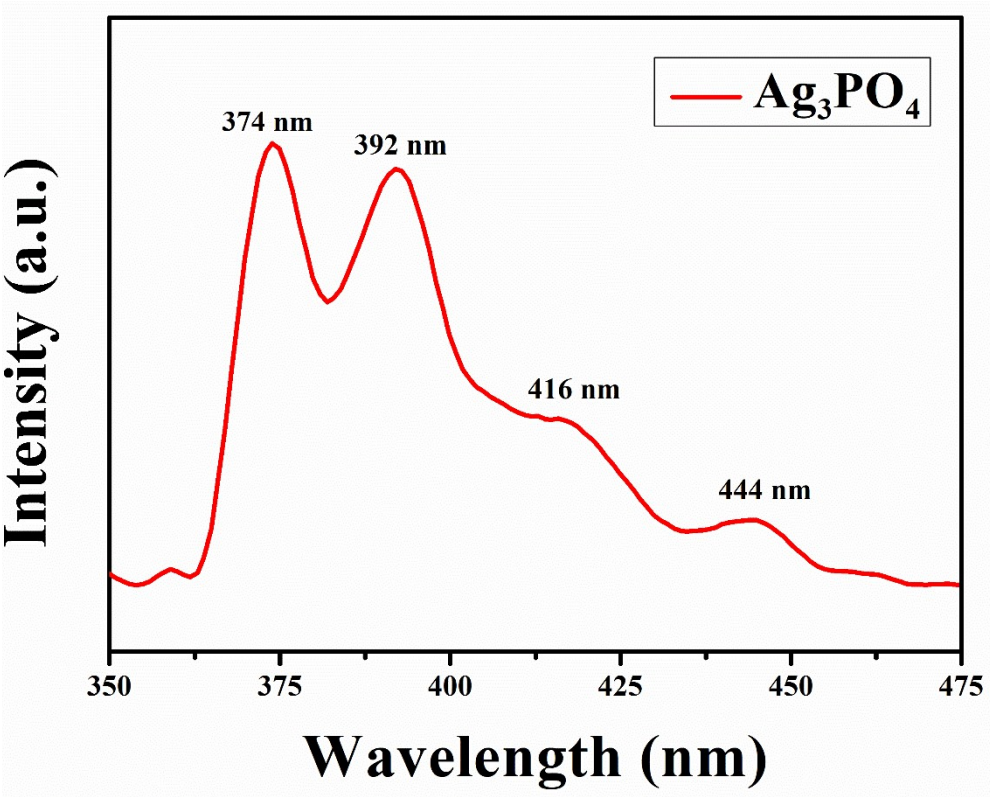

Figure S7. PL spectrum of pure Ag_3PO_4.

Performance of reusability test: The best performance sample AP/0.5-PPy/20-CN, out of various ternary catalysts has been used to study its reusability performance. The degradation time of each recycle degradation process has been set to 45 minutes since the degradation rates are not increasing significantly after that, as shown in Figure 14. Therefore, after lasting for 45 minutes of photodegradation, AP/0.5-PPy/20-CN samples are pulled out and heat treated by drying at 80 ^{0}C for 1h and calcinating at 150 ^{0}C for 2h, to get rid of impurities and renew the samples. The recycle performance of AP/0.5-PPy/20-CN after 5 reusing cycles are shown in Figure 14. As the reusing times increases from Ist to 5th cycle the degradation performance of catalyst decreases from 95 % to 90 % due to the reduction in the active sites on catalyst surface by adsorption of TC.

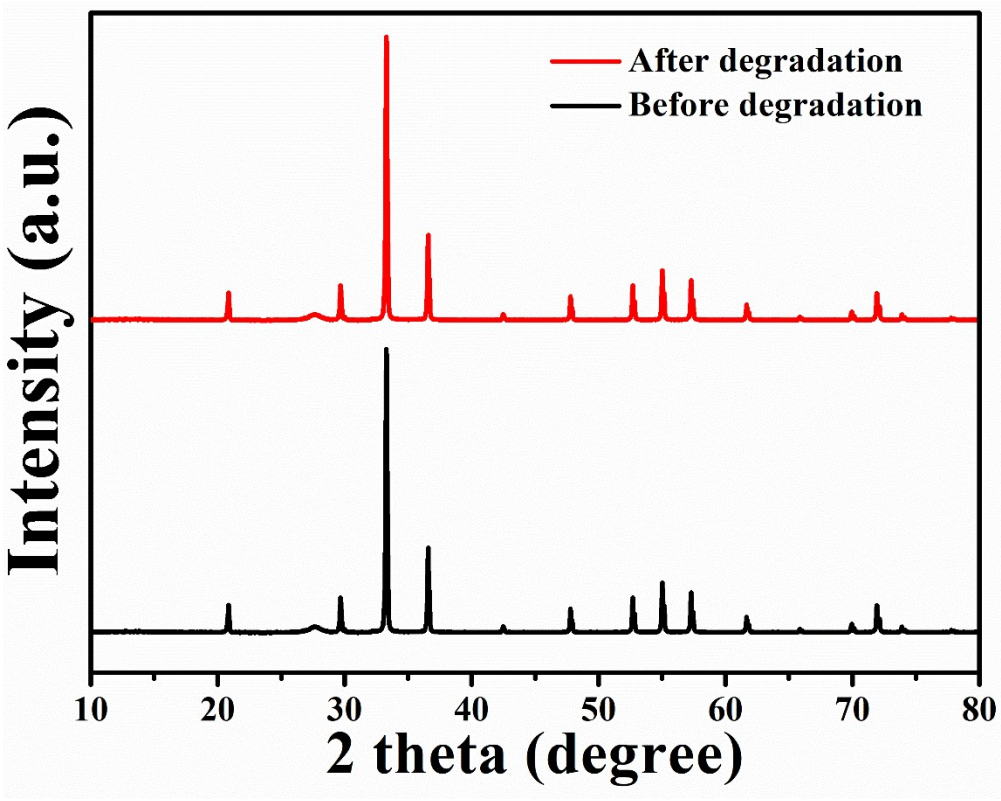

Figure S8. XRD of ternary photocatalyst (AP/0.5-PPy/20-CN) before and after photodegradation of TC.