Supporting Information

Preparation of Al-O linked porous-g-C_3N_4/TiO_2-nanotubes Z-scheme composites for efficient photocatalytic CO_2 conversion and 2,4-dichlorophenol decomposition and mechanism

Jing Wu[a], Yujie Feng[a], B.E. Logan[b], Changchao Dai[a], Xiaoyu Han[a], Da Li[a]*, Jia Liu[a]*

[a]State Key Laboratory of Urban Water Resource and Environment, Harbin Institute of Technology. No 73 Huanghe Road, Nangang District, Harbin 150090, China

[b]Department of Civil and Environmental Engineering, Penn State University, 212 Sackett Building, University Park, Pennsylvania, 16802, United States.

*Corresponding Author:

E-mail: jia14921@163.com; E-mail: lidacumt@163.com;

Phone: (+86) 451-86287017; Fax: (+86) 451-86287017

Total number of pages: 11

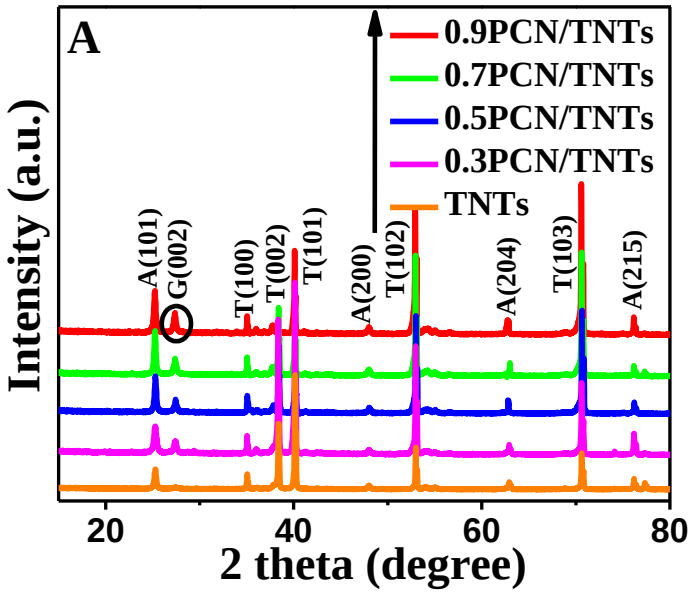
Total number of figures: 8

Total number of tables: 1

Contents

Supplementary Figures and Tables:

Figure S1. XRD patterns of (A) pure TNTs, PCN modified TNTs (B) PCN and Al−O co-modified TNTs. PCN stands for porous g-C_3N_4. The numbers 0.3, 0.5, 0.7, 0.9 stand for the used mass of PCN precursor. The numbers 0.1, 0.2, 0.4, 0.6 stand for the concentration of $AlCl_3$ aqueous solution used. 0.7CN/TNTs stand for the g-C_3N_4 modified TNTs, in which 0.7 stands for the used mass of g-C_3N_4 precursor.



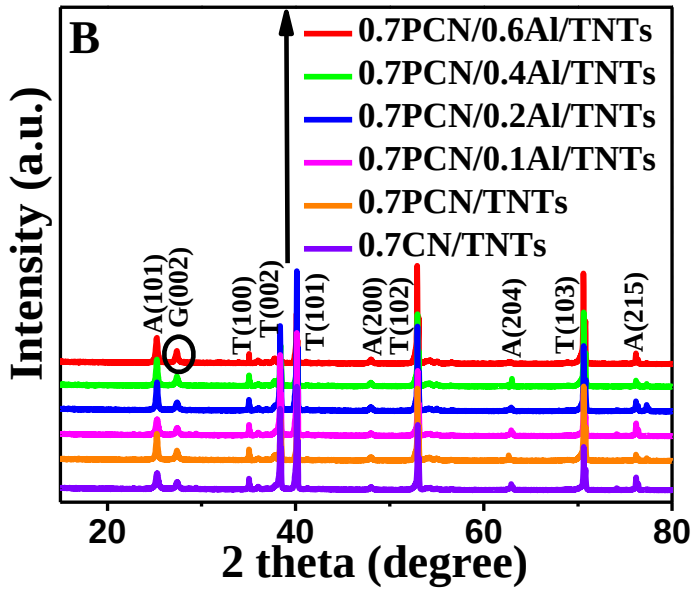


Figure S2. UV–vis absorption reflectance spectra of PCN sample. The inset is the Tauc plot of transformed Kubelka–Munk function $[F(R)\cdot h\nu]^{1/2}$ versus hν.

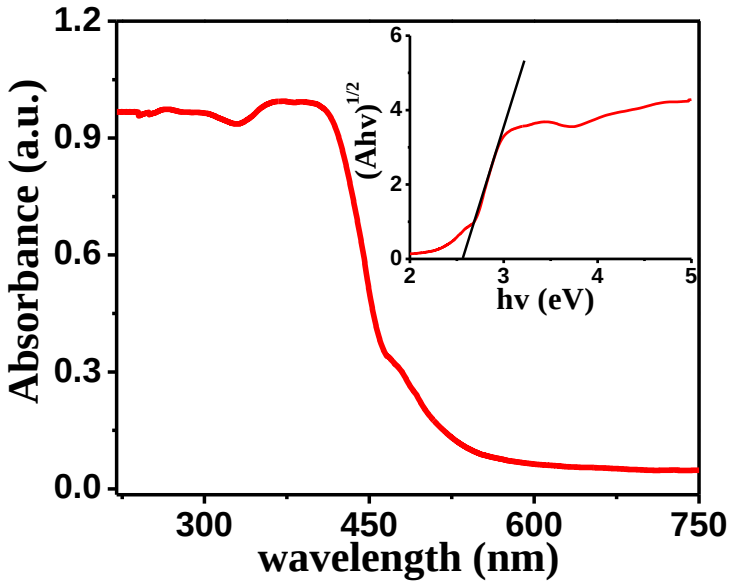
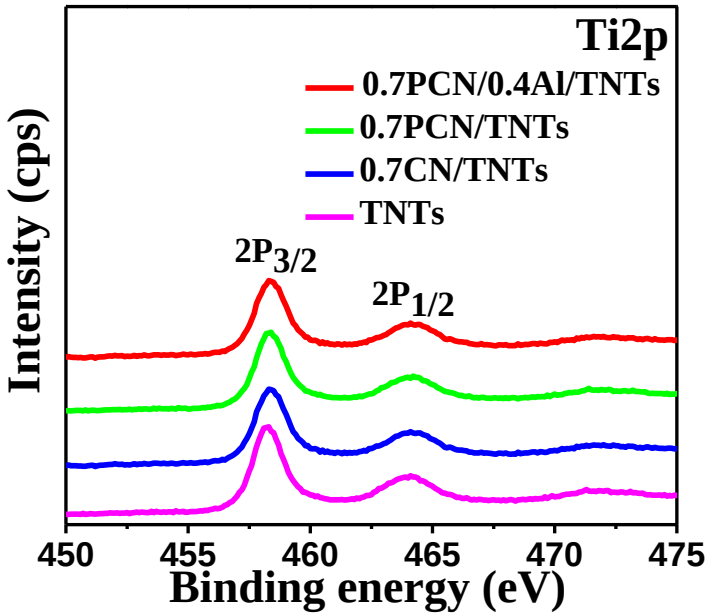
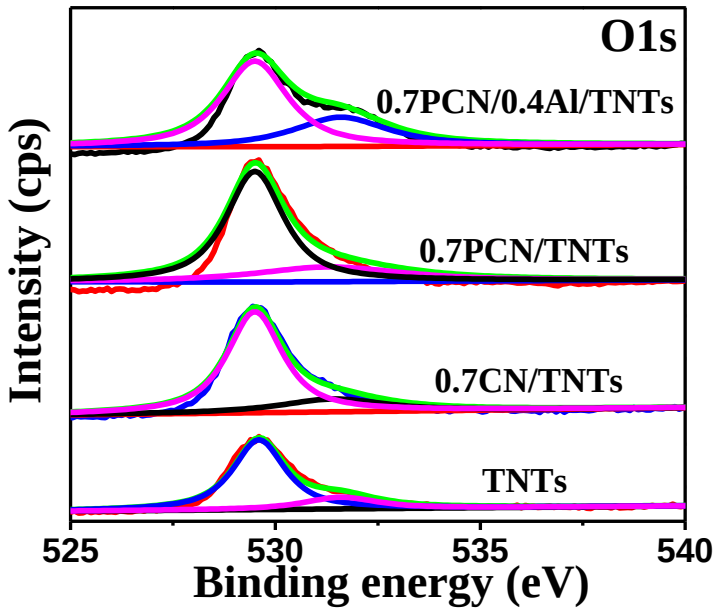
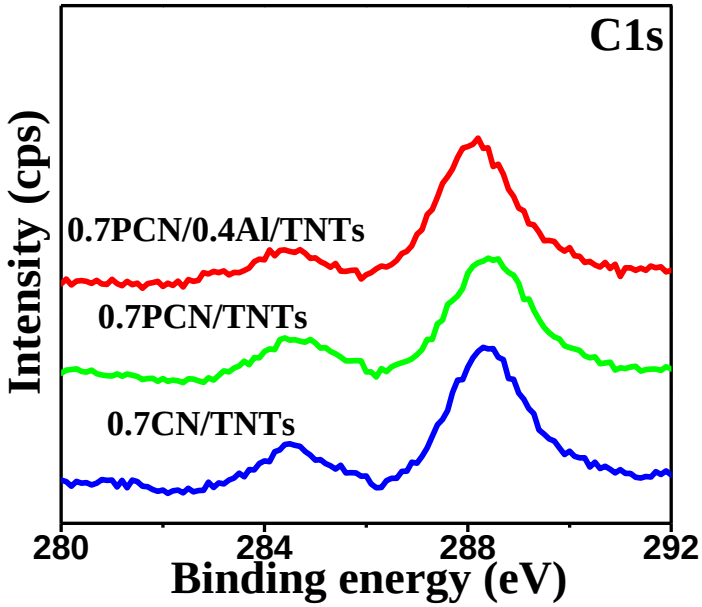


Figure S3. Ti2p, O1s, C1s and N1s spectra of different samples.






C1s
Intensity (cps)
0.7PCN/0.4Al/TNTs
0.7PCN/TNTs
0.7CN/TNTs
280
284
288
292
Binding energy (eV)

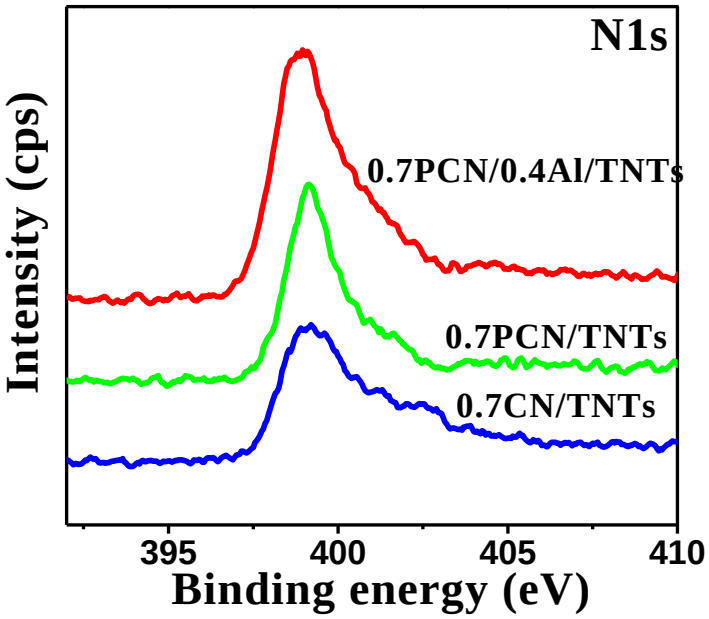
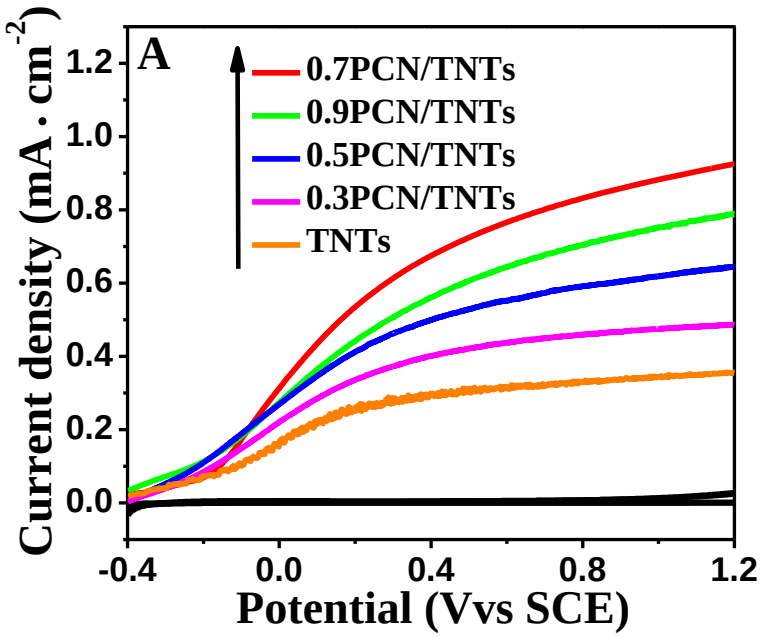

N1s
Intensity (cps)
0.7PCN/0.4Al/TNTs
0.7PCN/TNTs
0.7CN/TNTs
395
400
405
410
Binding energy (eV)

Figure S4. I-V curves in dark (black lines) and under light irradiation (colored lines) of (A) pure TNTs and PCN/TNTs composites (B) Al−O linked PCN/TNTs composites.



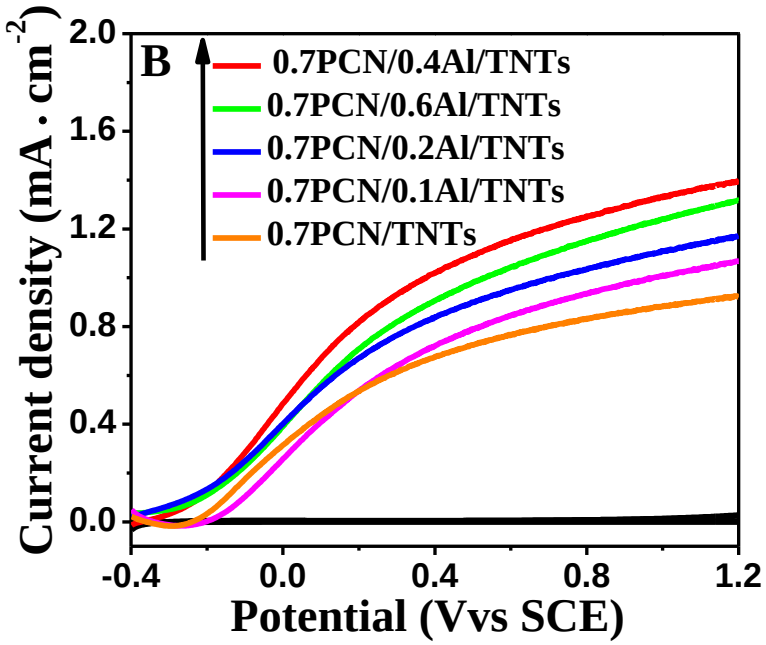
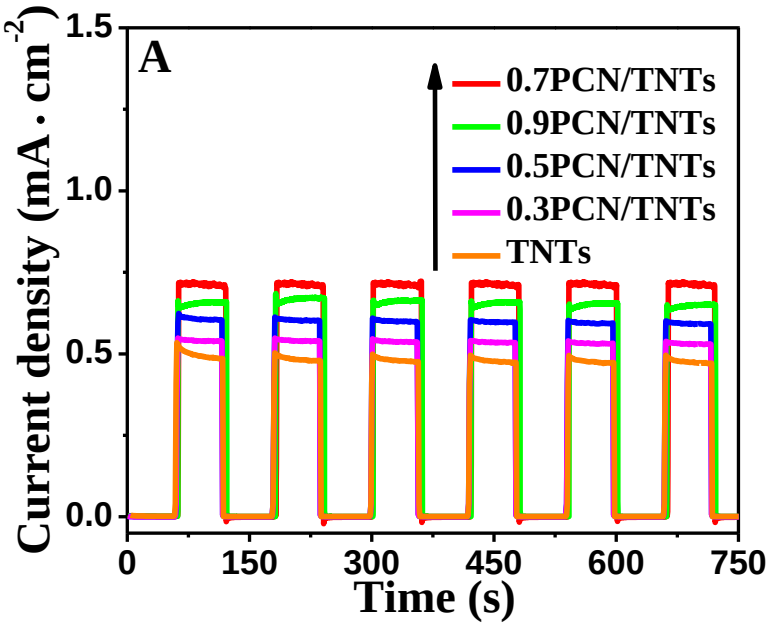


Figure S5. Transient photocurrent response of (A) pure TNTs and PCN/TNTs composites (B) Al−O linked PCN/TNTs composites.



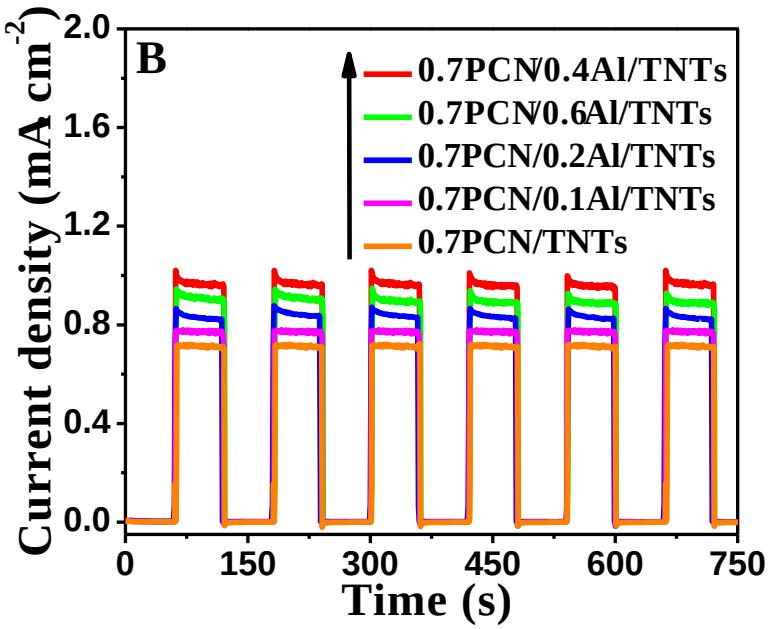


Table. S1 EIS parameters obtained from the equivalent circuit model of Rs(Cdl(RctW)) of different samples.

Samples	R_s/Ω	R_{ct}/Ω
TNTs	4.121	4.124×10^4
0.7CN/TNTs	4.041	3.660×10^4
0.7PCN/TNTs	3.896	3.336×10^4
0.7PCN/0.4Al/TNTs	3.665	2.717×10^4

Figure S6. The stability tests of photocatalytic CO_2 conversion on 0.7PCN/0.4Al/TNTs for 7-run recyclable experiments.

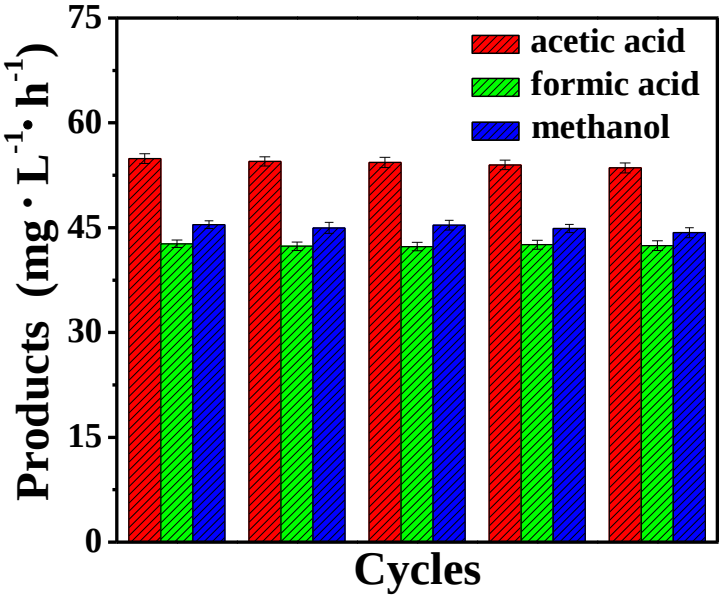


Figure S7. SPS responses of (A) pure TNTs and PCN/TNTs composites and (B) Al−O linked PCN/TNTs composites.

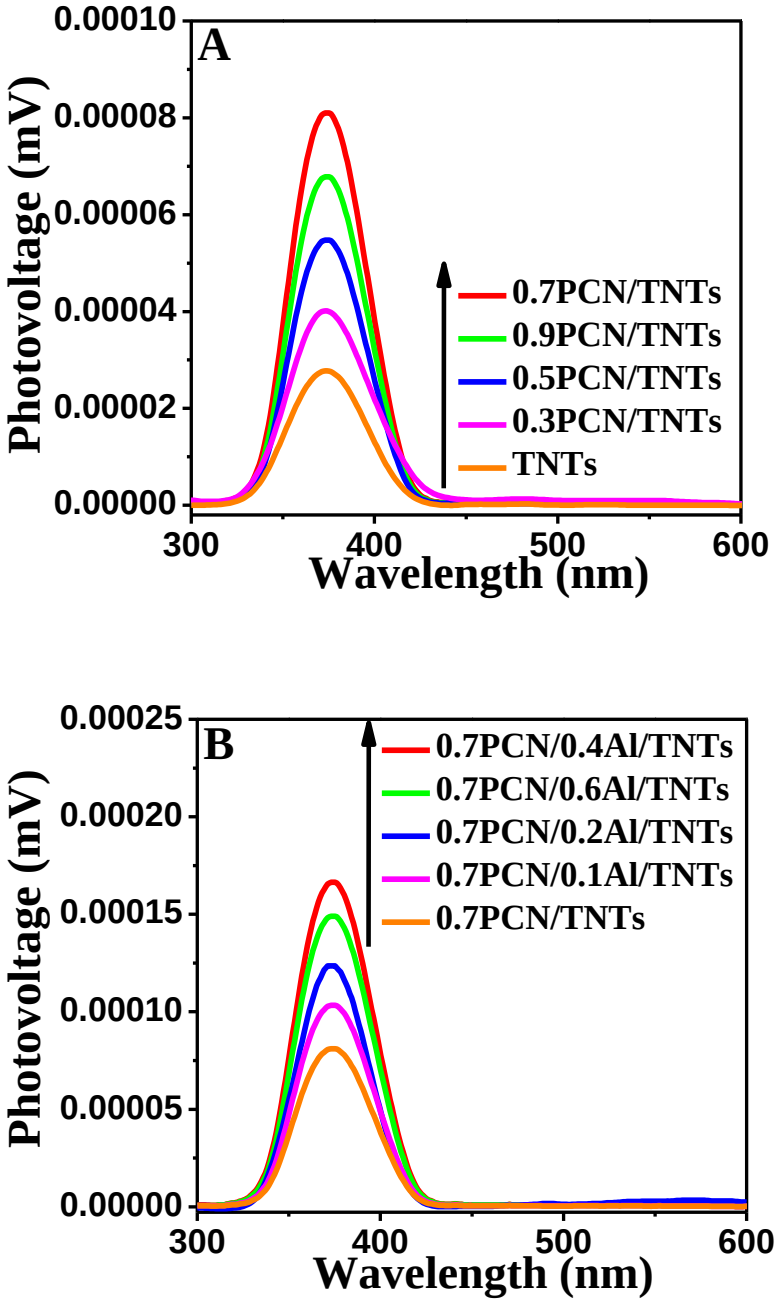


Figure S8. Fluorescence spectra related to hydroxyl radicals on (A) pure TNTs and PCN/TNTs composites and (B) Al−O linked PCN/TNTs composites.