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# Visible light driven $NaTiO_3$/g-$C_3N_4$ heterojunction photocatalyst for ultra-fast organic dye degradation

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**Supplementary Information**

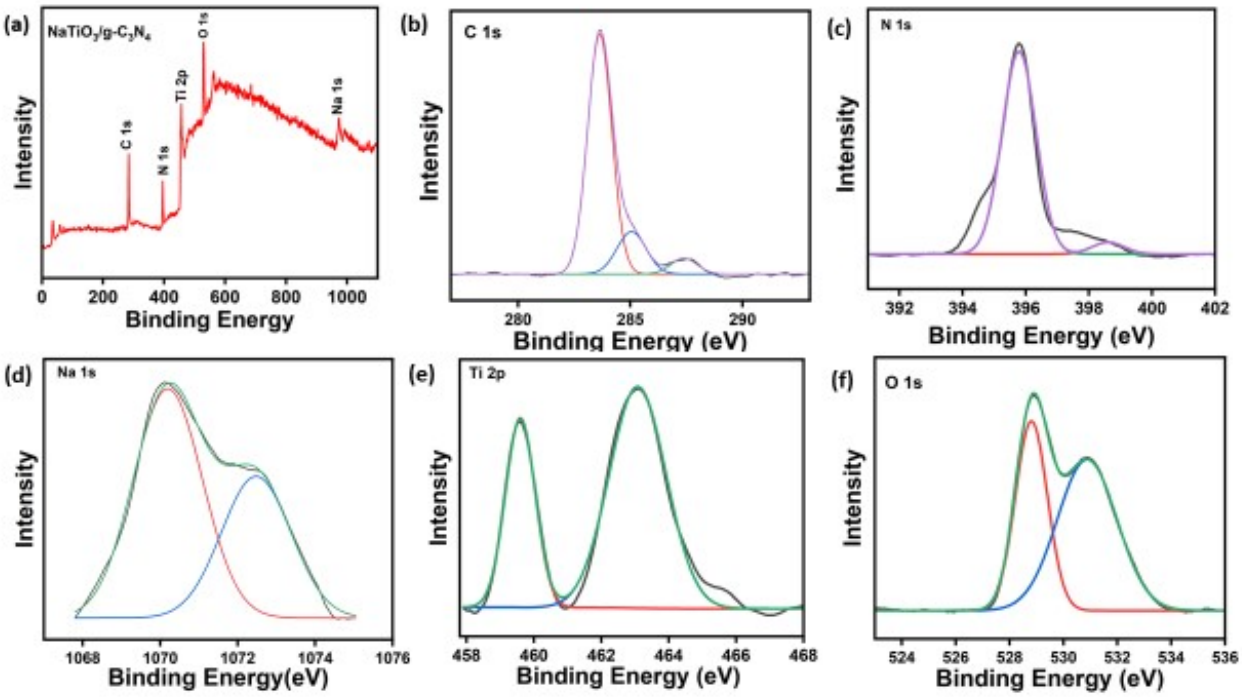


**Fig.S1(a) survey spectrum of $NaTiO_3$/g-$C_3N_4$ heterojunction photocatalyst, XPS spectra of (b) C 1s (c) N1s (d) Na 1s, (e) Ti 2p and O 1s state.**

The X-ray photoelectron spectrum serves as a valuable tool for discerning the valence states and chemical environments of constituent elements located at the sample's surface. The

comprehensive XPS survey spectrum in Figure 4(a) unveils the predominant elements situated on the product's surface, encompassing C, N, O, Na, and Ti. Evident photoelectron peaks manifest at specific binding energies: 285 eV (C 1s), 400.1 eV (N 1s), 532.6 eV (O 1s), 455 eV (Ti 2p), and 1072 eV (Na 1s). Delving into the specifics, the photoelectron signal associated with C 1s (Figure 4(b)) unveils two well-defined peaks positioned at 285.13 and 288.27 eV. Meanwhile, the high-resolution N 1s XPS spectra (Figure 4(c)) display an asymmetric profile, indicating the coexistence of diverse nitrogen environments. Employing a three-component fit reveals binding energies of 398.6, 399.8, and 401.5 eV. Among these, the peaks at 399.8 and 401.5 eV correlate with tertiary nitrogen (N (C)3) and amino functional groups containing hydrogen (C N H). The 398.6 eV peak commonly corresponds to N atoms sp2-bonded to two carbon atoms (C N C), thus confirming the presence of graphite-like sp2-bonded graphitic carbon nitride. The XPS peak exhibiting a binding energy of 285.13 eV is attributed to graphitic carbon adsorbed onto the surface of $NaTiO_3$. In contrast, the XPS peak at 288.27 eV originates from carbon atoms bonded to three nitrogen atoms within the g-$C_3N_4$ lattice [1]. Exploring the Na 1s spectrum, the presence of $Na^+$ oxidation state is convincingly supported by the presence of two distinct peaks at 1070.1 and 1072.4 eV (Figure 4(d)). The Ti 2p peaks, positioned at 459.6 eV and 463.05 eV, are identified as Ti $2p_{3/2}$ and Ti $2p_{1/2}$, as shown in Figure 4(e)[2]. In the O 1s XPS spectrum (Figure 7(d)), the peak located at 529 eV is attributed to the oxygen within the $NaTiO_3$ crystal lattice. Furthermore, the presence of a peak at 532 eV indicates the presence of chemisorbed oxygen species on the sample's surface [3].

Reference

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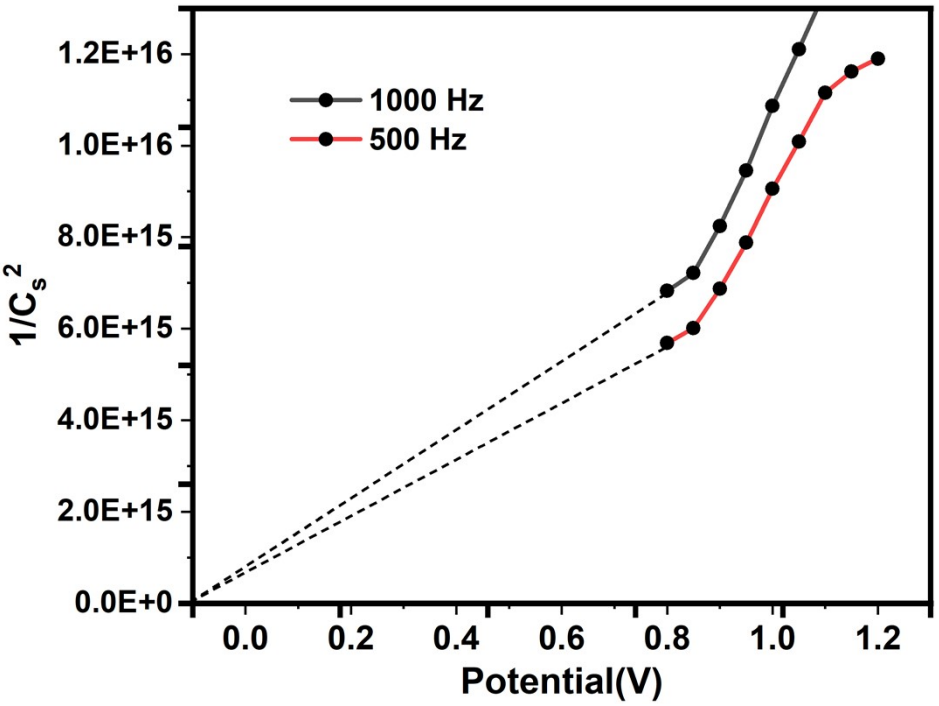
2. Ernawati, L., Yusariarta, A.W., Laksono, A.D., Wahyuono, R.A., Widiyandari, H., Rebeka, R. and Sitompul, V., 2021. Kinetic studies of methylene blue degradation using CaTiO3 photocatalyst from chicken eggshells. In Journal of Physics: Conference Series (Vol. 1726, No. 1, p. 012017). IOP Publishing.
3. Yan, Y., Yang, H., Yi, Z., Li, R. and Xian, T., 2020. Design of ternary CaTiO3/g-C3N4/AgBr Z-scheme heterostructured photocatalysts and their application for dye photodegradation. *Solid State Sciences*, *100*, p.106102.




**FigS2. Mott-Schottky plot of $NaTiO_3$/g-$C_3N_4$ heterojunction with two frequencies (500 and 1000 Hz).**

The Mott-Schottky plot of $NaTiO_3$/g-$C_3N_4$ heterojunction was plotted with two different frequencies (500 and 1000 Hz). The Fermi level energy obtained from the plot is -0.1 V.

Reference

1. Bian, C., Wang, Y., Yi, Y., Shao, S., Sun, P., Xiao, Y., Wang, W. and Dong, X., 2023. Enhanced photocatalytic activity of S-doped graphitic carbon nitride hollow microspheres: Synergistic effect, high-concentration antibiotic elimination and antibacterial behavior. Journal of Colloid and Interface Science, 643, pp.256-266.

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3. Sun, P., Liu, Y., Mo, F., Wu, M., Xiao, Y., Xiao, X., Wang, W. and Dong, X., 2023. Efficient photocatalytic degradation of high-concentration moxifloxacin over dodecyl benzene sulfonate modified graphitic carbon nitride: Enhanced photogenerated charge separation and pollutant enrichment. Journal of Cleaner Production, 393, p.136320.

**S3. Cost estimation of the as synthesized $NaTiO_3$/g-$C_3N_4$ heterojunction photocatalyst**

Cost of 40 g NaOH = $ .32

Cost of 1g $TiO_2$ = $ 2.40

Cost of .5g melamine = $ 2.71

Total cost for the fabrication of heterojunction = $ 2.7/g