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Photocatalytic dye degradation using modified g-C_3N_4

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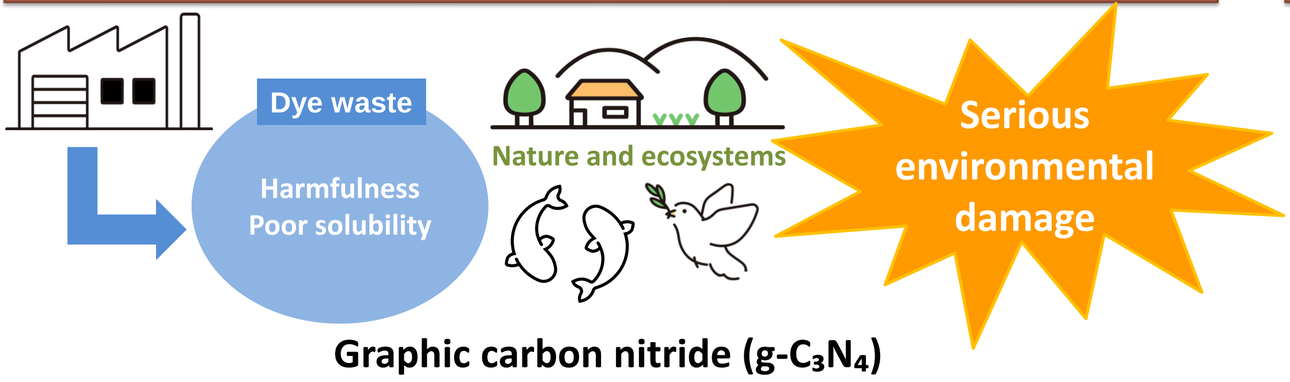
INTRODUCTION & AIM



Graphic carbon nitride (g-C_3N_4)

Advantages
- Inexpensive
- Easy to prepare
- Chemically and thermally stable

Disadvantages
- Narrow visible light absorption
- Quick recombination photogenerated electron-hole pair

In this research, we aim to enhance the dye degradation performance by synthesizing g-C_3N_4 incorporating heteroatoms.

METHOD

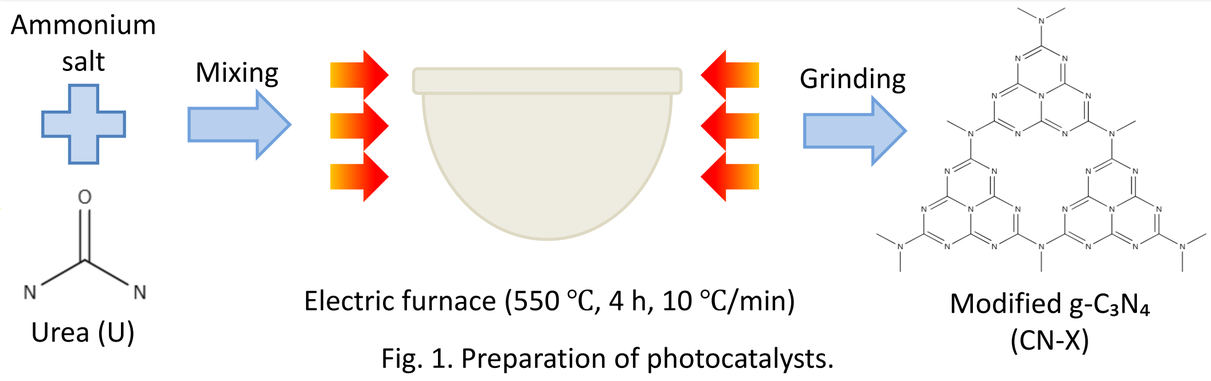


Fig. 1. Preparation of photocatalysts.

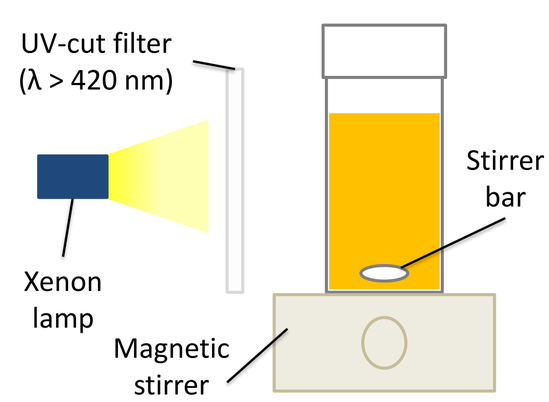


Fig. 2. Dye degradation reactor.

Table 1. Experimental conditions.

Sample	Methyl orange, Methylene blue (10 ppm, 35 mL)
Photocatalyst	g-C_3N_4 (20 mg)
Light source	Xenon lamp (λ > 420 nm)
Detection	MO : 465 nm, MB : 663 nm
Detector	UV-vis spectroscopy

RESULTS & DISCUSSION

【Dye degradation】

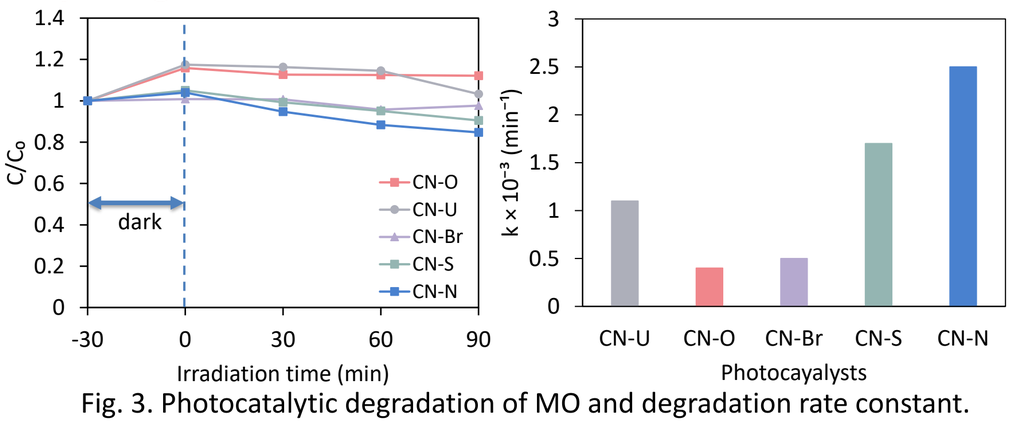


Fig. 3. Photocatalytic degradation of MO and degradation rate constant.

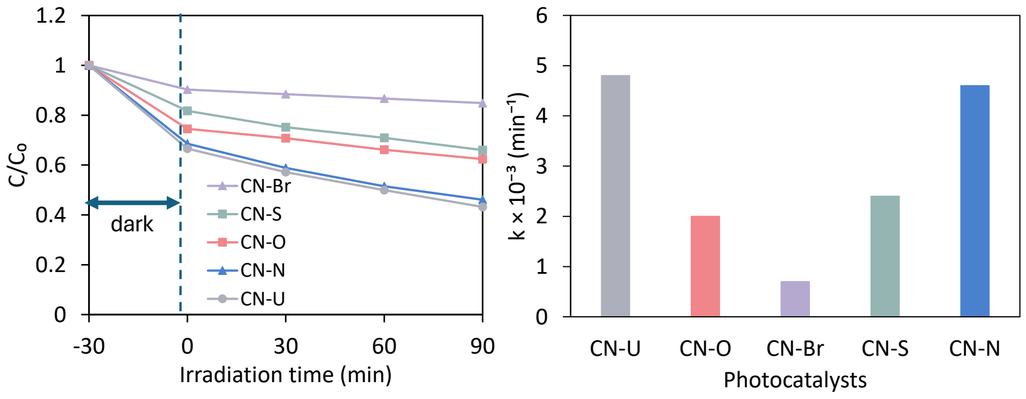


Fig. 4. Photocatalytic degradation of MB and degradation rate constant.

From dye degradation experiment results, for MO, CN-N degraded the most. For MB, CN-U and CN-N degraded the most.

【Scavenger & Mechanism】

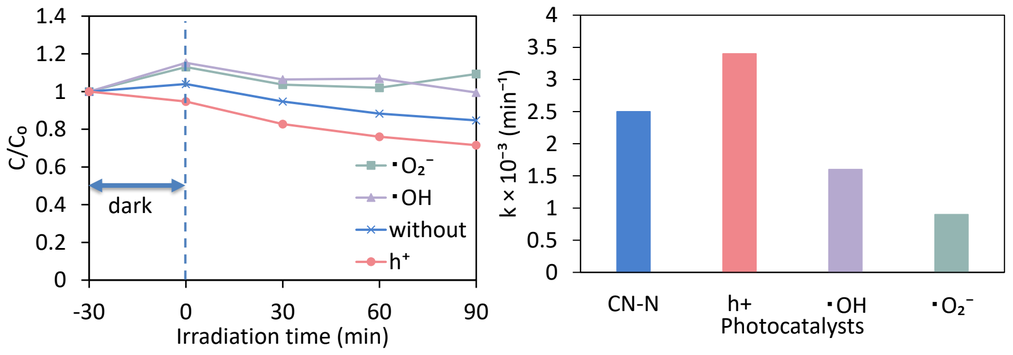


Fig. 5. Effects of different scavengers on MO degradation over CN-N and rate constants of photocatalysts.

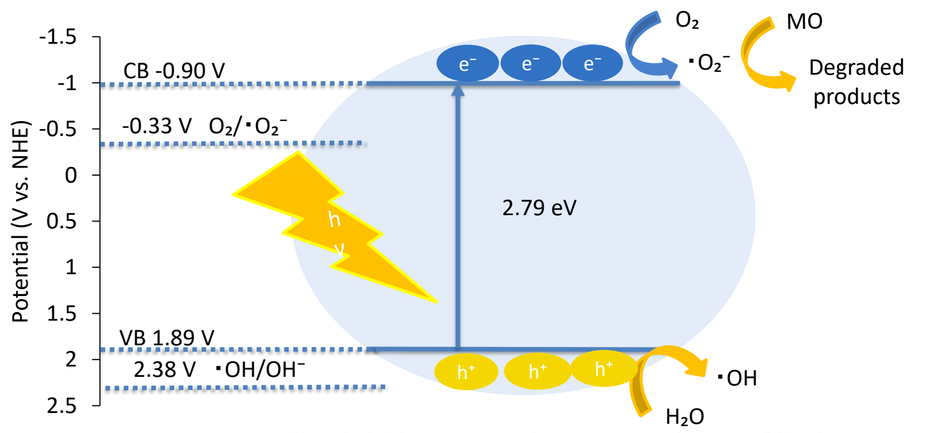


Fig. 6. MO degradation mechanism of CN-N.

From scavenger experiment results, The main active species is ·O^{2-}. The MO was decolorized by the ·O^{2-} produced by the excited electrons. The h^+ in the VB reacts with water to form ·OH.

【XRD・FT-IR】

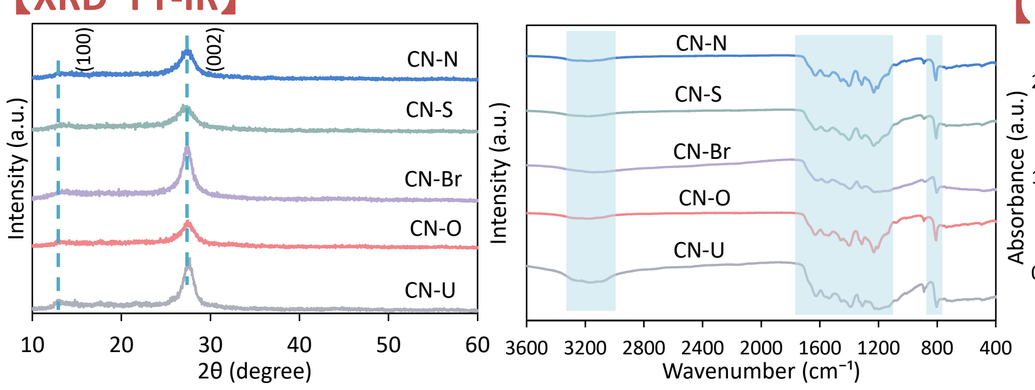


Fig. 7. XRD patterns and FT-IR spectra of photocatalysts.

【DRS・PL】

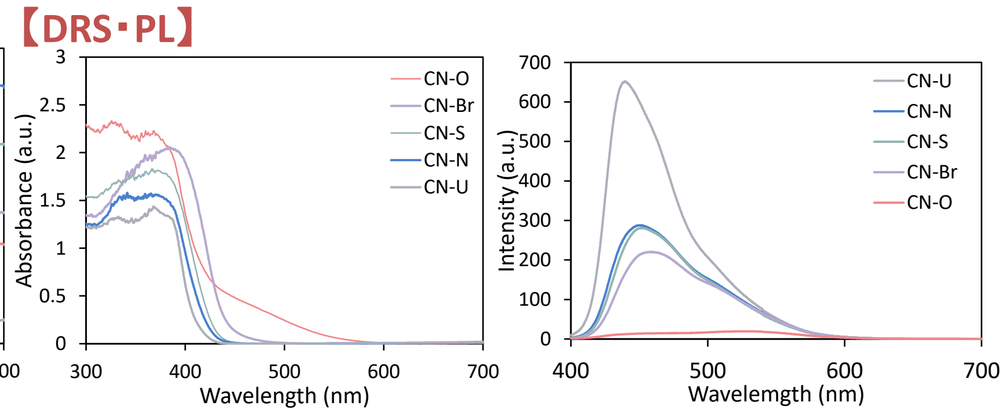


Fig. 8. UV-vis absorption and PL spectra of photocatalysts.

From XRD・FT-IR, typical structure of g-C_3N_4 was maintained.
From DRS・PL, Optical absorption in the visible light region was increased and recombination of electron-hole pairs was suppressed.

CONCLUSION

- Successful calcined of g-C_3N_4 incorporating heteroatoms
- CN-N showed the best photocatalytic activity
- We think this is due to improved optical properties resulting from the incorporation of heteroatoms.

FUTURE WORK / REFERENCES

- Perform characterization
- Consider other heteroatoms (ex. Cl, Pyridine ring…)
- Consider the amount of Photocatalyst used in the experiment