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# Application of MIL-88/g-$C_3N_4$ Nanocomposite Photocatalyst in Organic Pollutant Degradation in Water

**Chung-En Tan[1], En-Chin Su[2], Ming-Yen Wey[1]**
[1]Department of Environmental Engineering/ National Chung Hsing University
Taichung 402, Taiwan, ROC
d108063001@mail.nchu.edu.tw; ecsu1014@nuk.edu.tw
[2]Department of Civil and Environmental Engineering/ National University of Kaohsiung
Kaohsiung 811, Taiwan, ROC
mywey@dragon.nchu.edu.tw

## Extended Abstract

Metal-organic frameworks (MOFs) are widely used materials due to their diversity and porous properties. Moreover, MIL-88A (M88A) belongs to the MIL series, which are one of the many branches of MOFs. It has gained attention for its potential applications in photocatalytic processes for water pollution treatment due to its good optical properties, stability in water, and ability to be synthesized in a green way without the need for organic solvents in aqueous phase. In addition, graphite-like carbon nitride (g-$C_3N_4$ or CN) is a highly sought-after photocatalytic material due to its good light absorption properties and excellent physical and chemical stability, which offer potential for photocatalytic applications. However, its low specific surface area and adsorption capacity limit its applications.

Therefore, this study aims to develop a heterojunction photocatalyst consisting of M88A and CN nanosheets. In our previous research, we developed mixed imidazole ligand M88A nanorods (IFM8) [1]. Compared to conventional M88A, IFM8 has smaller nanoscale dimensions and significantly improved adsorption capacity. However, the commonly encountered problem of photogenerated charge recombination in single photocatalytic materials limits the photocatalytic application of IFM8. When IFM8 is combined with CN, IFM8 can provide more active sites and strong oxidative photogenerated holes, while the presence of CN can enhance charge separation and reduce charge recombination. Additionally, the relatively high oxidation potential of CN allows for the generation of highly reactive superoxide radicals, which can significantly enhance the overall photocatalytic activity of the system.

Preliminary tests showed that the CN/MIL-88A composite semiconductor, when used for photocatalytic degradation of organic matter under simulated sunlight, achieved more than 99% decomposition of 30 ppm azo dye AR1 within 60 minutes and maintained a dye decomposition rate of over 80% after three cycles of use. Subsequently, CN/MIL-88A will be used to degrade emerging pollutant tetracycline. Furthermore, various physical and chemical characteristics, optical and electrochemical analyses will be performed to investigate the main factors contributing to the enhancement of photocatalytic efficiency by CN/MIL-88A composite material.

## References

[1] C. E. Tan, E. C. Su, and M. Y. Wey, "Mixed imidazole ligand MIL-88A for enhanced photo-Fenton decomposition of azo dye," *Solar Energy*, vol. 246, pp. 89-103, 2022.