Insight into the role of light exposure in radical-driven decomposition of graphitic carbon nitride

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Background

➢ **2D Graphitic carbon nitride (g-C_3N_4):** a promising engineered nanomaterial

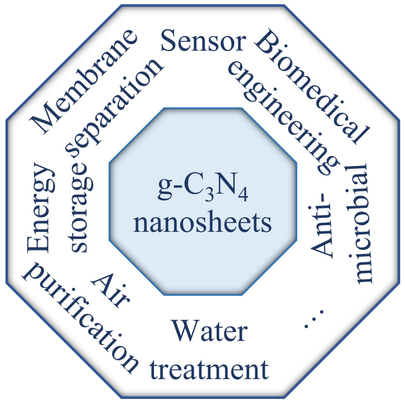

Figure 1. Various applications of g-C_3N_4 nanosheet

❖ >5800 publications by October 2021
❖ Global market is expected to grow

➢ **Release into nature is inevitable**
➢ **Chemical transformation kinetics and pathways remain unknown**

Objectives

➢ Systematically study the **influence of light exposure on the decomposition of g-C_3N_4 nanosheets**

➢ Provide a fundamental **understanding of the decomposition pathway**

Methods

1. Use different methods to synthesize two g-C_3N_4 nanosheets, D and M2

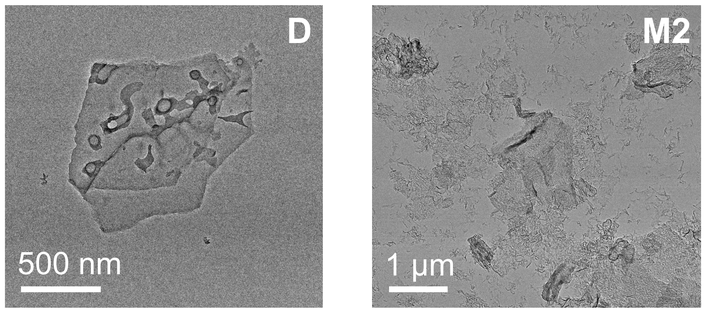

Figure 2. Transmission electron micrograph of D and M2

M2 has better photoreactivity and more pores, edges, and defects.

2. Continuously feed O_3 (and H_2O_2) to create a high concentration of hydroxyl radical (**•OH, 10^{-13}-10^{-12} M**)

3. Use LED lamps that irradiate photos at **395 nm (L1), 455 nm (L2), and 525 nm (L3)** to excite D and M2

Results

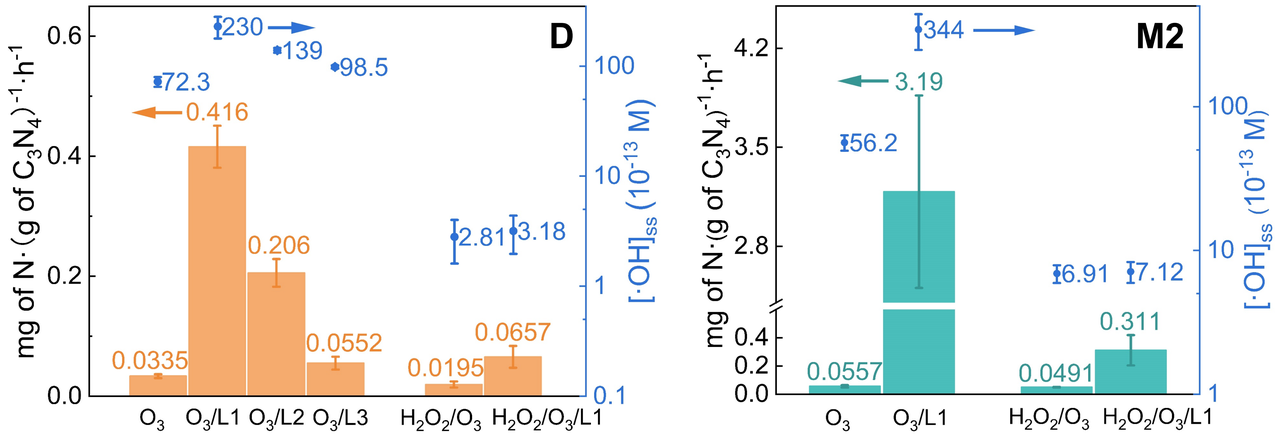

Figure 3. Nitrogen release rate (**decomposition rate**) of D and M2 under various experimental conditions

➢ ***Light exposure and photoreactivity play an essential role in g-C_3N_4 decomposition***

Results

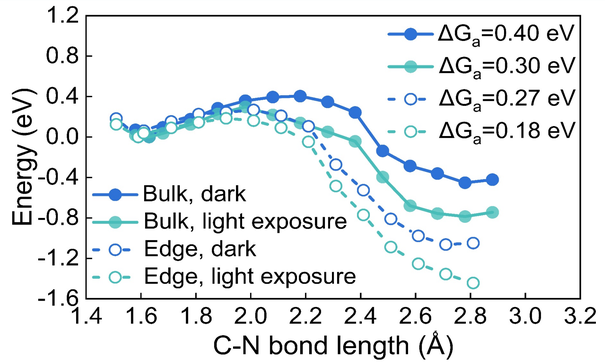

Figure 4. Energy profile for a bulk-phase or edge-site heptazine unit in the dark or under light exposure (with a h^+)

➢ ***Synergistic effect of •OH and h^+***

Conclusions

Figure 5. ***g-C_3N_4 decomposition in the dark***

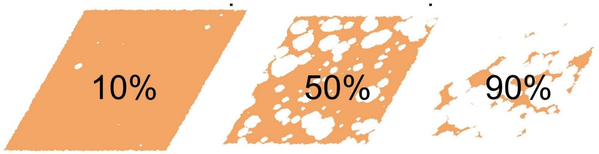

Figure 6. ***g-C_3N_4 decomposition under irradiation***

Publication

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