Electro-tailored carbon nitride oxide structure and reactivity with enhanced photoactivity

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The design of efficient photocatalysts is crucial for addressing current environmental and energy challenges [1]. Carbon nitride stands out as a promising metal-free semiconductor, yet conventional thermal synthesis typically yields materials with limited surface reactivity and suboptimal charge separation [2,3].
In this work, we present a fast, room-temperature galvanostatic route to produce highly oxidized carbon nitride (CNO) from melamine in alkaline media. This method enables direct incorporation of oxygen-containing functionalities and controlled formation of CN oligomers, thereby tuning both the electronic structure and surface chemistry of the material. By adjusting the applied electrochemical current density, we obtained CNO samples with enhanced light absorption and improved electron-hole separation efficiency.
Structural and compositional analyses confirmed the successful formation of oxidized CN frameworks and the impact of the electrosynthetic parameters on polymerization and defect formation. The photocatalytic performance, evaluated through Rhodamine B degradation under simulated solar irradiation, showed a remarkable activity enhancement compared with thermally derived g-C_3N_4.
This study highlights electrochemical synthesis as a versatile and scalable strategy for engineering advanced carbon-nitride-based photocatalysts for environmental applications.

References

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Figures

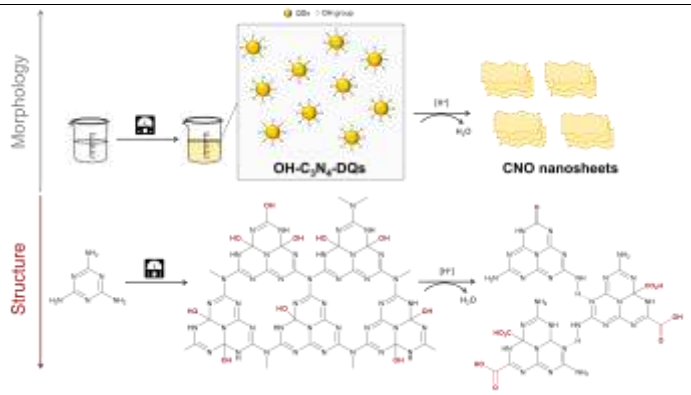

Figure 1: Scheme of the morphological and structural evolution of CN materials during electrosynthesis