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Improving Methane Selectivity of Photo-Induced CO_2 Reduction on Carbon Dots through Modification of Nitrogen-Containing Groups and Graphitization

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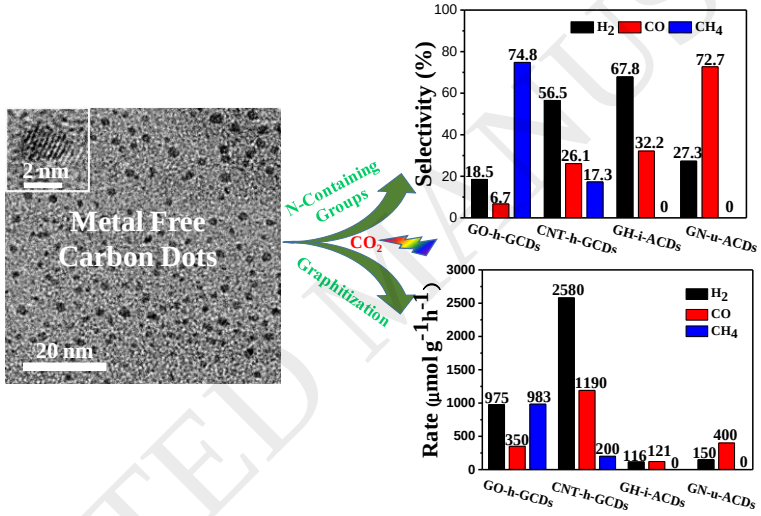
Graphical Abstract



Highlights

- Carbon dots without metal loaded can serve as an efficient photocatalyst for reducing CO_2.
- The aromatic planes can stabilize photogenerated electrons and promote CO_2 reduction reactions.
- Nitrogen-containing groups can chemisorb CO intermediate and lead to high selectivity of methane.

Abstract

The photocatalytic performance of carbon dots is strongly related to surface modifications and graphitization. Herein, we show that carbon dots without metal loaded can serve as an efficient photocatalyst for reducing CO_2. The conjugate carbon great π could stabilize the photogenerated electrons, which turned out to improve the separation of the photogenerated electron-hole pairs and can kinetically promote interfacial reaction. Besides, the strong chemisorption of the nitrogen-containing groups on the carbon dots to the CO would help to further conversion of the intermediate in the demonstrated CO_2 photo-reduction systems. As a result of these merits, the highly graphitized