

Review

# 2D Personality of Multifunctional Carbon Nitrides towards Enhanced Catalytic Performance in Energy Storage and Remediation

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**Citation:** Inwati, G.K.; Yadav, V.K.; Ali, I.H.; Vuggili, S.B.; Kakodiya, S.D.; Solanki, M.K.; Yadav, K.K.; Ahn, Y.; Yadav, S.; Islam, S.; et al. 2D Personality of Multifunctional Carbon Nitrides towards Enhanced Catalytic Performance in Energy Storage and Remediation. *Appl. Sci.* **2022**, *12*, 3753. <https://doi.org/10.3390/app12083753>

Academic Editors: Claudia Barile and Gilda Renna

Received: 24 February 2022

Accepted: 29 March 2022

Published: 8 April 2022

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**Abstract:** Numerous scholars in the scientific and management areas have been overly focused on contemporary breakthroughs in two-dimensional objects for multiple prospective applications. Photochemical and electrocatalytic functions of integrated circuits associated with multi-component tools have been enhanced by designing the macro- and microstructures of the building blocks. Therefore, the current research attempts to explore a larger spectrum of layered graphitic carbon nitrides ( $g\text{-C}_3\text{N}_4$ ) and their derivatives as an efficient catalyst. By executing systematic manufacturing, optimization, and evaluation of its relevance towards astonishing energy storage devices, adsorption chemistry, and remediation, many researchers have focused on the coupling of such 2D carbon nitrides combined with suitable elementals. Hybrid carbon nitrides have been promoted as reliable 2D combinations for the enhanced electrophotocatalytic functionalities, proved by experimental observations and research outputs. By appreciating the modified structural, surface, and physico-chemical characteristics of the carbon nitrides, we aim to report a systematic overview of the  $g\text{-C}_3\text{N}_4$  materials for the application of energy storages and environments. It has altered energy band gap, thermal stability, remarkable dimensional texturing, and electrochemistry, and therefore detailed studies are highlighted by discussing the chemical architectures and atomic alternation of  $g\text{-C}_3\text{N}_4$  (2D) structures.

**Keywords:** carbon allotropes; 2D atomic structures; surface alteration; energy storage; environmental concerns

## 1. Introduction

Over the last several years, rapid innovations in the field of innovations and research have enabled to upgrade the effectiveness and development of humankind, while the latest