

The role of surface and structural functionalisation on graphene adsorbent nanomaterial for CO₂ adsorption application : Recent progress and future prospects

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ABSTRACT

Recent progress in carbon dioxide (CO₂) capture technologies using adsorption techniques has resulted in advances in the fabrication of solid adsorbents. Graphene (2D carbon-based category) nanomaterials have the potential for CO₂ capture, owing to their abundantly available material sources, graphitic properties, sole porosity, stability, and cost-effectiveness. Graphene also demonstrates versatility toward numerous functionalisation and modification approaches with numerous agents. This significantly alters its physicochemical properties and adsorption capability, which will consequently improve the CO₂ capture performance. Therefore, it is important to provide a review of the cutting-edge of graphene-based nanomaterial adsorbent studies on CO₂ adsorption. This review covers various modification approaches, including surface functionalisation/modification (e.g., by using an amine, N-doping, and ionic liquid) and nanomaterial composite with other suitable materials and their effect on CO₂ adsorption performance. A number of factors affecting CO₂ capture behaviour are discussed thoroughly in order to gain a better understanding of the CO₂ capture's enhancement mechanism. Furthermore, the direction for upcoming studies presented in this review are anticipated to guide the expansion of novel graphene-based CO₂ capture systems.

KEYWORDS

Adsorption capacity; Graphene-based; Porous carbonaceous; Solid adsorbents

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