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REVIEW PAPER

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A review on carbon nanomaterials for K-ion battery anode: Progress and perspectives

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Summary

Li-ion batteries (LIBs) are being used extensively in a wide range of applications owing to the facile preparation technology as well as a high energy density, which exceeds those of other commercial batteries. However, LIBs alone cannot satisfy the burgeoning energy demand due to Li-resource constraints. Recently, K-ion batteries (KIBs) have garnered the interest of the scientific community as promising alternatives for LIBs due to the abundance of K resources, the affordability of K, and its superior electrochemical properties. However, the development of KIBs is hindered by the slow development of appropriate anode materials that can accommodate the repeated intercalation/deintercalation of large K ions without sustaining significant structural damage. Thus, the development of appropriate anode materials is crucial for the realization of practically viable KIBs. Carbon nanomaterials are promising anode materials due to their remarkable potassiation/depotassiation ability, structural stability, and structural evolution from zero to three dimensions. It is anticipated that an evaluation of the recent advances in carbon and their composites anode materials for KIBs can facilitate the development of practically viable KIBs. This review comprehensively discusses recent developments in carbonaceous and their composites as anode materials for KIBs and provides a prospective for the next research step.

KEYWORDS

anode, carbon materials, K-ion battery, nanomaterials

1 | INTRODUCTION

The growing energy demand associated with urbanization, lifestyle changes, and an increasing population is driving the depletion of conventional, nonrenewable energy resources such as petroleum, coal, and natural gas; to avoid further depletion and mitigate climate change, it is imperative to ensure that the technology

