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Recent trends in synthetic Top-down approach for Mesoporous Carbon: A seminal review

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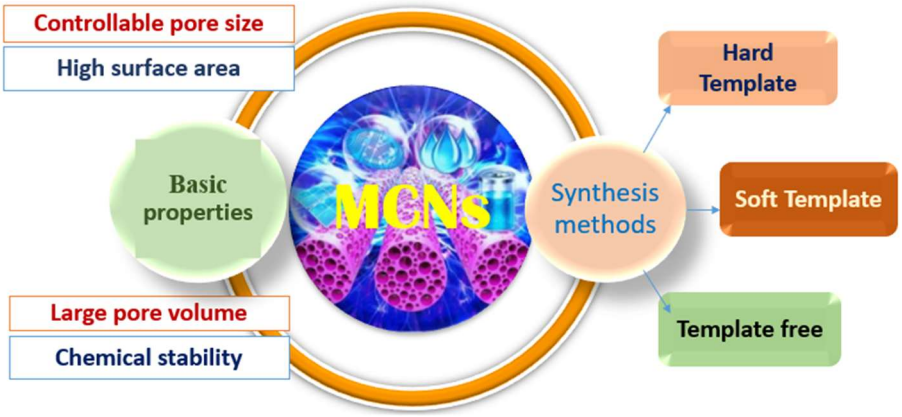
Review



ABSTRACT This review is focused on the different synthetic methods of mesoporous carbon for exotic applications. In the 21st century, doped carbon nanostructures and composites have cutting-edge applications in materials sciences due to their superior physicochemical properties. Porous carbon has enticed material scientists because of its excellent properties like ordered porous structure, tunable pore size, and high specific surface area. As a result, the extensive studies on the synthesis and modification of mesoporous carbon are being performed. The most enticing approaches for synthesis of ordered mesoporous carbon are hard template and soft template methods. On the other hand, non-templating pathways are equally important to synthesize mesoporous carbon as that are templating pathways. This report includes details of different synthetic methods for synthesis of mesoporous carbon materials by templating as well as non-templating methods.

Keywords: Synthetic methods; Carbon Nanomaterials; Mesoporous, template methods, non-template method,

INTRODUCTION

In recent times, the significance of nanomaterials has risen significantly due to their remarkable characteristics; as a result, researchers are concentrating on new approaches in the field of materials science to modify the physicochemical properties of nanomaterials by incorporating carbon nanomaterials. The carbon and synthesis of mesoporous carbon nanomaterials are of trending topics in the scientific community.[1,2] The designing of mesoporous carbon nanomaterials with unique properties and controllable porous structure.[3,4] high specific surface area, large pore volume,[5] and excessive stability has gained enormous curiosity from scientists around the globe. Porous carbon nanomaterials can be synthesized using a variety of techniques, including hard template synthesis, template-free method, hydrothermal carbonization, mechanochemical assembly, nano casting, and soft template.[6-16] These techniques provide several benefits. Carbonaceous solids can be produced from biomass without the need for an energy-intensive drying process attributable to an ordered mesoporous structure, a simple and adaptable approach, the ability to retain small particle sizes during carbonization, easy synthesis, and control, etc. Mesoporous carbon materials with their distinctive physicochemical characteristics, tunable pore size, and uniform structure frame it a perfect skeleton for various applications such as electrochemical energy storage, adsorption, catalysis, sensing, and biomedical applications.[17-24]

The term "mesoporous material" refer to a material containing a pore diameter between 2 to 50 nm. The method for the production of mesoporous ordered carbon was initially established by scientist Ryoo *et al*. Mesoporous material can be ordered or disordered in a mesostructure. And the ordered

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