

Smart Nanomaterials Technology

Archana (Joshi) Bachheti
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Carbon-Based Nanomaterials

Synthesis, Agricultural, Biomedical, and
Environmental Interventions

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Smart Nanomaterials Technology

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Biomedical Applications of 1D and 2D Carbon-Based Nanomaterials



Tahmeena Khan, Saman Raza, and Qazi Inamur Rahman

Abstract Biomedical applications of nanomaterials have gained attention because of their pivotal role in the improvement of human health. As compared to bulk material, nanomaterials have improved diagnostic and therapeutic applications. Carbon-based nanomaterials have remarkable potential for biomedical applications like biosensing, drug delivery, and gene therapy. Carbon-based one-dimensional (1D) and two-dimensional (2D) materials have excellent thermal, mechanical, and optical properties and possess structural diversity. Carbon has several interesting allotropes, like carbon nanotubes (CNTs), graphene oxide (GO), and graphene quantum dots (GDQs). These allotropes have been associated with numerous biological applications like biosensing and drug delivery. This chapter explores the biomedical applications of 1D and 2D carbon-based nanomaterials, including CNTs, graphene, GO, and reduced graphene oxide (RGO). The structural features and their specific applications in the biomedical field have been elaborated, taking examples from the literature. Potential toxicity risks on living organisms and the environment are also discussed, along with their applications. It is pertinent to comprehend their interaction with living systems to use them for biomedical applications.

Keywords Carbon-based nanomaterials · Graphene · Biomedical · Drug delivery · Biosensing

1 Introduction

Nanotechnology is a fast-emerging field of science and technology that uses substances and techniques at the nanoscale, i.e., 10^{-9} m in dimension [1–9]. The very small size imparts unique characteristics owing to a large surface area to volume

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