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Review

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2D materials for next generation healthcare applications

Ashtami Jayakumar, Anju Surendranath, Mohanan PV*

Toxicology Division, Biomedical Technology Wing
Sree Chitra Tirunal Institute for Medical Sciences and Technology,
Poojappura, Thiruvananthapuram 695 012, Kerala, India

*Corresponding Author: Dr. PV. Mohanan
Email: mohanpv10@gmail.com or mohanpv@sctimst.ac.in
Phone: 91-471-2520266, Fax: 91-471-2341814

Abstract
2 dimensional (2D) materials are budding new class of materials with exciting potential in optical, electrical, chemical and biomedical applications. Inspired by the attractive properties of graphene attributing to its 2D structure has stimulated researchers to hunt for new 2D materials. Unique characteristics like high surface-volume ratio, shape, surface charge, anisotropic nature and tunable functionalities of 2D structures opens up its application scope further. 2D materials have marked their impact on a wide range of area notably material science, optoelectronics, engineering and biomedical science. Currently, researchers are focusing on developing new 2D materials and functionalizing 2D materials to achieve desired properties. This review underlines the recent renovations done to 2D materials so as improve its functionality and biocompatibility. Growing trend towards exploring the potential of 2D materials for biomedical applications including targeted drug delivery, imaging, photothermal therapy, tissue engineering and regenerative medicine emphasize the need to consider its biosafety. Large surface area of 2D materials increases chances of exposure of these materials towards cells which in turn shoots up the possibility for cellular interactions augmenting chances of potential toxicity. The present review concludes that the 2D materials are promising choice for next generation biomedical device development.

Keywords:2D material, drug delivery, imaging, biocompatibility, safety, biomedical

1. Introduction

Dimensionality is one of the major factors in determining material properties. The influence of dimensionality is evident from the fact that graphene, a 2D material, exhibit distinct properties in comparison with fullerene (0D), carbon nanotubes (1D), graphite or diamond (3D), although all are allotropes of carbon. Milestone discovery of graphene and its widespread applications in diverse fields has attracted world focus. Fascinating properties of graphene attributing to its 2D structure has triggered a pursuit for other 2D materials (1). 2D materials are the class of materials having one dimension in nanoscale (<100 nm). In the last few years, much attention has been focused on developing graphene analogs having single layers or layers of few atom thickness held together by van der Waals forces. Currently, researchers are focusing on developing new 2D materials and improvising existing materials to improve their physical, chemical and