Nanotechnology, Graphene Family, and MXenes at the Forefront of Scientific Innovation

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Abstract

Nanotechnology is a forefront of scientific innovation for creating solution of tissue engineering, drug delivery, electronic, photonics, energy generation and storage, and biosensing. The covid#19 detection and diagnosis have been effectively done by nanomaterials or nanoscience for last few years. The surface functionalization, physiochemical, and electron transfer rate of graphene family nanomaterials are highly visible in literature.

Keywords; Electroadhesion, Material properties, Electron transfer rate, Biofunctionalization

1. Introduction

Richard Feynman delivered a talk on December 29, 1959 called "There's plenty of room at the bottom" at an annual meeting of the American Physical Society Caltech published in 1960 laid the foundations present nanotechnology by conceptualization of things could be miniaturized [1]. The design and development of biological macromolecules had opened a path of nanotechnology in manipulating biological materials [2]. Drexler "*Engines of Creation*" advances the nanotechnology to create bionic molecules capable of structuring useful quantity for scientific innovation in the 21st century [3]. The Feynman vision of nanotechnology based on nanomachines structured from atom-by-atom regulation promises scientific and technological opportunities in facing global useful perspectives [4-5]. The nanotechnology is one of the six technologies due to the emerging trend of patent registrations at inventing nanomaterials of order billionth of a meter of self-organizing mechanochemical nanoparticles properties, opens new dimensions in exploiting nature nanoparticles, and increasing the industrial productivity [6]. Nanoscience is omnipresent in modern technology from Faraday's electro-rubbing to molecular domain (1 to 100 nm scale) for several potential biological and mechanical applications [7]. The effective visualization of nanoscience and nanotechnology (Fig. 1) have been seen at science-policy-society interface in multiple applications.

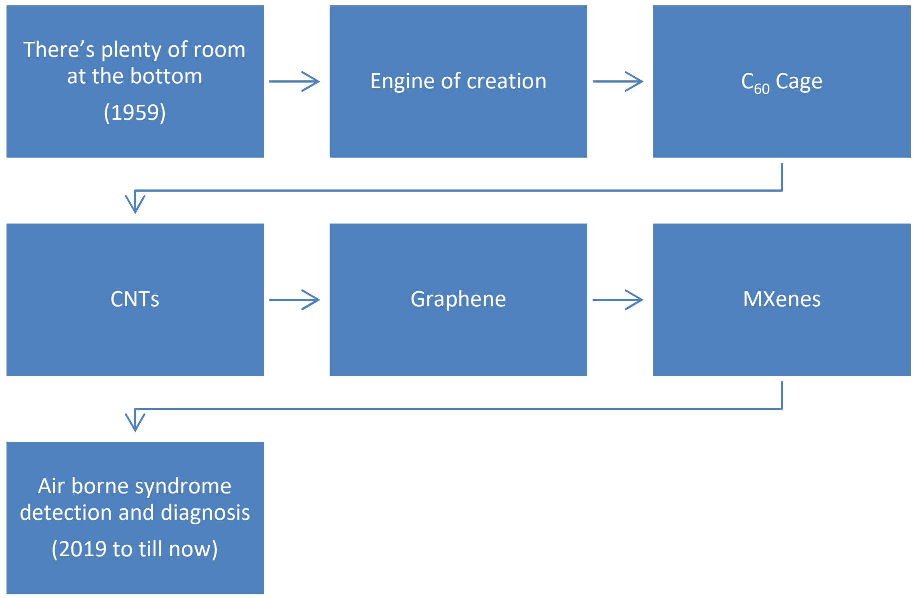

Fig. 1 The illustration of nanoscience, graphene family, and the rise of MXenes

2. Functionalization

The nanotechnology application in medicine, healthcare, and tissue engineering has been preferred to defeat the most prevailing cardiovascular and cancer diseases [8]. Nanoparticles of thickness 2–10 atoms or less than 100 nm could invade body immune systems theoretically behave like quartz dust or asbestos particles to damage respiratory system [9]. Epidemiological investigations have shown that particulate air pollution not only exacerbations of illness in respiratory disease but also rises in the mortality from biomedical disease amongst elderly [10]. Nanotechnology is advancing technology and industry sectors such as information technology, medicine, energy, food safety, and environmental science, among many other applications for rapidly growing list of benefits [11]. The Lithium-Ion Batteries (LIBs) are fast emerging due to nanotechnology in energy storage, higher energy density, lower cost of production, fast charging, and life span with the involvement of high surface electronic surface functionalities graphene cathode [12-14]. The achievement of a tangible biomechanical impact is crucial in consideration of the early stages of research and socio-economic aspects linked to the nanotechnologies have to be applied to empower local communities for their needs.

3. Nanomaterials: Graphene family/MXenes

Nanotechnology and nanoscience have been advancing scientific innovation at the forefront of 21st century. The involvement of carbon nanomaterials such as graphene, Graphene oxide (GO), few layers of graphene (FLG), carbon nanotubes (CNTs), and

Carbon Dots (CDs) useful for applications [15]. The 21st century is extrapolated with the discovery of the unique physicochemical properties of single-layer graphene and two-dimensional nanomaterials led to both a new wave of research towards novel nanomaterials such as metal dichalcogenides and boron nitride. The MXene research has focused primarly MXene, $Ti_3C_2T_x$ and use it without specifying the composition as there are numerous structures and compositions of MXenes [16]. The sustainability, climate action, and transformation of energy sector towards high energy density batteries may be achieved in involving nanoscience.

Conclusions

- Ultra-electron transfer performance of nanomaterials such as graphene, GO, FLG, CNTs, and carbon dots
- Biofunctionalization in biosensing, cytotoxicity, tissue engineering, and covid#19 detection or diagnosis
- Surface functionalities, electroadhesion, and socioeconomic demand for design and manufacturing of LIBs in reducing environmental reactions for achievement of net zero emission by 2050
- Transforming MEMS to NEMS as per the nanoscience requirement of 21st century

Author Contribution

Author wrote paper

Conflict of Interests

None conflict of interests to declare

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