

Graphene-based nanocomposites and their fabrication, mechanical properties and applications

AKM Asif Iqbal^a, Nazmus Sakib^a, A. K. M. Parvez Iqbal^b, Dewan Muhammad Nuruzzaman^a

^a Faculty of Manufacturing and Mechatronic Engineering Technology, University Malaysia Pahang (UMP), 26600, Pekan, Pahang, Malaysia

^b Department of Mechanical Engineering, International University of Business, Agriculture and Technology (IUBAT), Uttara Model Town, Dhaka-1230, Bangladesh

ABSTRACT

Graphene, the thinnest two-dimensional atomic material, has emerged as a revolutionary material and sparked a flurry of research and innovation owing to its outstanding mechanical, electrical, optical and thermal properties as well as high specific surface area. Graphene-based materials and their composites possess promising applications in a wide range of fields such as sensors, actuators, electronics, biomedical aids and membranes. In this review paper, a critical and comprehensive review has been carried out on the synthesis process and mechanical properties of graphene and graphene-based nanocomposites. Firstly, the concept and structure of graphene materials are discussed then different synthesis techniques and their advantages and limitations have been reviewed. The addition of graphene and its derivatives in producing different polymer and metal-based nanocomposite as well as fabricating hybrid nanocomposite has been thoroughly reviewed. Almost all the papers show that the presence of graphene even at very low loadings can provide significant improvement to the final material. Besides, other parameters that affect the nanocomposite are thoroughly reviewed. Furthermore, the perspective application of graphene materials and its nanocomposite in different promising fields has been discussed.

KEYWORDS

Graphene; Graphene derivatives; Nanocomposite; Synthesis; Application

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