

# NANOMATERIALS AND POLYMER NANOCOMPOSITES

Shera Mathew and Siby Varghese

Rubber Research Institute of India, Kottayam- 686009, Kerala, India

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Nanotechnology is recognized as one of the highly promising areas for technological development in the 21<sup>st</sup> century. Polymer nanocomposite is a rapidly emerging multidisciplinary research activity whose results could broaden the applications of polymers for the benefit of many industries. This article reviews different types of nanomaterials used for the preparation of polymer nanocomposites with special reference to rubber nanocomposites. The role of nanotechnology and its global outlook has been summarized. Different types of nanomaterials and their physical and chemical properties have been discussed in detail. It focuses on the general properties of the nanocomposites, their classification and routes of synthesis. Preparation of polymer nanocomposites derived from various nanomaterials, especially nanoclays; their morphological analysis, filler dispersion have been described. The techniques used for the characterization of polymer nanocomposites and their physical properties have been discussed categorically. The major challenges in nanotechnology research have been categorized in terms of the structures from nano to micro levels. Recent developments in natural rubber latex based nanocomposites and their blends with synthetic latices have been discussed. The application of polymer nanocomposites, especially in the packaging and automobile industries have been summarized.

**Keywords:** Aspect ratio, Layered silicate, Nanocomposite, Natural rubber latex

## INTRODUCTION

Generally nanotechnology deals with structures of size 100 nm or smaller in dimension and it involves in developing materials or devices within this size. Nanotechnology is very diverse, ranging from extensions of conventional methods to completely new approaches based upon new materials with dimensions on the nanoscale. The particles with size in the range from a few to several tens of nanometers were explained by Shiba *et al.* (2012). There has been much debate on the future implications of nanotechnology. It has

the potential to create new materials and devices with a wide range of applications, especially in medicine, electronics and energy production. On the other hand, nanotechnology raises many of the same issues as with the introduction of any new technology, including concerns about the toxicity and environmental impact of nanomaterials and their potential effects on global economics.

### The global outlook on nanotechnology

Nanocomposites are expected to penetrate into a number of key packaging