

Chapter 1

Overview of Functional Nanomaterials

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ABSTRACT

The purpose of this introductory chapter is to define the concepts of functional nanomaterials in science and technology. It will also highlight the fundamental characteristics of these materials in research. It also aims at emphasizing the role and importance of functional nanomaterials in various useful aspects. As research is the main tool of creating knowledge, different methods used by researchers are also briefly discussed here. This chapter will also develop a frame of reference for studying the various chapters that follow. These chapters form a modified core of functional nanomaterials and its applications in forensic investigation.

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PREVIEW

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Scientific Objectives

1. Describe overview of functional nanomaterials.
2. Describe aim and scope of functional nanomaterials as a field of scientific study.
3. Explain the structure and analyze the importance of functional nanomaterials for applications.
4. Evaluate common methods of simulation and modeling of functional nanomaterials.

Functional Nanomaterials

Over the last decade, the prefix “nano” has been increasingly prevalent in a variety of study. Nanoscience, nanomaterials, nanotechnology and nano chemistry are only a few of the new nano-related terminology that have become widely known, even among non-experts, in scientific studies, popular literature, and newspapers. The prefix nano is derived from the ancient Greek, which is copied from the Latin nanus, which way dwarf, by extension, and little. It is used to represent a 10⁹-fold reduction factor according to the International System of Units (SI) agreement. As a result, the nanoscale universe is measured in nanometers (1nm = 10⁻⁹ m) and includes systems that are larger than molecular dimensions but smaller than macroscopic ones. Nanotechnology is the study of very small things. It change the use and influence of materials on a very small scale. Molecules and atoms acquit differently at this size, allowing for several unhoped and provocative applications. Studies in nanotechnology and nanoscience have exploded in popularity in recent years across a wide range of product categories. It opens up possibilities for the production of new substantial, including those for medical uses, when traditional methods may be limited. Nanotechnology should not be regarded as a single approach with limited applications. Nanotechnology does not only relate to exceedingly small buildings and products, despite its common moniker of “little science.” In bulk materials and huge surfaces, nanoscale characteristics are frequently integrated. Nanotechnology entails the planning, development, and manufacture of nanoscale objects.

Nanoparticle Classification

Nanomaterials can be classified using a variety of methods. Nanoparticles are divided into different dimensions: one, two, and three

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