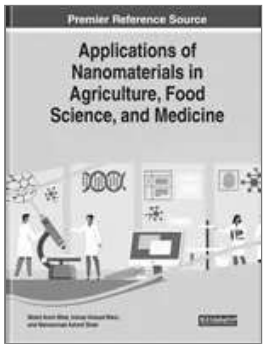

Applications of Organic Chemistry in Nano-Medicine: Current and Future Prospects

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Abstract

Nanotechnology offers multiple benefits. Nanomedicine and nanodelivery systems are relatively new areas in nanotechnology. There are number of outstanding applications of the nanomedicine in diagnosing diseases, delivering drugs to its target location, and thus treating human diseases. Here materials in the nanoscale range are employed to serve as means of diagnostic tools and also to deliver precise medicines to specific targeted sites in a controlled manner. Also, metal nanoparticles offer great interest in modern chemistry and materials research because of their applications in diverse fields such as photochemistry, nanoelectronics, optics, and catalysis. Chemistry provides various nanostructured materials either synthetic or isolated from natural sources offers opportunities and challenges in drug delivery and their applications including biomedical imaging, biosensing, diagnostic, and therapy. Thymoquinone, a bioactive compound in Nigella sativa, after encapsulation in lipid nanocarrier, has been found to show six-fold increase in bioavailability in comparison to free thymoquinone. In addition to this, organic nanomaterials have recently become of great interest for photovoltaic applications also.

Chapter Preview

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Introduction

Science of the new era in nanomedicine has lot of application. It is used in drug designing, drug delivery, electronics and in various other industries. It involves manipulating matter at the atomic or molecular scale. A nano particle is generally of 100 nm or less in size. But usually the nano particles utilized in drug delivery are 100- 200 nm. Materials are designed at the atomic or molecular level by changing their dimensions, surface properties, compositions etc. their physiochemical properties can also be changed. Nanoparticles have different surface to volume ratios. Through nanotechnology diseases are diagnosed early. The medicines used at nanoscale leads it to the early and required treatment of the diseases at the micro level. Since nano-materials are common in the organic, inorganic, and biological fields therefore, modern smart nano structured systems are broadly divided into organic and inorganic nanocarriers.

Nanomedicine research is one of the fastest growing areas of research in nanotechnology and it revolutionise healthcare and medicine through transformative new diagnostic and therapeutic tools. Chemistry provides advances in nanomedicine and new functional materials as well as state-of-the art biochemical and analytical techniques. Various nanostructured materials have been synthesized for diverse applications, including biomedical imaging, biosensing, diagnostics and therapy. Their size-dependent physical properties and nanometer-scale dimensions play important roles in biological systems. Also various types of highly sensitive nanosensors are synthesized for biomarker detection. A variety of organic or inorganic nanoparticles have been synthesized with sizes ranging from several to several hundred nanometers, and many of them have shown important role in biomedical applications due to their tunable sizes, high agent loadings, prominent surface chemistry, controllable drug release kinetics, improved biocompatibility, and enhanced tumor accumulation through passive tumor targeting, the enhanced permeability and retention (EPR) effect, or active tumor targeting (Davis et al., 2010; Kim et al., 2013). Nanoscale materials allow the implementation of highly effective imaging techniques, such as magnetic resonance imaging (MRI), positron emission tomography (PET), computed tomography, and optical imaging () as Shown in figure1.

Figure 1.
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