

# Nanotechnology and its Application in Dentistry

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## Abstract

Nanotechnology influences almost every facet of everyday life from security to medicine. The concept of nanotechnology is that when one goes down to the bottom of things, one can discover unlimited possibilities and potential of the basic particle. In nanotechnology, analysis can be made to the level of manipulating atoms, molecules and chemical bonds between them. The growing interest in the dental applications of nanotechnology is leading to the emergence of a new field called nanodentistry. An electronic database search that included PubMed, MedLine, and Cochrane library was conducted. Key words used in the search are nanotechnology dentistry and applications. Language limitation was set as articles reviewed were only those written and published in English language. We did not search the gray literature. Initially, 52 articles were retrieved from the database, and articles considered were those published from 2008 to 2013. Eight articles that met the selection criteria were eventually selected and reviewed.

**Keywords:** Application, Biotechnology, Dentistry, Nano

## Introduction

### Definition

Nanotechnology or nanoscience refers to research and development of an applied science at the atomic or molecular level (i.e. molecular engineering, manufacturing).<sup>[1]</sup> The word "nano" is said to be derived from the Greek word which stands for "dwarf".<sup>[2]</sup> Nanoscale though small in size has vast potential.<sup>[1]</sup> One nanometer is 1 billionth or  $10^{-9}$  of a meter.<sup>[1]</sup> The comparative size of a nanometer to a meter is the same as the size of a marble to the size of the earth. The other way of putting it is that a nanometer is the amount a man's beard grows in the time it takes him to raise a razor to his face.<sup>[3,4]</sup>

### History

The American Physicist Richard Feynman through his lecture titled "there is plenty room at the bottom" delivered at Caltech in 1959 was touted as the one who provided the inspiration for the field of nanotechnology, but it was the Japanese scientist Norio Taniguchi of the Tokyo University of Science who first

employed the term "nano-technology" in 1974.<sup>[5]</sup> However, the term "nanotechnology" as against "nano-technology" was coined by Prof. Kevin E. Drexler in his 1986 book titled *Engines of Creation: The Coming Era of Nanotechnology*.<sup>[6]</sup>

### Concept and production of nanostructures

The basic idea of nanotechnology is to employ individual atoms and molecules to construct functional structures.<sup>[7]</sup> Nanotechnology can be applied to various medical fields like Pharmacological research, clinical diagnosis, supplementing immune system, cryogenic storage of biological tissues, detection of proteins, probing of DNA structure, tissue engineering, tumor destruction via heating (hyperthermia) separation and purification of biological molecules and cells, magnetic resonance imaging (MRI) contrast enhancement, etc. Nanotechnology influences almost every facet of everyday life from security to medicine. The concept of nanotechnology is that when one goes down to the bottom of things, one can discover unlimited possibilities and potential of the basic particle. In nanotechnology, analysis can be made to the level of manipulating atoms, molecules and chemical bonds between them. The various nanoparticles include nanotubes, nanotubes, quantum dots, nanoshells, nanospheres, nanowires, nanocapsules, dendrimers, nanorods, liposomes and so on.<sup>[7,8]</sup> More recently, tiny machines called nanoassemblers that could be controlled by computer to perform specialized jobs have been invented. These nanoassemblers could be smaller than a cell nucleus so that they fit into places that are hard to

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## **Table of Contents Data Sheet Quasarelectronics**

1. Understanding the eBook Data Sheet Quasarelectronics
  - The Rise of Digital Reading Data Sheet Quasarelectronics
  - Advantages of eBooks Over Traditional Books
2. Identifying Data Sheet Quasarelectronics
  - Exploring Different Genres
  - Considering Fiction vs. Non-Fiction
  - Determining Your Reading Goals
3. Choosing the Right eBook Platform
  - Popular eBook Platforms
  - Features to Look for in an Data Sheet Quasarelectronics
  - User-Friendly Interface
4. Exploring eBook Recommendations from Data Sheet Quasarelectronics
  - Personalized Recommendations
  - Data Sheet Quasarelectronics User Reviews and Ratings
  - Data Sheet Quasarelectronics and Bestseller Lists

5. Accessing Data Sheet Quasarelectronics Free and Paid eBooks
  - Data Sheet Quasarelectronics Public Domain eBooks
  - Data Sheet Quasarelectronics eBook Subscription Services
  - Data Sheet Quasarelectronics Budget-Friendly Options
6. Navigating Data Sheet Quasarelectronics eBook Formats
  - ePub, PDF, MOBI, and More
  - Data Sheet Quasarelectronics Compatibility with Devices
  - Data Sheet Quasarelectronics Enhanced eBook Features
7. Enhancing Your Reading Experience
  - Adjustable Fonts and Text Sizes of Data Sheet Quasarelectronics
  - Highlighting and Note-Taking Data Sheet Quasarelectronics
  - Interactive Elements Data Sheet Quasarelectronics
8. Staying Engaged with Data Sheet Quasarelectronics
  - Joining Online Reading Communities
  - Participating in Virtual Book Clubs
  - Following Authors and Publishers Data Sheet Quasarelectronics
9. Balancing eBooks and Physical Books Data Sheet Quasarelectronics
  - Benefits of a Digital Library
  - Creating a Diverse Reading Collection Data Sheet Quasarelectronics
10. Overcoming Reading Challenges
  - Dealing with Digital Eye Strain
  - Minimizing Distractions
  - Managing Screen Time
11. Cultivating a Reading Routine Data Sheet Quasarelectronics
  - Setting Reading Goals Data Sheet Quasarelectronics
  - Carving Out Dedicated Reading Time
12. Sourcing Reliable Information of Data Sheet Quasarelectronics
  - Fact-Checking eBook Content of Data Sheet Quasarelectronics
  - Distinguishing Credible Sources
13. Promoting Lifelong Learning

- Utilizing eBooks for Skill Development
  - Exploring Educational eBooks
14. Embracing eBook Trends
- Integration of Multimedia Elements
  - Interactive and Gamified eBooks

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