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INTRODUCTION AND HISTORY OF NANOTECHNOLOGY

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Abstract: As we all are the part of the era of technology, we should know the changes in the technology. In this paper we will introduce nanotechnology, Nanotechnology research and present applications have experience rapid growth in recent years. Also we have studied the olden times in the field of nanotechnology.

Keywords: Nanotechnology, Rapid Growth

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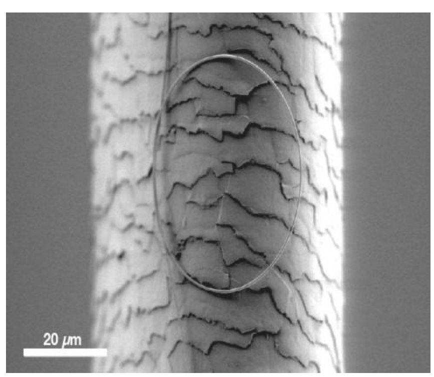
INTRODUCTION

Nanotechnology is the manipulation of matter on an atomic and molecular scale. The earliest, widespread description of nanotechnology[1][2] referred to the particular technological goal of precisely manipulating atoms and molecules for fabrication of macroscale products, also now referred to as molecular nanotechnology. A more generalized description of nanotechnology was subsequently established by the National Nanotechnology Initiative, which defines nanotechnology as the manipulation of matter with at least one dimension sized from 1 to 100 nanometers. This definition reflects the fact that quantum mechanical effects are important at this quantum-realm scale, and so the definition shifted from a particular technological goal to a research category inclusive of all types of research and technologies that deal with the special properties of matter that occur below the given size nanometers scale. It is therefore common to see the plural form "nanotechnologies" as well as "nanoscale technologies" to refer to the broad range of research and applications whose common trait is size. Because of the variety of potential applications governments have invested billions of dollars in nanotechnology research. The United States had the largest contribution of nanotechnology research and China and Korea had the fastest growth rate. Through its National Nanotechnology Initiative, the USA has invested 3.7 billion dollars. The European Union has invested [when?] 1.2 billion and Japan 750 million dollars.[3]

In particular, the things that are less than 100 nanometer in size. One nanometer is 10-9 mater or about 3 atom long. For comparison, a human hair is about 60-80,000 nanometer wide. Scientists have discovered that materials at small dimensions, small particles, thin films etc can have significantly different properties than the materials at larger scale. There are thus endless possibilities for improved devices, structures, and materials if we can understand these differences, and learn how to control the assembly of small stuctures.



Nanotechnology as defined by size is naturally very broad, including fields of science as diverse as surface science, organic chemistry, molecular biology, semiconductor physics, microfabrication, etc.[4] The associated research and applications are equally diverse, ranging from extensions of conventional device physics to completely new approaches based upon molecular self-assembly, from developing new materials with dimensions on the nanoscale to direct control of matter on the atomic scale.

Scientists currently debate the future implications of nanotechnology. Nanotechnology may be able to create many new materials and devices with a vast range of applications, such as in medicine, electronics, biomaterials energy production, and consumer products. On the other hand, nanotechnology raises many of the same issues as any new technology, including concerns about the toxicity and environmental impact of nanomaterials,[5] and their potential effects on global economics, as well as speculation about various doomsday scenarios. These concerns have led to a debate among advocacy groups and governments on whether special regulation of nanotechnology is warranted.

HISTORY:

The concepts that seeded nanotechnology were first discussed in 1959 by renowned physicist Richard Feynman in his talk There's Plenty of Room at the Bottom, in which he described the possibility of synthesis via direct manipulation of atoms. The term "nano-technology" was first used by Norio Taniguchi in 1974, though it was not widely known.

Inspired by Feynman's concepts, K. Eric Drexler used the term "nanotechnology" in his 1986 book Engines of Creation: The Coming Era of Nanotechnology, which proposed the idea of a nanoscale "assembler" which would be able to build a copy of itself and of other items of arbitrary complexity with atomic control. Also in 1986, Drexler co-founded The Foresight Institute to help increase public awareness and understanding of nanotechnology concepts and implications.

Thus, emergence of nanotechnology as a field in the 1980s occurred through convergence of Drexler's theoretical and public work, which developed and popularized a conceptual framework for nanotechnology, and high-visibility experimental advances that drew additional wide-scale attention to the prospects of atomic control of matter. In 1980s two major breakthroughs incepted the growth of nanotechnology in modern era.

First, the invention of the scanning tunneling microscope in 1981 which provided unprecedented visualization of individual atoms and bonds, and was successfully used to manipulate individual atoms in 1989. The microscope's developers Gerd Binnig and Heinrich Rohrer at IBM Zurich Research Laboratory received a Nobel Prize in Physics in 1986.[6][7] Binnig, Quate and Gerber also invented the analogous atomic force microscope that year.

Second, Fullerenes were discovered in 1985 by Harry Kroto, Richard Smalley, and Robert Curl, who together won the 1996 Nobel Prize in Chemistry.[8][9] C60 was not initially described as nanotechnology; the term was used regarding subsequent work with related graphene tubes called carbon nanotubes and sometimes called Bucky tubes which suggested potential applications for nanoscale electronics and devices.

Meanwhile, commercialization of products based on advancements in nanoscale technologies began emerging. These products are limited to bulk applications of nanomaterials and do not involve atomic control of matter. Some examples include the Silver Nano platform for using silver nanoparticles as an antibacterial agent, nanoparticle-based transparent sunscreens, and carbon nanotubes for stain-resistant textiles.[12][13]

Governments moved to promote and fund research into nanotechnology, beginning in the U.S. with the National Nanotechnology Initiative, which formalized a size-based definition of nanotechnology and established funding for research on the nanoscale.

By the mid-2000s new and serious scientific attention began to flourish. Projects emerged to produce nanotechnology roadmaps[12][13] which center on atomically precise manipulation of matter and discuss existing and projected capabilities, goals, and applications.

In the early 2000s, the field garnered increased scientific, political, and commercial attention that led to both controversy and progress. Controversies emerged regarding the definitions and potential implications of nanotechnologies, exemplified by the Royal Society's report on nanotechnology.[10] Challenges were raised regarding the feasibility of applications envisioned by advocates of molecular nanotechnology, which culminated in a public debate between Drexler and Smalley in 2001 and 2003.[11]

CONCLUSION:

Today, many of our nation's most creative scientists and engineers are finding new ways to use nanotechnology to improve the world in which we live. Although there are many research challenges ahead, nanotechnology already is producing a wide range of beneficial materials and pointing to breakthrough in many fields. It has opened scientific inquiry to the level of molecules and a would of new opportunities. They see doctors detecting diseases at its earliest stages and treating illness such as cancer, heart disease and diabetes with more effective and safer medicines. They picture new technology for protecting both our military forces and civilians from conventional, biological and chemical weapons. These researchers envision a world in which new materials, designed at the atomic and molecular level, provide realistic, cost-effective methods for harnessing renewable energy sources and keeping our environment clean.

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