Nanotechnology: A Next Generation Tool

Fareed Hariz*

Nanomaterials and Nanotechnology Department, Central Metallurgical Research and Development Institute (CMRDI), P.O. 87 Helwan, Cairo, 11421, Egypt

Commentary

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***For Correspondence:**

Fareed Hariz,
Nanomaterials and Nanotechnology Department, Central Metallurgical Research and Development Institute (CMRDI), P.O. 87 Helwan, Cairo, 11421, Egypt

E-mail: hfareed@hotmail.com

DESCRIPTION

The tremendous variety of nanotechnology trials and tools to fabricate and characterize ever-smaller structures down to molecular or indeed atomic scales leads to inflexible demands for appropriate, so-called “silent”, premises that permit such susceptible experiments to be implemented. In addition to minimum disturbances inside the laboratory, remote long-range noise sources have to be considered for future-generation laboratories that focus on screening the disturbances and keeping the remaining values at utmost constancy.

Nanotechnology deals with the utilization of low energy and resources, little quantity of nanomaterials are highly effective as compared to large material in bulk quantity. Nanotechnology includes multiple fields like physics, chemistry, mathematics, material science, computer science, bio-instrumentation, environmental science, pharmacy, etc. These considerations of nanoparticles make them more suitable to use in multiple biomedical and clinical applications such as drug delivery, tissue engineering, probing of DNA structure and antimicrobial agents.

There are several important modern developments. The atomic force microscope (AFM) and the Scanning Tunneling Microscope (STM) are two pre versions of scanning probes that introduced nanotechnology. There are other varieties of scanning probe microscopy.

Even though conceptually similar to the scanning confocal microscope developed by Marvin Minsky in 1961 and the scanning acoustic microscope (SAM) developed by Calvin Quate and colleagues in the 1970s, newer scanning probe microscopes have much broader resolution, since they aren't restricted by the wavelength of sound or light.

The tip of a scanning probe can also be operated to manipulate nanostructures (a process called positional assembly). Feature-oriented scanning methodology may be a bright way to implement these nanomanipulations in automatic mode. However, this is quite slow process because of low scanning velocity of the microscope.

Various techniques of nanolithography such as optical lithography, X-ray lithography, dip pen nanolithography, electron beam lithography or nanoimprint lithography were also developed. Lithography is a top-down fabrication technique where a bulk material is reduced in size to nanoscale pattern.

The other groups of nanotechnology techniques include nanotubes and nanowires, which are used in semiconductor fabrication such as deep ultraviolet lithography, electron beam lithography, focused ion beam machining, Nano imprint lithography, atomic layer deposition, and molecular vapour deposition, and further including molecular self-assembly techniques such as those retaining di-block copolymers. The precursors of these techniques preceded the nanotech era, and are extensions in the development of scientific advancements rather than techniques which were devised with the single purpose of creating nanotechnology and which were outcomes of nanotechnology research.

Nanotechnology also has vital role in aquaculture and fisheries sustainability. There many other fields in which nanotechnology could be a new tool for upcoming generation researches.

Anticipating the future of any major technology is difficult. On one hand, there often is a tendency to underestimate the impact of a technology and the pace of its development. Nanotechnology development already is outpacing the predictions framed when the NNI (National Nanotechnology Initiative) was created in 2000. Otherwise, the promise of a technology and the pace of its development may be exaggerated. There are several examples of technological advances that were predicted to be imminent but that hadn't materialized decades, or even centuries, later. A further complication is that a technology can develop in fully unexpected directions and be applied in ways that no one envisaged.