Fundamentals of nanotechnology

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Biological properties

Biotechnology is a form of nanotechnology also known as the wet side of nanotechnology. All the nanomachines of cellular life and viruses are grouped in this category.

Biological systems contain many examples of nanophase materials and nanoscale systems. Biomineralization of nanocrystallites in a protein matrix is highly important for the formation of bones and teeth, and is also used for chemical storage and transport mechanisms within organs.

Biomineralization involves the operation of delicate biological control mechanisms for the synthesis of materials with well-defined characteristics such as particle size, crystallographic structure, morphology and architecture.

Biological properties

Complex biological molecules, such as DNA, usually have the ability to undergo highly controlled and hierarchical self-assembly, which makes them ideal for the assembling of nanosized building blocks.

Methods for altering and controlling these nanoscale building blocks and assembling nanoscale architectures are important in biology. Biological cells have dimensions usually in the range of 1-10 μm, and contain numerous extremely complex nanoassemblies, such as molecular motors, which are complexes embedded within membranes and powered by natural biochemical processes.

Naturally occurring biological nanomaterials have been refined over a long timescale and therefore are highly optimized. We can use biological systems as a guide for producing synthetic nanomaterials and nanosystems, and such a process is often called biomimicry.

Biological properties

A list of some of the applications of nanomaterials to biology or medicine is given below:

- Fluorescent biological labels
- Drug and gene delivery
- Bio detection of pathogens
- Detection of proteins
- Probing of DNA structure
- Tissue engineering
- Separation and purification of biological molecules and cells