

Nanotechnology in modern technology

Technology



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Nanotechnology does not have to be as small as atoms or molecules, but it is much smaller than anything you can see with your naked eye. Many materials exhibit unusual and useful properties when their size is reduced.

Researchers who try to understand the fundamentals of these size-dependent properties call their work nanoscience, while those focusing on how to effectively use the properties call their work nanoengineering.

Nanoscale & Nanometer How do we measure the size of nanotechnology materials? We measure materials using the nanoscale.

While not precisely defined, the nanoscale ranges from about 1 nanometer (nm) to 100 nanometers. From things the size of individual atoms on the smallest to what you might see with very good optical microscope at the largest size. A nanometer is one billionth of a meter. (A meter is about 10% longer than a yard.) The prefix “ nano” means “ one billionth”, or 10^{-9} , in the international system for units of weights and measure. A sheet of paper is about 100, 000 nanometers thick; a single gold atom is about a third or a nanometer in diameter. **Nanomaterials** By nanomaterials is a term that refers to all nanosized materials.

When particles are purposefully manufactured with nanoscale dimensions, we call them engineered nanoparticles. There are two other ways nanoparticles are formed. Nanoparticles can occur as a byproduct of combustion, industrial manufacturing, and other human activities; these are known as incidental nanoparticles. Natural processes, such as sea spray and erosion, can also create nanoparticles. Many important functions of living organisms take place at the nanoscale. The human body uses natural

nanoscale materials, such as proteins and other molecules, to control the body's many systems and processes.

A typical protein such as hemoglobin, which carries oxygen through the bloodstream, is 5 nms in diameter. Nanoparticles, Nanotubes, & Nanofilms Think of these simply as particles, tubes, and films that have one or more nanosized dimension. Nanoparticles are bits of a material in which all three dimensions of the particle are within the nanoscale. Nanotubes have a diameter that's nanosize, but can be several hundred nanometers (nm) long or even longer. Nanofilms or nanoplates have a thickness that's nanosize, but their other two dimensions can be quite large.