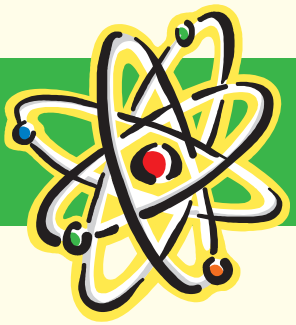
Nanotechnology

Too BIG to Ignore



Nano: No Small Business!

What is Nano?: A nanometer (nm) is 1 millionth of a millimeter (10-9 m). Nano-science and technology deal with anything smaller 100 nm. An atom is 0.2 nm in size! To have a feel how small 1nm is, it is pertinent to say that a human hair is typically 70,000 nm. A man's beard grows by a nanometer in the time it takes him to lift the razor from the bathroom sink table to his face. A short person may benefit using a nanoscale to measure his/her height. How tall is a 5'2" person? About 1.6 million nanometers tall! A kid friendly You Tube video that describes nanotechnology can be found at by keying in 'Nanotechnology - What is it?'

Nano is not new: Nobel Prize winning American Physicist Richard Feynman first proposed the term 'nano-technology' in 1959 during his talk given at California Institute of Technology (Caltech) titled "There's Plenty of Room at the Bottom". In 1985 the first known nanoparticle, fullerenes, was discovered. Nobel Prize for chemistry was awarded to Robert Curl, Harold Kroto, and Richard Smalley for the discovery of fullerenes. Buckyball or Buckminster fullerene C60 is the simplest of fullerenes. There are lots of complex fullerenes. A buckyball resembles a soccer ball and is made up of 12 pentagons and 20 hexagons. Then came the carbon nanotubes, quantum dots, various metal, and non-metallic nanoparticles.

Nano in the market?: Nanotechnology-based stronger construction materials are already available in the market. Nanomaterial-based tennis balls last longer, golf balls fly better, and bowling balls are harder. There are sunscreens, ski wax, car wax, and sanitizers in the market which uses variety for nanoparticles including titanium, zinc, and silver. There are 'strain resistant' textiles available in the market and socks that don't stink! We will see more and more nanotechnology enhanced products in the market in the near future.

Future of Nano: New effective and target specific drug delivery is now possible with nanoparticles. Nanoparticles act like delivery vehicles for specific drug to specific human organs. The area of nanomedicine is still at its infancy but holds a lot of promises in detecting, diagnosing, and treating various diseases. Nanotechnology is expected to be the basis for regeneration or re-growth of our body parts lost due to diseases or accidents. Production of nanomaterials is relatively simple, but putting them together while maintaining the same nano characteristics is a difficult task. Scientists have now come up with a process what is known as 'self assembly'. Nanomaterials when kept together under the ideal conditions will start assembling together to form a bigger material (a semiconductor). Self assembly of human organs may not be far away! We should be able to go to a fabrication unit and order a better looking nose!! Who knows!!! With nanomaterials, the next generation computer chips will give us faster, smaller and more efficient computers. We will have low-cost flat screen televisions, better insulation materials, high energy batteries, sturdy storage tanks (hydrogen storage for energy generation), efficient energy production units, and sensors which will be used in automobiles, airplanes, and within human body.

Nano Worries: However, nanotechnology has a darker side too. Take the cases of nuclear energy, synthetic chemicals, and electronics. When these new technologies were introduced we were so excited that we didn't care to look at the darker sides of them. We learnt lessons from these and we are now better prepared. Nanomaterials are found to impact aquatic species like fish. They accumulate in their body and found to affect their brain. While doctors may want to kill cancer cells and bacteria with nanoparticles and environmental microbiologists are worried that these particles may wipe out a whole group of useful bacterial present in the environment.

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