NANO MATERIALS –IT'S APPLICATIONS IN THE PRESENT ERA

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ABSTRACT:

Nano technology is one of the most rapidly advancing scientific technologies today. Nano technology is a field of applied science focused on the design, synthesis, characterization application of materials and devices on the nano scale i.e. the study of nano materials is known as nano technology. So nano technology includes nano meter scales processing and the production of various components by controlling size and shape .A nano meter is one billionth of a meter. Generally the size is less than 100 nm, those production techniques can be consider as nano scale. There are two methods are used to produce nano materials one is called top down method and another is the bottom up method. In the first method, very small components are produced using larger parts of the material and in the bottom up method nano materials are produced by processing molecule by molecule or atom by atom.

Properties of Nano materials:

Mechanical properties

The large amount of grain boundaries in bulk materials made of nanoparticles allows extended grain boundary sliding leading to high plasticity.

Catalytic Properties

Due to their large surface, nanoparticles made of transition element oxides exhibit interesting catalytic properties. In special cases, catalysis may be enhanced and more specific by decorating these particles with gold or platinum clusters.

Magnetic Properties

In magnetic nanoparticles, the energy of magnetic anisotropy may be that small that the vector of magnetization fluctuates thermally; this is called superparamagnetism. Such a material is free of remanence, and coercitivity. Touching superparamagnetic particles are loosing this special property by interaction, except the particles are kept at distance. Combining particles with high energy of anisotropy with superparamagnetic ones leads to a new class of permanent magnetic materials.

Optical Properties

Distributions of non-agglomerated nanoparticles in a polymer are used to tune the index of refraction. Additionally, such a process may produce materials with non-linear optical properties. Gold or CdSe nanoparticles in glass lead to red or orange coloration. Semi-conducting nanoparticles and some oxide-polymer nanocomposites exhibit fluorescence showing blue shift with decreasing particle size.

APPLICATIONS OF NANO MATERIALS:

Nano technology has already contributed to number of innovative products in various engineering disciplines because of their unique physical, chemical and mechanical properties.

MEDICINE:

Nano technology has been a boom in medical field by delivering drugs to specific cells using nano particals. The overall drug consumption and side effects can be lowered significantly by depositing the active agent in the morbid region only and in no higher dose than need. This highly selective approach reduces casts and human suffering.

Nano technology can helps to reproduce or to repair damaged tissues.

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
- Tumour destruction via heating (hyperthermia)
- Separation and purification of biological molecules and cells
- MRI contrast enhancement
- Phagokinetic studies

INDUSTRY: Chemical analysis and filtration are two important examples where Nano technology already plays a role.

The most advanced Nano technology projects related to energy are: Storage, conversion, manufacturing improvements by reducing materials and process rates, energy saving (by better thermal insulation) and enhanced renewable energy sources.

Nanotechnology is impacting the field of consumer goods, several products that incorporate nanomaterials are already in a variety of items; many of which people do not even realize contain nanoparticles, products with novel functions ranging from easy-to-clean to scratch-resistant. Examples of those car bumpers are made lighter, clothing is more stain repellant, sunscreen is more radiation resistant, synthetic bones are stronger, cell phone screens are lighter weight, glass packaging for drinks leads to a longer shelf-life, and balls for various sports are made more durable.[1] Using nanotech, in the mid-term modern textiles will become "smart", through embedded "wearable electronics", such novel products have also a promising potential especially in the field of cosmetics, and has numerous potential applications in heavy industry. Nanotechnology is predicted to be a main driver of technology and business in this century and holds the promise of higher performance materials, intelligent systems and new production methods with significant impact for all aspects of society.

AEROSPACE: lighter and stronger materials will be immense use to air craft manufacters, leading to increased performance space craft will also benefit, where weight is a major factor. Nanotechnology would help to reduce the size of equipment and there by decreases the fuel consumption.

CONSRUCTION: Nanotechnology has the potential to make construction faster,cheaper,safer and more varied . Concrete is most commonly used material in the construction .it is the current active area of research and development.

Steel has been widely available material and has a major role in the construction industry. The use of nano tech steel helps to improve the properties of steel.

The glass is also an important material in construction .There is a lot of research being carried out in the application of nanotech to glass.

Vehicle manufacture: Much like aero space, lighter and stronger materials will be useful for creating vehicles that are both faster and safer.

NANO FOODS: According to project emerging nano technologies (PEN) three foods are introduced.

- A brand of canola cooking oil is called canola active oil.
- A tea called Nano tea.

- A chocolate diet shake called nano ceuticals slim shake chocolate.

AGRICULTURE: Applications of nano technology have the potential to change the entire agriculture sector and food industry chain from food protection to conservation, processing, packaging, transportation and even waste treatment.

Research and development needs

The following research and development needs arise with respect to the environmental behaviour of nanomaterials contained in textiles, their impacts on humans and the environment and the sustainability of such textiles:

It is required to

•Develop and adapt suitable standardized measuring, testing, and analytical methods for measuring the exposure to nanomaterials in various environmental compartments (water, soil, air).

•Develop and adapt test guidelines that ensure the comparability of research findings on the environmental impact and behaviour of nanomaterials.

•Develop methods that detect the release of nanomaterials during the use and disposal of textiles containing nanomaterials across their life cycle, individual case studies of nano-materials across their life cycles: Determine their stability in textiles, their environmental fate after discharge or abrasion, and the contact of humans with nanomaterials (exposure estimate). This individual analysis should also include a comparison with alternative non nanoscale substances with similar functionality in textiles.

•Study the bioavailability and toxicity of such nanomaterials that are used in textiles.

•Perform life-cycle assessments of the advantages of textile products treated with nanomaterials compared to conventional products, including the impact on human health and the environment across the product life cycle. Nano fibering cloth materials have water and strain repellent (or) wrinkle free.

Nano science concepts and nano technology applications have the potential to redesign the production cycle, restructure the processing and conservation processes and redefine the food habits of the people.