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A Review: Impact of Nanotechnology on Human life

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Abstract: ***No aspects of life are untouched without technology. Recently, the field of nanotechnology becomes most commercial technology due to its wide range of applications in daily life. The nanostructured materials e.g. nanoparticles, nanopowders, nanowires, nanotubes, nanorods, nanofibers, dendrimers, nanocluster, nanocrystal are globally produced in large quantities due to their wide range potential such as health and skin care, electronics, photonics, biotechnology, drug delivery, agriculture etc. This technology seems to be remedy of environmental and water pollution problems which the world is facing. Apart from vast usefulness of nanotechnology, the nanomaterials have detrimental effects on human life which cannot be neglected and needs proper attention to be paid . Certain nanoparticles can enter the body through breathing may cause damage to lung tissue and chronic breathing problems while some particle enter the body through lungs or other organs via food, drink and medicine and affect different organ and tissues like kidney, liver, brain etc. and may cause cytotoxic effects. The toxic effect and interaction with biological system of nano-particle largely depends upon the shape, size, concentration, solubility and stability. So it becomes necessary while adopting new technology to understand its risk and cost of resulting damage. Therefore, it is necessary to study the various nanostructure materials and their human exposure for the safety of the society. This review gives a brief summary of application & possible impacts of Ag & TiO_2 nanoparticles on human life & environment with focus on their utility and toxicity.***
Keywords: Nanotechnology, Nanoparticles, Environmental pollution, Toxicity.

I. INTRODUCTION

Nanomaterial is not new. This material were created and used by human unintentionally centuries ago. Artists used silver and gold nanoparticles to colour the stained glass windows of medieval cathedrals. Artists grind the gold particles into smaller and smaller pieces, changing the colour from the original yellow to blue, then to green, and finally to red. The colloidal metals were used to dye fabric and to treat arthritis too.

However, the ability to "see" and intentionally manipulate matter began in last few decades .The renowned physicist Richard Feynman was the first to envision man-made molecular machines built with atomic precision; but his vision took more than 20 years of advances in technology and microscopy to come to realization.Nanoscience and technology has advanced considerably in last 20 years and many of its applications have become realities.

But there are many aspects of nanoscience and technology that are yet to be explored fully and there are many challenging aspects where future research and development efforts are to be made. The present review article on the nanomaterial e.g. titanium dioxide and silver nanoparticles is just to draw attention on the crucial need of investigating the toxicological effects of nanomaterials along with the variety of their applications.

A. Titanium Dioxide (TiO_2)

Titanium dioxide (TiO_2) is a multifaceted compound. This is a substance that creates toothpaste white and paint opaque.TiO_2 is also a powerful photo catalyst that can break down almost any organic compound when exposed to sunlight, and a number of companies are seeking to capitalize on titanium dioxide's reactivity by developing a wide range of environmentally beneficial products, including self-cleaning fabrics, auto body finishes, and ceramic tiles. Currently, they are mainly found in high-factor sun protection creams, textile fibres or wood preservatives. For a long time, sun creams have been manufactured adding titanium oxide micro particles that gave the products a pasty, sticky consistency. Applying these sunscreens without leaving a visible film was not easy and was not good for the skin. Sun creams that contain the transparent nanoscale titanium dioxides can be applied much more easily. In addition, their protective effect against harmful UV radiation is much better. Currently, high UV protection can only be achieved using nano-sized titanium dioxide.

1) *Applications of titanium dioxide*

a) *Photo Catalyst:* A photocatalyst is a chemical reaction that occurs when light strikes a photosensitive compound such as titanium dioxide. When light strikes titanium dioxide, chemical reactions are repeated in the vicinity, causing decomposition of organic toxin odours [1].

b) *Environmental Improvement Applications:* TiO_2 removes environmental pollutants from the atmosphere, such as NOx and exhaust gas, and also destroys SOx, a harmful inorganic substance in the atmosphere.

c) *Water Purifying Applications:* TiO_2 also causes detrimental organic matter such as organic chlorine compounds, tetrachlorethylene, trihalomethane and other harmful substances to break down. For example, chloroform breaks down according to the process below:
$H_2O + CHCl_3 + (1/2)\ O_2 \rightarrow CO_2 + 3HCl$

B. Are Titanium Nano Particles Safe?

The safety profile of nano particles for infants and the children is unknown. Some studies have suggested the concern over titanium nano particle safety to be “overblown”. Titanium dioxide nano particles have been shown to induce emphysema and lung flares in adult mice. In addition, exposure of the developing lungs to nano particles can lead to chronic irritation and adverse effects on lung development, increasing the risk of respiratory diseases. [2]

Titanium nano particles are harmful to the lungs if inhaled. Researchers at the National Institute of Occupational Safety and Health in Morgantown West Virginia observed a significant increase in the levels of lung injury in rats that had inhaled titanium compounds. [3]

C. Titanium’s Effect on Your Brain

Titanium exposure may be harmful to your brain. Titanium nanoparticles can penetrate directly into the hippocampal area of the brain through the nose and olfactory bulb. A study conducted by Escuela Superior de Medicina at the National Politécnico Institute found that titanium dioxide had a toxic effect on glial cells of the brain.[4]

Long-term chronic exposure and environmental pollution are undocumented and there may be an association between exposure to nanoparticles and the development of degenerative brain diseases. [5]

II. SILVER NANO PARTICLE (AG)

Nanosilver is not a new discovery by nanotechnologists, but new research suggests it has been used in a variety of products for over100 years. The antibacterial effects of small particles of silver known as "colloidal silver" have been known since the earliest days of its use.

Nanoparticles have unique optical, electrical and thermal properties and include biological and chemical sensors in optoelectronics and are included in various products. For example, a wired ink, paste, and filler use silver nanoparticles for high electrical conductivity, stability and low sintering temperatures. Additional applications include molecular diagnostics and photonic devices that use new optical properties of these nanomaterials. Antimicrobial coating uses nanoparticles and multiple fibres, keyboards, wound dressing and bio medical elements to ensure protection from bacteria .

A. Application of Silver Nanoparticle

Silver nanoparticles are used in many technologies and are included in a wide range of consumer products that take advantage of their desired optical, conductive and antimicrobial properties.[6]

1) *Application to Diagnosis:* Silver nanoparticles are used in biosensors and numerous tests in which silver nanoparticle materials can be used as biological markers for quantitative detection.

2) *Antibacterial Uses:* Because of their antibacterial properties, silver nanoparticles are used in clothing, footwear, paints, dressings, home appliances, cosmetics, and plastics.

3) *Conductive Applications:* Silver nanoparticles are used in conductive inks and incorporated into composites to improve thermal and electrical conductivity.

4) *Optical Applications:* Silver nanoparticles are used for efficient light collection and advanced optical spectroscopy, including metal-enhanced fluorescence (MEF) and surface-enhanced Raman scattering (SERS).

B. Nano Silver Health Risk

Food supplements containing nanosilver may be harmful to health, Danish researchers have shown that small particles can enter cells and cause damage.Silver has antibacterial properties and is used in the food and cosmetic industries. Nanosilver can be found in beverage bottles, band-aids, toothbrushes, athletic socks, and food packaging. It is also marketed as a dietary supplement, promising antibacterial, anti-influenza and anti-cancer effects. Nanosilver is regulated in the UK, and you can easily find it online .Danish Veterinary and Food Governance will take nutritional supplements in accordance with the research of Southern Denmark University, which suggests that nano silver can cause cell changes." Silver as a metal, does not exhibit risk, but when the particles become small enough to penetrate the cell walls creates risk", the professor , Thiago Verano-Braga said. When the nanosilver enters a human cell, the cell can change. They can see that "Nano silver forms the harmful interferences of free radicals in the cells. We can also be seen in the number of forms and proteins. It teases us. Multiple diseases, including cancer, Alzheimer and Parkinson, are characterized by excess production of free radicals in cells.ACS Nano's research was conducted in human cells in laboratories, and Kjelsen and Verano -Braga do not know the dose of nano silver that he should be exposed before this change occurs. "We do not know how much you need it. So we cannot conclude that Nano Silver can hurt you but we can say that we must be worried when we see over production of free radicals in human cells." On May 15, 2014, Cell Biology, Food Beverage & Beverage report this news.

III. CONCLUSION

Few publications show the effects of engineered nanoparticles on the flora and fauna of the environment. However, many studies have investigated the uptake and action of nanoparticles at the cellular level to evaluate their effects on humans. It could reasonably be assumed that the results of this study could be extrapolated to other species, but more research is needed to confirm this assumption. In addition, careful study and interpretation of existing data and careful planning for new studies are required to establish the true impact of nanoparticles on the environment and their differences from larger and more common forms of matter. Persistent insoluble nanoparticles can cause far more serious environmental problems than those identified in human health assessments.

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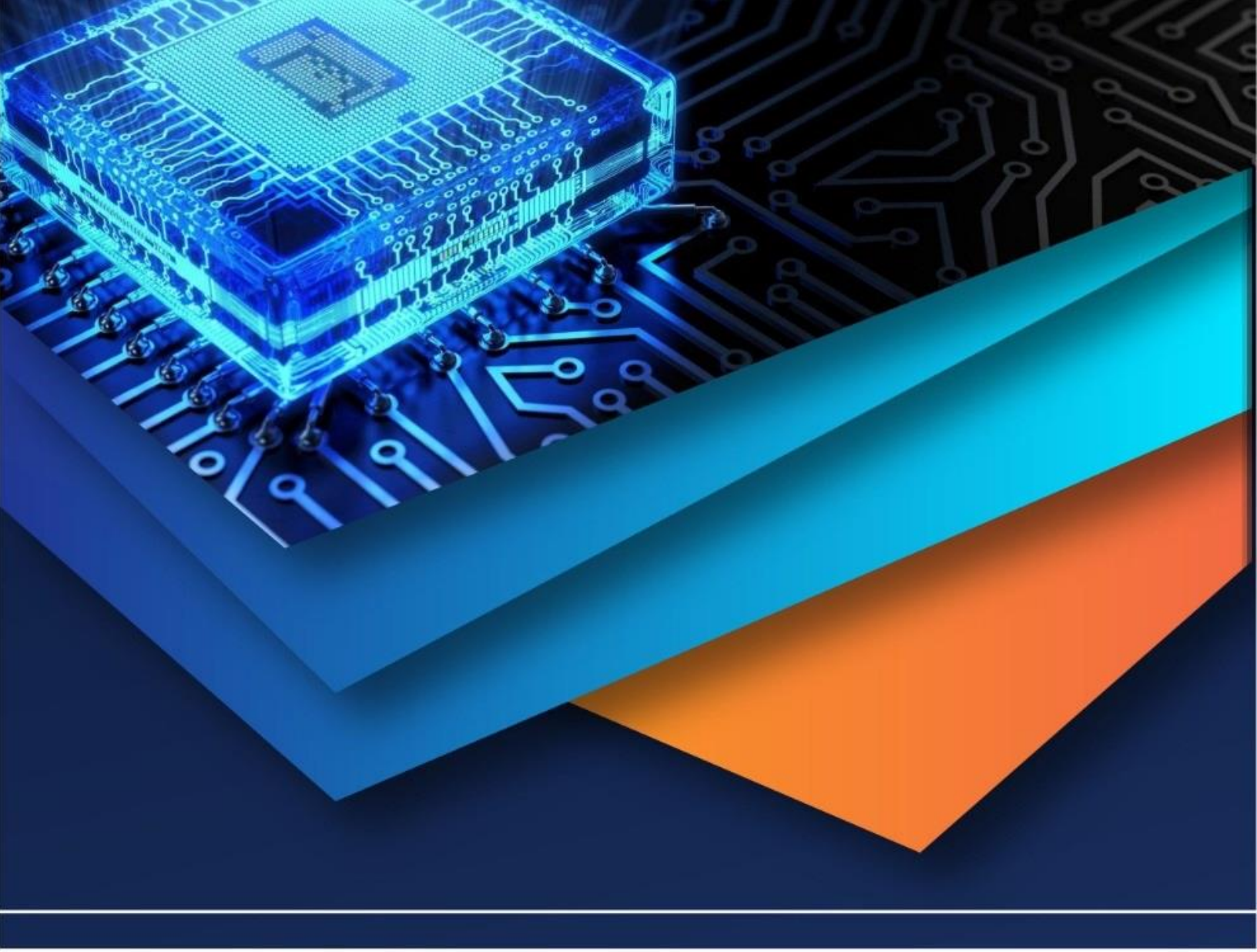

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