A REVIEW ON NANO PARTICLES, THEIR PHASES AND HEALTH EFFECTS.

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Abstract:
This study observes that Nano material's are an active of research but also an economic sector which addresses many application domains in various fields. Nano materials are chemical substances that are engineered with particle sizes between 1 to 100 nanometers in at least one dimension. It can be established that engineered nano materials derive many functional advantages from their unique properties. Free nano particles are formed through various process like breaking down of larger particles or by controlled assembly processes. Man made nanoparticles engineered to have the different desired size, desired chemical composition, different surface nature in solid phase and charge properties can be produced in the liquid phase mainly through controlled chemical reactions. The main nature of formation of nanoparticles in the gas phase is by a chemical reaction in which gases are converted into tiny liquid droplets, followed by condensation and growth. Natural phenomena and many human industrial and domestic activities, manufacturing or road and air transport release certain amount of nanoparticles into the atmosphere, In advance Nano particles are used in Technological applications with magnetic storage, electro communications ,microwave devices and Medical applications such as drug delivery systems .This paper addresses in particular difficulties in defining these materials,the state of knowledge on human or environmental toxicity and agencies in change of safety.

KEYWORDS : Nan Materials, Nano Particles, Phases, toxicity, Applications.

I. INTRODUCTION:

Nanomaterial's and nano manufactured goods represent areas of scientifiic research and industrial application in full expansion. They are already an industrial and economic reality. As far as industrial sectors, the introduction of these products should be considered in terms of potential effects of toxicity and other material[1]. Free nanoparticles are formed through either the breaking down of larger particles or by controlled assembly processes.Natural phenomena and many human industrial and domestic activities, such as cooking, manufacturing or road and air transport release nanoparticles into the atmosphere[3].

In recent years, nanoparticles intentionally engineered for advanced technologies and consumer products have become a new source of exposure. At present it is not clear just how significantly human exposure to these engineered nanoparticles has increased, be it in the workplace, or through the use of nanotechnology-based products [4].

II. DEFINITION OF NANOMATERIAL'S

"Nanotechnology - terminology and definition for the "Nano objects", i.e. Nanoparticle, nanofiber and nano plate", namely:

(i) nano- definition considered the range of dimension between 1 and 100 nm.

(ii) nano- objects are material with one, two or three external in the nano- domain dimension. Among these nano objects, nanoparticles include their three dimensions in the field of Nano; nano-oplates have one Nano sized dimension[2]

’’Nanomaterial: means a material that meets at least one of the following criteria:

(i) Consists of particles ,with one or more external dimensions in the size range 1 nm- 100 nm for more than 1% of their number size distribution.

(ii) May have internal or surface structures in one or dimensions in the size range 1 nm-100 nm.

There are two approaches for the manufacturing of nanomaterials

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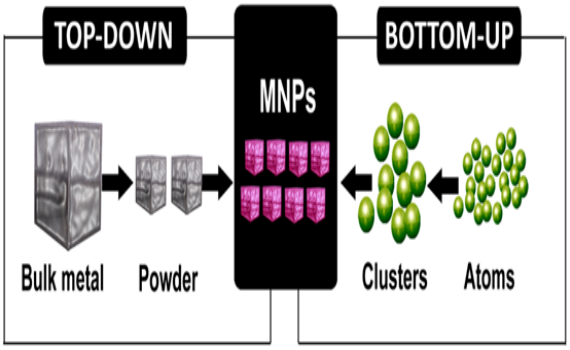

The “ top-down ” approach involves the breaking down of large pieces of material to generate the required nanostructures from them. This method is particularly suitable for making interconnected and integrated structures such as in electronic circuitry.In the “ bottom-up ” approach, single atoms and molecules are assembled into larger nanostructures. This is a very powerful method of creating identical structures with atomicprecision, although to date, the man-made materials generated in this way are still much simpler than nature’s complex structures [5-7].

Sources of free nanoparticles:

Nanoparticles are formed through the

natural or human mediated disintegration of larger

structures or by controlled assembly processes. The associated processes occur either in the gas phase, in a plasma, in a vacuum phase or in the liquid phase, eventually followed by the intentional or unintentional transfer into one or more relevant fluid media and then to an individual receptor in an exposure setting [8-10].

Formation of nanoparticles in the liquid phase

Defined bottom-up production of nanoparticles in the liquid phase with respect to particle size, chemical composition, surface and charge properties occurs mainly through controlled chemical reactions (Frens 1973), and self limiting self assembly processes have evolved by controlling growth conditions. In view of the ecological cycling of nanomaterials, some emphasis has to be given to the corrosion and disintegration of bulk materials, where little knowledge is currently available (Oberdörster G et al 2005]. Naturally occurring processes generating nanosized structures in the liquid phase include erosion and chemical disintegration of organic (plant or microorganism debris) or geological (e.g. clays) parent materials. In all these types of disintegration process, the surface properties and their change through chemical reaction are critical in determining whether individual nanoparticles will be formed in the respective medium [11-14].

Formation of nanoparticles suspended in the gas phase

The main route of bottom-up formation of nanoparticles in the gas-phase is by a chemical reaction leading to a non-volatile product, which undergoes homogeneous nucleation followed by condensation and growth. Recently, this has become an important pathway for the industrial production of nanoparticle powders, which may be of metals, oxides, semiconductors, polymers and various forms of carbon, and which may be in the form of spheres, wires, needles, tubes, platelets or other shapes. This is also the unintentional pathway by which nanoparticles are formed following the oxidation of gas-phase precursors in the atmosphere, in volcanic plumes, in natural and man-made combustion processes, or in fumes associated with any man-made process involving volatilizable material at elevated temperature, such as welding or smelting, polymer fabrication, or even cooking .

As with the liquid phase case, disintegration processes of parent materials provide a pathway

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which only leads to nanoparticles suspended in the gas phase under special conditions. While in the liquid phase the presence of emulsifying agents accompanying an erosion or chemical disintegration process could support the suspension process, the dispersion of nanoparticles into a gas from liquid emulsions or dry powders is severely limited by the strong adhesive forces between individual nanoparticles[15]. Therefore, any mechanically induced stress on the parent material mostly leads to particles in the micrometer range and above. Only under accidental conditions, e.g. in the case of uncontrolled release of a powder or an emulsion from a highly pressurized vessel could strong shear forces overcome these adhesive forces (Reeks and Hall 2001). In contrast, the spraying of liquids containing nanoparticles or soluble material at very low concentrations, followed by drying of the solvent, can lead to the resuspension of nanoparticles or to the formation of new nanoparticles from the solutes. This can lead to redistribution of nanoparticles, biological material or toxic substances into nanoparticulate airborne form[16].

The Sources of airborne nano particles:

In ambient air, the number of nanoparticles can be surprisingly similar in urban and rural areas, with as much as one million to one hundred million nanoparticles per litre of air depending on conditions.

In rural areas, nanoparticles are the product of chemical reactions involving compounds emitted by living organisms or by human activities such as wood burning.

In urban areas, most nanoparticles come from diesel engines or cars with defective or cold catalytic converters

In urban areas, the primary sources of nanoparticles are diesel engines or cars with defective or cold catalytic converters. Particularly, high-speed road traffic produces high numbers of nanoparticles of very small size.

In some workplaces, airborne nanoparticles may represent a potential health risk[17]. It is unlikely that nanoparticles would be released during manufacture because processes that generate them are often performed in closed chambers. Instead, exposure to nanoparticles is more likely to happen after the manufacturing process itself, or as a result of leaks arising from improper sealing. It is important to bear in mind that smaller nanoparticles remain airborne for longer periods of time than larger particles

III. OCCUPATIONAL SOURCES OF AIRBORNE NANOPARTICLES

Inhaled nanoparticles may represent a potential health risk. Aerosols in workplace environments may be derived from a wide variety of sources, depending on the type of activity and processes taking place. Nanoparticle aerosols arising from mechanical processes (e.g. the breaking or fracture of solid or liquid material) are unlikely to be formed. Grinding and surface finishing typically releases micrometre and submicrometre particles, possibly down to 100 nm but rarely below this. Most plasma and laser deposition and aerosol processes are performed in evacuated or at least closed reaction chambers. Therefore exposure to nanoparticles is more likely to happen after the manufacturing process itself, except in those cases of failures during the processing (Luther 2004). In processes involving high pressure (e.g. supercritical fluid techniques), or with high energy mechanical forces, particle release could occur in the case of failure of sealing of the reactor or the mills. Nanoparticles exhibit increased diffusivity with decreasing size and therefore show delayed sedimentation in the earth's gravitational field, which translates into potentially increased lifetimes for nanoparticulate impurities at low concentration. In the presence of larger microparticles, as with the wide size distribution in aerosols such as smoke, the highly diffusive character of nanoparticles may lead to faster agglomeration or impaction on the larger particles. Furthermore, many particles, including metallic particles, are highly pyrophoric and there is a considerable risk of dust explosions.

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IV. CHARACTERISTICS OF NANOPARTICLES ARE RELEVANT FOR HEALTH EFFECTS:

Toxicology of Nanoparticles:

Studies specifically dealing with the toxicity of nanoparticles have only appeared recently and, although now emerging in the literature, are still rare. Data concerning the behaviour and toxicity of particles mainly comes from studies on inhaled nanoparticles[18-20].

Health implications of nanoparticles used as drug carriers:

Particles for Drug Delivery

Carriers for Drug Delivery

Nanostructures and nanoparticles can be used for drug delivery purposes, either as the drug formulation itself or as the drug delivery carrier Current research focuses on cancer therapy, diagnostics and imaging, although many challenges still need to be solved .In addition, nanostructures are being investigated for gene delivery purposes Many different formulations involving nanoparticles have been used for drug delivery purposes, including albumin , poly(D,L-lactic-co-glycolide)acid (PLGA) (Panyam et al 2002, Weissenbock et al 2004), solid lipid formulations , cetyl alcohol/polysorbate nanoparticles ,hydrogels ,gold , polyalkylcyanoacrylate composites, magnetic iron oxide methoxy poly(ethylene glycol)/poly(ε-caprolactone) and gelatin . Albumin nanoparticles are already the subject of clinical studies for anticancer drug delivery purposes .

The use of nano particles as drug carriers may reduce the toxicity of the incorporated drug,although discrimination between the drug and the nano particle toxicity cannot always be made.The structure and properties of gold nanoparticles make them useful for a wide array of biological applications. Toxicity, however, has been observed at high concentrations using these systems. Goodman et al (2004) demonstrated that for 2 nm gold particles cationic particles were moderately toxic, whereas anionic particles were relatively non-toxic. Such very small sized gold nanoparticles were found to be non toxic when administered to mice for tumour therapy[21-23].

V. NANO SAFETY SUBSTITUTION

It means:

1) Replace toxic substance by less toxic substances,

2) Change the physical nature of the material,

3) Change the type of application: this approach relates to the replacement of an application in powder or liquid spray by an application in liquid phase,

4) Eliminate nanoparticles as soon as they are no longer necessary,

5) Favor forms which are non - dispersible in atmosphere including suspension in liquid or Use masters- mixtures.

VI. TECHNOLOGIES

This means implementing technical protection measures that are designed, as well as possible, to establish a barrier between workers and potentially dangerous substances or processes. Thus one effectively eliminates hazard exposure[24-25].

The following approach should be assessed

1) Use closed systems,

2) Use unbreakable containers or double containers for storage and transport,

3) Manufacture and use the substance on a form which limits its dispersion,

4) Capture pollutants at emitting source,

5) Air filtering prior to release,

6) Separate work premises and adapt ventilation of the premises

CONCLUSIONS

All of the country available studies, in vivo and in vitro; highlight the existence biological effects of nanomaterials in terms of functional, inflammation, modulations at cellular level for whole body. Still, little data are currently available, and it seems urgent to deepen existing awareness on the mechanisms involved in the dispersal of nanomaterials in the body. The risk assessment must not only take into account, but also their behavior and all of their life cycle.

Moreover, it is essential to know levels and situations of exposure, and therefore the condition of manufacture and composition of the products containing nanomaterials. In the absence of regulatory obligation, industrialists are very reluctant to communicate this information. In addition, epidemiological surveillance of workers exposed to nanomaterials should contribute decisively to the improvement of knowledge about their health effects possible medium and long term.

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