Nanotechnology and Nature

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ABSTRACT
Two criteria are proposed for characterizing the diverse and not yet perspicuous relations between nanotechnology and nature. They assume a concept of nature as that which is not made by human action. One of the criteria endorses a distinction between natural and artificial objects in nanotechnology; the other allows for a discussion of the potential nanotechnological modification of nature. In so far as current trends may be taken as indicative of future development, nanotechnology might increasingly use the model of nature as a point of orientation, while many of its products will continue to be clearly distinguished from nature.

Keywords: Nanotechnology, Nature, Technology, Environment Impact.

I INTRODUCTION

Nanotechnology is the engineering **of** functional systems at the molecular scale. *Nature Nanotechnology* is focused on all topics regarding nanoscience and nanotechnology. Technologies are related to materials that are high performance or organic, inorganic, and hybrid.

Over the past decade, there has been growing concern over the potentially adverse environmental and health impacts of nanomaterials. At the same time, nanotechnology has provided improved environmental solutions, especially in the field of water quality. Environmental problems are a complicated mosaic of multiple phenomena that require multidimensional analysis and solutions.

We try to understand the fundamental physical interactions between nanomaterials and the ecosystem, and have developed several facile schemes for doing so using the principles and techniques Nanomaterials for Water Treatment

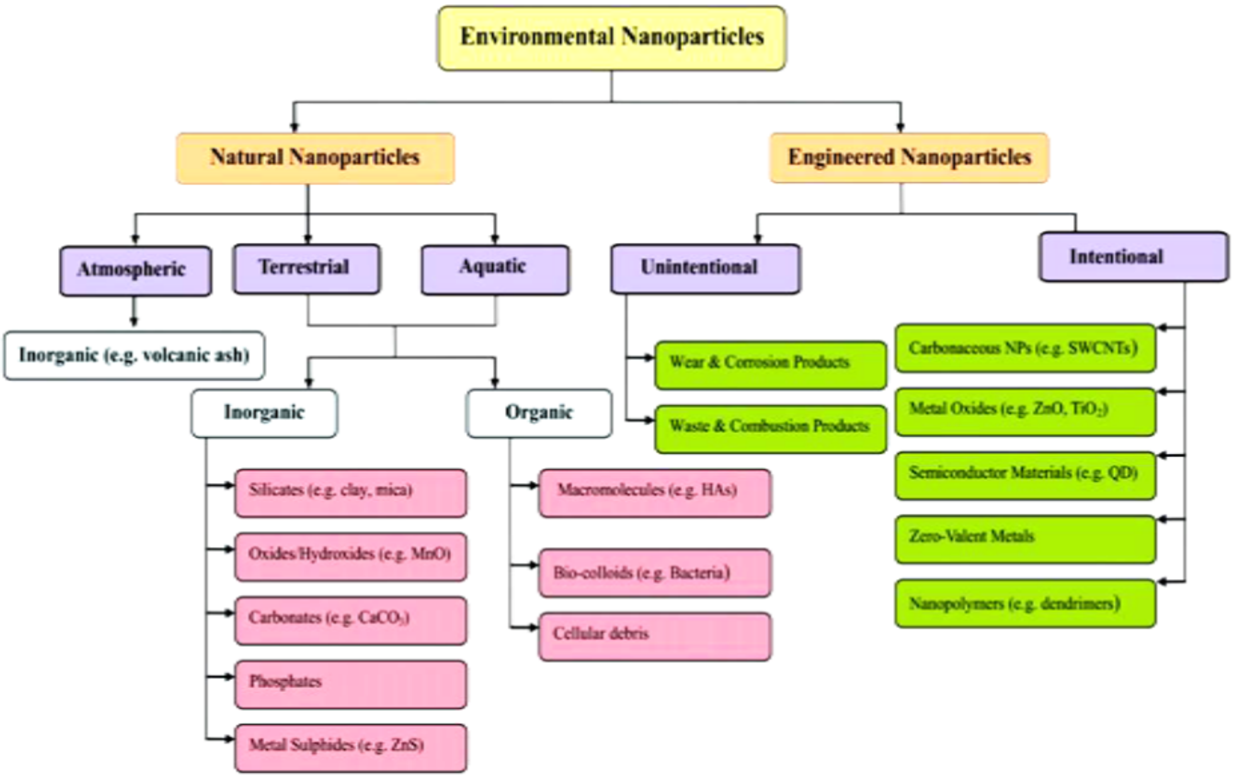

Fig 1: A detailed sorting of nanoparticles existing in the environments

II ENVIRONMENTAL ANALYSIS

Several nanoscale inclusions have been used for various applications. Among these nanoscale inclusions, graphene has the higher priority for various reasons. Graphene is one of the most advanced materials for structural improvement, substitution of silicon for electronic devices, as well as thermal transferring, and fire retardant. Three papers have been published describing the benefits of altering graphene to be more environmentally friendly. One study by Marcano, D.C., et al., improved the process of making graphene oxide (GO) by increasing amount of $KMnO_4$ and eliminate $NaNO_3$ that improves the process efficiency, and produces less toxic emission21. Salas, E.C., *et al.,* 22 and Kotchey, G.P., *et al.*,23 have also shown that shewanella bacteria and some other bacteria can decompose graphene and make graphene less toxic to the environment. 6

III POSITIVE EFFECTS ON ENVIRONMENT

(a) Positive Effects

Nanotechnology offers potential economic, societal and environment benefits. Nanotechnology also has the potential to help reduce the human footprint on the environment by providing solutions for energy consumption, pollution, and green gas emissions. Nanotechnology offers the potential for significant environmental benefits, including:

(i) Cleaner, more efficient industrial processes
(ii) Improved ability to detect and eliminate pollution by improving air, water, and soil quality
(iii) High precision manufacturing by reducing amount of waste
(iv) Clean abundant power via more efficient solar cells
(v) Removal of greenhouse gases and other pollutants from the atmosphere
(vi) Decreased need for large industrial plants
(vii) Remediating environmental damages.
(viii) The nanoscale products that utilize graphene in an industrial use or research can benefit the environment in several ways:
(ix) Graphene based nanocomposites reduce the weight of airplanes by substituting traditional metals and composites, and the consequence of the weight saving results in a reduction of a thousand tons of gasoline
(x) Graphene thin films or graphene buckypapers can be substituted in place of metal meshes around the fuselage of airplane used to prevent the direct and indirect effects of lightning strikes
(xi) The eminent properties of graphene increases the efficiency of advanced renewable energy processes, such as reducing the weight of a wind turbine blades and increasing the energy converse efficiency.

(b) Negative Effects

Understanding of the environmental effects and risks associated with nanotechnology is very limited and inconsistent. The potential environmental harm through nanotechnology can be summarized as follows:

(i) High energy requirements for synthesizing nanoparticles causing high energy demand
(ii) Dissemination of toxic, persistent nanosubstances originating environmental harm
(iii) Lower recovery and recycling rates
(iv) Environmental implications of other life cycle stages also not clear
(v) Lack of trained engineers and workers causing further concerns.

Worldwide, 1.1 billion people lack access to sufficient amounts of safe water. Adequate supplies of decontaminated water with high throughput at a low cost are a growing challenge around the world.
Current water purification methods in wide use employ chemically intensive treatment that is relatively expensive, harmful to the environment, and is not adaptable to the non-industrialized world.
Nanomaterial-based technologies, adsorbents and catalysts could create novel,

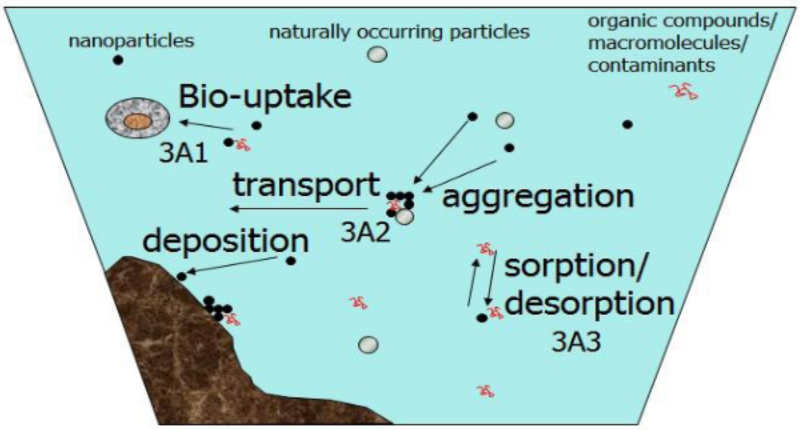

Fig 2 : Nanoparticles in a liquid environment

environmentally benign solutions for water treatment. There are three main applications where nanomaterials show promise – sensing and detection of pollutants, treatment and remediation of contaminants, and finally, prevention of pollution. Nanomaterials are also being used to enhance membrane separation processes, leading to greater selectivity and lower costs. However, successful applications of these technologies require high degree of control of nanoparticle (NP) mobility, reactivity, and ideally, specificity for the contaminant of interest.

The unknown ecological effects, environmental stability, fouling properties, low detection limits, high costs, and concerns over their regeneration and environmental deposition limits the large scale applications of many commonly used nanomaterials for water treatment, such as nano zero valent iron, titanium dioxide nanoparticles, carbon nanotubes and zeolites. Advances in macromolecular chemistry such as the synthesis of dendritic polymers have provided great opportunities for improving and developing effective filtration processes for water purification to eliminate different organic solutes and inorganic anions. Dendritic polymers which include hyperbranched and dendrigraft polymers, dendrons and dendrimers are highly synthetic, nanoscale branched structures with a high degree of surface functionalities, monodispersity, controlled composition, and architecture which display interesting physicochemical behavior due to their shape, size and multiple functionalities.4 of physics, materials, and physical chemistry. The focus of this article is the key contributions our lab has made to the field of drinking water remediation using nanomaterials

IV CONCLUSION

Nanotechnology offers great potential for benefit to humankind, and also brings severe dangers. While it is appropriate to examine carefully the risks and possible toxicity of nanoparticles and other products of nanoscale technology, the greatest hazards are posed by malicious or unwise use of molecular manufacturing. CRN's focus is on designing and promoting mechanisms for safe development and effective administration of MM.

V FUTURE DIRECTIONS

We are developing strategies for extending the scope of dendritic polymers for environmental remediation. One of our recent studies explored the ability of these dendritic polymers to disperse spilled oil,16 a huge environmental hazard associated with the offshore operation of the petroleum industry. Energetically, the hydrophobic interior of these polymers at ambient water pH provide for ample space for hydrophobic oil molecules to partition in.

While over 70% of the earth's surface is covered by water, only about 3% of it is available for human consumption. Even worse, in developing countries, 80% of illnesses are water related. In addition to providing technical solutions to the staggering challenge of providing clean drinking water, regulatory and public acceptance to using nanotechnology for drinking water treatment must be established. In addition, life cycle assessments of the risks and benefits of these nanomaterials are crucially necessary.

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