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Nanotechnology And Climate Change: A Reviews

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Abstract

Nanomaterials that can efficiently use carbon-dioxide from the air, capture toxic pollutants from water and degrade solid waste into useful products. Nanomaterials could help us to mitigate pollution. They are efficient catalysts and mostly recyclable. Now, they have to become economical for commercialization and better to replace present day technologies completely. To help slow the climate changing rise in atmospheric CO_2 levels, Researchers have developed Nano catalyst harvesters that suck atmospheric pollutants and deploy it for industrial purposes. In this article we will discuss the review on causes drastic climate change and how Nanomaterials could combat the reduction in pollution.

KEYWORDS: Environmental, Climate, Nanomaterials, Pollution, Greenhouse gases.

1. Introduction:

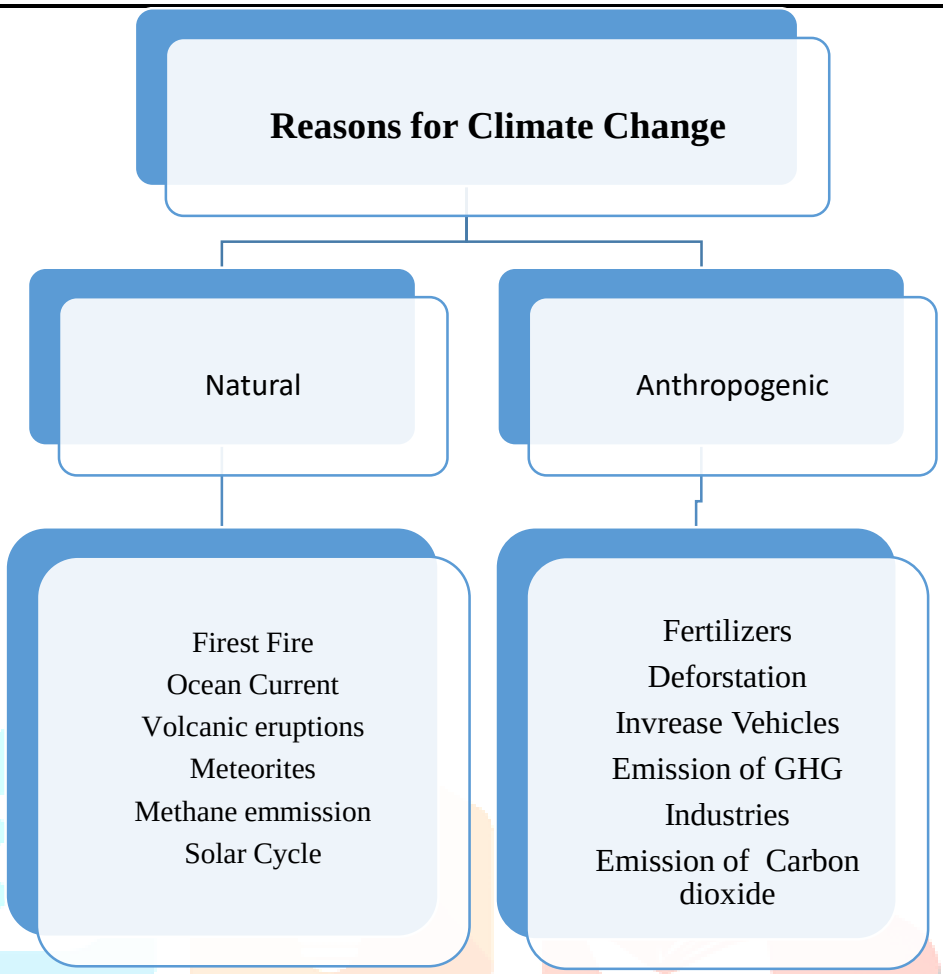
The climate crisis threatens to undo the last fifty years of progress in development, global health, and poverty reduction, and to further widen existing health inequalities between and within populations [1-2]. Pollution is the introduction of contaminants into the natural environment that cause adverse change. Carbon emissions cause Ocean acidity, the ongoing decrease in the pH of the Earth's oceans as CO_2 becomes dissolved. The emission of greenhouse gases leads to global warming which affects ecosystems in many ways. Pollution can take the form of any substance (solid, liquid, or gas) or energy (such as radioactivity, heat, sound, or light) [3]. The basic concept of pollution control on a molecular level is separating specific elements and molecules from a mixture of atoms and molecules [4]. The current method for separating atoms is thermal partitioning, which uses heat to force phase changes. However, the preparation of reagents and the procedure itself are costly and inefficient. Current methods of energy extraction utilize combustion to create heat energy, most of which is wasted and results in unwanted byproducts that require purification and proper disposal. Theoretically, these high costs could be solved with the nanostructuring of highly specific catalysts that will be much more efficient [5]. These climate-sensitive health risks are disproportionately felt by the most vulnerable and disadvantaged, including women, children, ethnic minorities, poor communities, migrants or displaced persons, older populations, and those with underlying health conditions [6]. Nano catalysts work by speeding up chemical reactions that transform harmful vapors from cars and industrial plants into harmless gases. Nanotechnology eases the water cleansing process because inserting nanoparticles into underground water sources is cheaper and more efficient than pumping water for treatment [7-8]. Nanotechnology's potential and promise have steadily been growing throughout the years.

2. Nanotechnology for Climate Change:

Nanomaterials are defined as the size and dimensions in the range of 1 to 100nm [9,10]. The term nanometer was first used in 1914 by Richard Adolf Zsigmondy[11]. Norio Taniguchi might be first to use the word nanotechnology in 1974. He stated that "nanotechnology mainly consists of the processing separation, consolidation and deformation of materials by one atom or one molecule" [12,13]. At the beginning of 21st century, there was an increased interest in the nanoscience and nanotechnology fields. Current scenario is the nanomaterials found in scratch free paints, surface coatings, electronics, cosmetics, environmental remediation, sports equipment, sensors and energy storage devices. It has been evolving every day and now with a powerful characterization and Synthesis tools are available for producing Nanomaterials with better controlled dimensions [1]. Properties of nanomaterials are attributed to quantum effects, larger surface area, and self-assembly. Nanomaterials are unique for several reasons, one of which is their small size. The surface area to volume ratio of nanoparticles is extremely high. They bridge the gap between bulk materials and molecular structures.

3. Reasons Climate Change:

It is the introduction of contaminants into the natural environment that cause adverse change. It can take the form of any substance solid, liquid, or gas or energy. Although environmental pollution can be caused by natural events, pollution generally implies that the contaminants have an anthropogenic source created by human activities [14].The main driver of climate change is the greenhouse effect. Some gases in the Earth's atmosphere act a bit like the glass in a greenhouse, trapping the sun's heat and stopping it from leaking back into space and causing global warming. Many of these greenhouse gases occur naturally, but human activity is increasing the concentrations of some of them in the atmosphere, in particular: carbon dioxide (CO_2), methane, nitrous oxide, fluorinated gases. 2011-2020 was the warmest decade recorded, with global average temperature reaching 1.1°C above pre-industrial levels in 2019. Human-induced global warming is presently increasing at a rate of 0.2°C per decade [15].



4. Nanomaterials for reduction in environmental pollution:

A wide range of applications, substantially boosting the performances of Various devices and materials in a number of fields. Some of them are discussed below Table 1.

Table 1. Innovative Idea for Climate Change Solution

Innovative Idea	**Climate Change Solution**
Lightweight Nano-composite materials	Use of lighter, stronger, and stiffer Nano-composite materials is considered to have the potential to significantly reduce vehicle weight [16]
Adsorption and Nanosorbents	Adsorption is a very mature technology that has been extensively used in environmental remediation. Nano adsorbents are fullerene, nano diamonds, quantum dots, nanotubes, graphene, nanospheres, and mesoporous carbons [17]
Nano-coatings	They are a good short-term way of reducing emissions and maximizing clean energy production. Hydrophobic Nano-coatings can also improve the energy consumption.
Membrane and nanomembrane	Nanomaterials led to the fabrication of membrane with nanoscale thickness, namely nanomembranes. Such unique membranes can greatly extend the applications of membrane for environmental applications. Membrane and

	nanomembrane also greatly contribute to the development of nanofiltration technology [18]
Mechanistic studies	The new mechanisms can be originated from the size, shape, composition, surface feature, or hybridizations of the materials. Both the environmental processes and materials science should be illustrated to optimize the environmental nanotechnology. [19]
Nano catalysts	Improve fuel efficiency by incorporation of Nano catalysts. A third generation Nano catalyst developed by Energies, uses the oxygen storing cerium oxide nanoparticles to promote complete fuel combustion, which helps in reducing fuel consumption.
Nano-structured Materials	Nanostructured materials, such as aerogels, have the potential to greatly reduce heat transfer through building elements and assist in reducing heating loads placed on air-conditioning/heating systems.
Nanotech sensors	Sensors could be used for the Smart Grid to detect issues ahead of time, i.e. to measure degrading of underground cables. It is one of the easiest and most cost-effective ways to combat climate change, and reduce energy costs for consumers [20]

5. Conclusion:

Nanotechnology's potential and promise have steadily been growing throughout the years. The world is quickly accepting and adapting to this new addition tothe scientific toolbox. Although there are many obstacles to overcome in implementing this technology for common usage, science is constantly refining, developing, and making break through.

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