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# An Approach to Prevent Air Pollution and Generate Electricity Using Nanostructured Carbon Materials

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## ABSTRACT

Pollution is one of the major threats for the environment as well as society. It causes severe problems for the living organisms and can give birth to various unknown issues. Different sources like cars, industrial belts, fossil fuels, etc. are the major causes of air pollution. Different researchers are working to develop new methods to combat air pollution. The domain of nanotechnology is emerging day-by-day, and different fields are supported by the blessing of nanotechnology. Application of nanotechnology can also be helpful in reducing air pollution as well as producing electricity. The main objective of this article is to propose a novel concept to generate electricity and reduce air pollution with the help of the nanotechnology. In this work, a new solution is proposed to fight against air pollution. The proposed solution is based on nanotechnology which fight against air pollution and can generate electricity using the nanostructured carbon materials. The proposed solution can be deployed in a real-life scenario to reduce the air pollution and produce electricity in a large scale to provide an alternate energy resource to society.

## KEYWORDS

Air Pollution, Electricity, Energy Conservation, Nanostructures, Nanotechnology

## INTRODUCTION

The issue of environmental pollution has become a vital issue and one of major concerns of the today's world. It is mainly caused by toxic chemicals and includes air, water pollution and many more. This pollution results in degradation of human health. With the advancement in technology, various methods are applied in real life to handle this situation. Pollution becomes a social curse and whole world is under this threat (Dockery & Pope III, 1994). Various researchers across the globe are working in this domain to find an effective solution. Nanotechnology is one of the emerging technologies that offers many ways to fight with this problem. Nanotechnology is the study, process, and manipulation of materials at a molecular level. Nanotechnology has four major functions as follows: clean-up and purification, detection of contaminants, pollution prevention and maybe used to generate electricity (Fleischer & Grunwald, 2008). In today's world where industries have been

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so advanced that our environment is filled with pollutants which are coming directly or indirectly from human activities. Human activities such as oil, coal, gas combustion and contaminants emitted from vehicles pollutes the air. Water pollution caused by waste disposal, oil spills and by-products of industrial processes. Thus, we need a technology that can clean the contaminants and use them in an appropriate way (e.g., to produce electricity) and improve the quality of the environment. With the advancement of technology, various efficient methods are gradually developing to solve and handle several problems in a cost effective manner (S. Chakraborty et al., 2016; S. Chakraborty, Mali, Banerjee, et al., 2018; S. Chakraborty & Bhowmik, 2015; Shouvik Chakraborty et al., 2016; Shouvik Chakraborty, Chatterjee, Ashour, et al., 2017; Shouvik Chakraborty, Chatterjee, Dey, et al., 2017; Shouvik Chakraborty et al., 2020, 2015; Shouvik Chakraborty, Mali, et al., 2017; Shouvik Chakraborty & Bhowmik, 2015, 2013; Shouvik Chakraborty & Mali, 2018; Datta et al., 2017; Fang et al., 2009; S. Hore et al., 2016, 2018; Sirshendu Hore et al., 2015; Lu et al., 2012; Mali, Chakraborty, & Roy, 2015; Mali, Chakraborty, Seal, et al., 2015; M. Roy et al., 2018; Mousomi Roy et al., 2019, 2017; Sarddar et al., 2015; Seal et al., 2017). The machine learning-based approaches are frequently used in different application domain to solve various problems efficiently. Machine learning is a branch of artificial intelligence that allows machines to behave intelligently (S. Chakraborty, Mali, Chatterjee, et al., 2018; Shouvik Chakraborty, 2020; Shouvik Chakraborty & Mali, 2020a, 2020b, 2020c, 2021; Miller & Brown, 2018; Mondal et al., 2021). With no exception, nanostructure based designs also exploits the advantages of the machine learning on several occasions that proves to be highly effective (*Bioinspired Intelligent Nanostructured Interfacial Materials - Lei Jiang, Lin Feng - Google Books*, n.d.). Although this article does not incorporate the concept of machine learning systems but it will be an interesting future work and the real-life implementation of this work can be benefitted with the blessings of machine learning based nanostructure systems.

Nanotechnology is used to prevent the formation of pollutants by using nanomaterials (Baruah & Dutta, 2009; Silva et al., 2017; Yang et al., 2015). Nanomaterial is very small in size and the ratio of the surface area to the volume is high so that it can be used to detect very sensitive contaminants. These nanomaterials are magnet dependent and therefore, magnets can be used to determine the direction. So, any flying device like a drone which is equipped with camera and magnet attached in it, can be used in seas and other water-bodies to determine the direction and prevent water pollution. In this article, a method is proposed to prevent air pollution and generate electricity using nanotechnology. Carbon which are collected from the pollutants emitted from vehicles is deposited on a quartz substrate of carbon nanotube (CNT). The device is inserted in deionized water to generate electricity from water evaporation and thus decreasing air pollution (Pummakarnchana et al., 2005). Structure of some nanostructured carbon materials is given in Figure 1.

## PROPOSED SOLUTION

Water evaporation is a natural process that harvests thermal energy from the ambient environment. Here, it is shown that water evaporation from the surface of a variety of nanostructured carbon materials can be used to generate electricity. It is found that evaporation from centimeter-sized carbon black sheets can generate sustained voltages. The interaction between water molecules and the carbon layers with evaporation induced water flow within the porous carbon nanotube is the key to generate electricity.

Air pollution has serious effects on health and can have deadly situation if a person resides in a polluted environment for a long period of time which includes heart problems, lung cancer, respiratory problems etc. It also causes damage to brain, liver and nerves of living organisms. Scientists suspects that it causes birth defects too. Air pollution is caused by emission from vehicles, combustion of fossil fuels and household pollutants. There are many ways to control air pollution but still it is may not be always possible to control.