

**Review Article**

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Smog Busters Paint

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Corresponding author: Muhammad Perviaz, Department of Basic and Applied Chemistry, Faculty of Science and Technology, University of Central Punjab, Pakistan.**Received Date:** May 29, 2023**Published Date:** June 20, 2023**Abstracts**

The science behind metal dioxide paints, generally, is that when sunlight hits them, their electrons get excited and interact with and break down other molecules, including pollutants. The idea is that you can use the paint on the outside of buildings to make them “eat smog.” I have decided to use Graphene as one of the components of my paint because graphene being the wonder material can help in it. Along with graphene there are other innovative components which I will be using in order to absorb smog from the atmosphere.

Introduction

We can still halt the most buzzing issues of the 21st century, “POLLUTION” to some extent. The disintegration of our technologies, that are the main cause for these, is just a murder of science. However, steps can be taken to:

1. Reduce or minimize pollution.
2. Eliminate the present pollution.

The first can ignite the industrialism but the second option can seem quite feasible and that’s basically my project’s aim. Smog is the main issue of this world these days. Smog is basically the mixture of smoke and fog and have pollutants in it. Smog forming pollutants come from our daily use resources such as from vehicles, power plants, factories, plastic packaging etc. Smog causes aggravated health problems such as asthma, emphysema, chronic bronchitis, and infant losing their lives due to this. After doing literature survey I thought of using something which can be used adversely and have a more impactful approach. The whole world is being affected by smog on a very large scale and in order to control this, paints are the best way. Because in urban areas we see huge build

ings and offices and if we apply this smog absorbing paints, we can make the best use of it.

Graphene is a semimetal with a small overlap between the valence and the conduction bands. It is an allotrope of carbon consisting of a single layer of carbon atoms arranged in a hexagonal lattice. Described as a “one-atom thick layer of the layered mineral graphite,” it only has two dimensions, making it the thinnest but strongest material ever created.

Literature Review

Graphene paints have now been introduced and are being used for several purposes. In 2018, according to research Lahore has been ranked at no 9 in list of cities having worst air quality in the world, Karachi is at 27 while New Delhi is at no 1, inhaling this air is equal to smoking 45 cigarettes a day. In August 2015, Manchester University has teamed up with Amsterdam-based paints and coatings company Akzo Nobel, to investigate graphene oxide-based paints that provide protection against rust and corrosion for large metal structures, such as oil rigs, tankers and bridges.

In October 2014, researchers at the University of Manchester developed a new coating made from graphene-oxide that can be used to enable ultra-strong non-corrosive coating paints, hermetic food packaging and even a good substrate for flexible electronics. In September 2013, researchers from the Rensselaer Polytechnic Institute developed a graphene-based coating that can be used to make rough surfaces more water resistant. In September 2012, researchers from Monash University and Rice University developed a thin graphene film anti-corrosion coating. Their new coating can make copper more resistant to corrosion - almost 100 times better than uncoated copper. According to the researchers, that's the best graphene-based anti-corrosion material developed yet.

Data Analysis

I have decided to use graphene but since graphene paints already exist so what is novel about my project is that these paints have never been used for smog absorption. I thought of chemicals which I can use which will help to absorb pollutants.

Neem

Nimbin and Nimbidin are active components of neem. Have a triterpenoid structure with formula $C_{30}H_{36}O_9$. Used as an anti-inflammatory and antiseptic which can be used. Also have the ability to eat toxic chemicals.

Beet Root

Betalain is one of the components of beet root. It's used as an antibacterial to various purposes. We can use it in paints along with graphene and Cao to make it more effective.

Caesin

Unlike other chemicals, Caesin is not coagulated by heat hence we can apply it on buildings moreover it's fast drying and we can use this as a water-soluble medium.

Aluminum Sulphate

Aluminum has been used for eutrophication and to clear and remove phosphates from water. Since smog contains oxides of phosphorus and in order to remove them we can use this as a stimulator in this paint.

Calcium Oxide

It has a porous material and can be used in paints. Moreover, it helps to remove average of 14.40 kg of carbon dioxide in atmosphere significantly.

Potash Alum

It has extensive ability to coagulate the traces of small particles materials.

Glue

Polyurethane have been used as a polymer in paints but thing with them is that they are toxic and have harmful by products. Ad-

ditional to that they cause respiratory disorders that is why the reason some people have eye infections when paint is being applied. Hence what we can do is use glue as a polymer in our paint. It acts as a long fibrous polymer molecule made up of amino acids in a complex.

Procedure

1-Took some pencils in order to extract graphene from them.

2-Convert this graphene into graphene oxide.

3- 1 mg/ml CaO micro particle for the dispersion purpose was added to "GO solution" making the porous material in a centrifuge machine for 15 minutes. This will make joint composite for "CaO-GO surface"

4-After preparing the composite, add $Al_2(SO_4)_3$ in it which will be used as a stimulator.

5-Using the composite. I performed different tests.

TEST1-Graphene + Cao + $Al_2(SO_4)_3$

TEST 2-Graphene + Cao + $Al_2(SO_4)_3$ +Caesin

TEST 3-Graphene + Cao + $Al_2(SO_4)_3$ +beetroot

TEST 4-Graphene + Cao + $Al_2(SO_4)_3$ +Neem

TEST 5-Graphene + Cao + $Al_2(SO_4)_3$ +Glue

After being selected for nationals, I did more research and came to know about potash Alum and NaCl and their effective use hence I did some additional tests.

TEST 6- Graphene + Potash Alum + CaO + NaCl

TEST 7- Potash Alum + $CaCO_3$ + CaO + NaCl

Working

If metallic oxide is exposed to sunlight, electrons are activated and start breaking down organic particles and at the same time it creates a water-loving surface, also known as hydrophilic. Organic contaminants are sometimes invisible to the eye. One of the major pollution particles in the air that creates smog is nitrogen oxides. Nitrogen oxides particles have a negative effect on the air quality and therefore, dangerous to breath in.

Testing

After doing tests, in order to confirm whether its working or not I decided to use the following testing technique to note the amount of gases being absorbed.

Optical Detection

Luminal is a chemical reagent that emits chemo-luminescence in the presence of appropriate oxidizing agent and metal catalysts. NO_2 is a strong oxidizer, which can readily trigger the chemo-luminescence reaction of luminal. With the help of photon multiplier tube (PMT), detection of NO_2 with luminal is feasible (Figure 1).

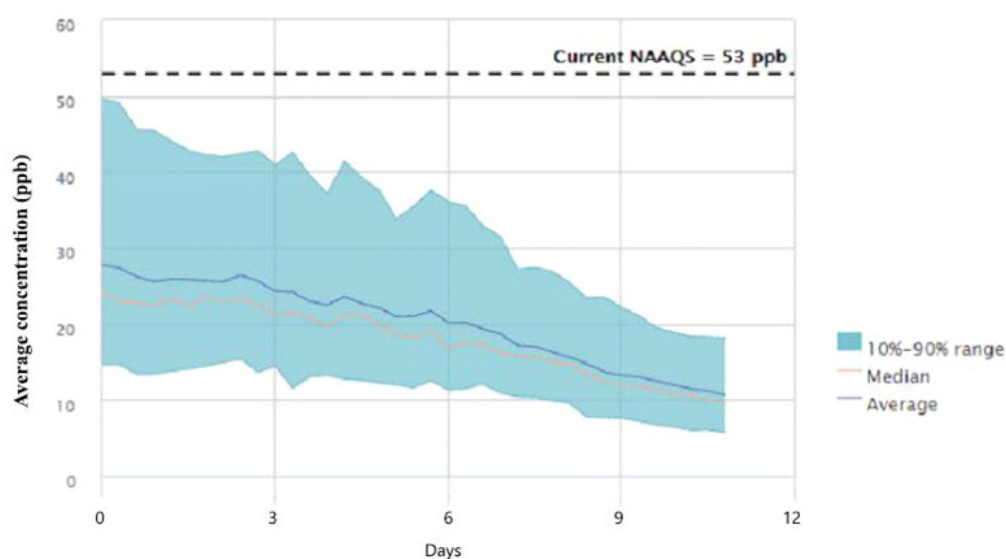


Figure 1: Ambient 12 days NO₂ Concentrations.

Field-Detection: Effect Transistor

Absorption of NO₂ or other gases may lead to changes of the chemical composition of a thin film of sensitive material. Electro-chemical behaviors including impedance, conductivity and resistivity will be changed accordingly. Therefore, detection and analysis of electrical signals can be used to calculate NO₂ concentrations. With the help of signal detection and amplification by the rapidly developing field-effect transistor (FET) and integrated circuit (IC), we can detect this.

Results & Conclusion

Removal of all microorganisms from surfaces via - scope for investigation on dust mite egg removal from carpets

1. Degradation of polluting compounds e.g., dirt etc. on its surface
2. Degradation/elimination of smog (i.e., on outside of buildings)
3. Since aluminum sulphate is used so it can help in water sanitizing and cleaning of water at much cheaper cost.
4. Air purification: The huge surface area of this composite allows for long contact time with polluted air, ensuring more compounds are removed.
5. Coating is much stronger, more efficient, and cheaper than the CaO and Graphene composite currently in use today.

Acknowledgement

None.

Conflict of Interest

No conflict of interest.

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