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"THE USE OF TITANIUM DIOXIDE TO PRODUCE SMOG ABSORBING CONCRETE"

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Abstract: The purpose of this paper is to solve the ever-increasing pollution problem in today's world, a sustainable solution is needed. This sustainability includes environmental protection, as well as social and economic equity. To achieve a fully sustainable solution, all three of these critical issues must be solved. The most promising solution to this problem is titanium dioxide-blended concrete. The material has similar structural properties to normal concrete, but because of the titanium dioxide, can remove pollutants from the air by decomposing them into harmless compounds. This solution provides a viable option to urban areas, where pollution levels are generally higher, due to the large potential surface area for the material.

Key Words: Smog absorbing concrete1, Titanium dioxide2, Photo catalytic process3, Smog adsorbing test4.

1. INTRODUCTION

Ever since the starting of the Industrial Revolution, the entirety of the planet has battled the by-products of increased productivity: pollution. Since the mid-1800s, pollution levels have increased at a rapid rate. More recently, pollution has been monitored worldwide by the United Nations. In more recent years, pollution has decreased slightly, but continues to pose massive problems due to high concentrations. Due to this, the World Health Organization (WHO) set maximum acceptable values of common pollutants. Particle matter was limited to between 10 and 20 μg/m3, depending on size, nitrogen oxides to 40 μg/m3, sulphur dioxide to 20 μg/m3, and ozone to 100 μg/m3. These pollutants all contribute to the build-up of smog.

Currently, the WHO states that 92% of the world's population live in areas where at least one of the air quality standards are not met. As a result, many people directly and indirectly suffer the consequences of industrialization, particularly poor people due to housing conditions near polluted areas. The WHO estimates 88% of those affected by health problems due to pollution are poverty-stricken, with a majority from Southeast Asia. Adverse health effects result from high quantities of pollutants in the air, ranging from minor problems such as chest pain, coughing, reduced resistance to infections, and fatigue, to more serious problems such as acute bronchitis, aggravated asthma, and development of chronic respiratory illnesses, irregular heartbeat and premature death. Overall, 3 million deaths occur annually due to pollution, with two thirds of deaths caused by heart disease and stroke.

1.1 Project Viewpoint

The purpose of present research is to utilize the materials like cement and to replace the costly and rare uncommon traditional building construction which satisfies the following characteristics:

Required Cost effective

Environmental friendly Less weight Inflammable

Easily available

1.2 Material

- Cement
- Course Aggregate
- Fine Aggregate
- Rhodamin Bdye
- Citation

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2.1 Cement:

Cement is one of the binding material in this research. Cement is the important binding material in today's construction world 53 grade Ordinary Portland Cement (OPC) confirming to IS: 8112-1989 cement used.

2.1 Sand:

Sand particles consist of small grains of silica (SiO2). It is

Shaped via way of means of the decay of sand stones because of diverse outcomes of weather. According to natural sources from which the sand is obtained, it's far termed as pit sand, river sand and sea sand. According to the scale of grains, the sand is assessed as fine, coarse and gravel.

3.1 Objective of paper

- To study smog eating concrete.
- To check performance of smog eating concrete for pollution control.
- To reduce harmful nitrogen oxides which are formed by vehicle combustion.
- To check performance of smog eating concrete for pollution control.

4. Methodology

4.1 Titanium dioxide:

Titanium dioxide, also known as titanium (IV) oxide or titania, is the naturally occurring oxide of titanium, chemical formula TiO_2. When used as a pigment, it is called titanium white, Pigment White 6 (PW6), or CI 77891. Generally, it is sourced from limonite, rutile and anatase. It has a wide range of applications, including paint, sunscreen and food coloring.

2.3 Water:

Water is an important ingredient of papercrete as it is involved in the chemical reaction with cement. Potable water should be used for both soaking and mixing of papercrete.It must be free from biological constituents and the pH value should be between 6 and 7.

3. LITERATURE REVIEW

Research shows that all concretes have some tendency to absorb NO_2. However, this tendency depends on the concrete mix design, and it is also reduced significantly over time by carbonation. The use of small additions of activated carbon can greatly enhance the NO_2 absorption properties of many classes of concrete and also reduces the negative influence of carbonation the process.

The use of "smog-eating concrete" may provide a way to improve our cities. By reducing ambient NO_x concentrations, it will have a benefic impact on human health as well as on animal and plant life.

Titanium dioxide is cementations material which can replace cement in concrete for some extent. As titanium dioxide blended in concrete, it helps concrete to adsorb pollution from air and concrete made is self-cleaning concrete so pollution adsorbed on surface of concrete in the form of powder can be washed by water. Titanium dioxide accelerate the reaction of conversion of harmful pollutants

4.2 Photo Catalytic Process

This property allows for the oxidation of various molecules, including the pollutants in the air and on the surface, as well as the formation of hydroxyl and oxygen radicals from water and oxygen in the air. The products of these reactions then form salts. The salts are then washed off of the surface efficiently due to the super-hydrophilicity of titanium dioxide. When water normally encounters a surface, it tends to bead up due to the combination of the surface tension of the water and the difference in polarity between the water and the surface. Since both water and titanium dioxide are polar, they tend to be attracted to each other. This attraction is strong enough to compensate for the water tension, and as a result, water will run as a sheet rather than droplets across the surface, allowing for a more complete wetting of the surface.

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In addition to removing pollutants, the surface also proves effective at removing bio-film. Because of the reaction to UV light, the titanium dioxide surface can remove biological substances including E. coli, Staphylococcus aureus, staph, SARS, and MS2 coliphage. Tests show that the titanium dioxide concrete can remove nearly 100% of a sample within an hour.

4.3 Reactions with Pollutant

A large source of pollution in the air is nitrogen oxide which are harmful to environment by themselves and also can react with oxygen in the air to from ozone the main component in smoke according to titanium di-oxide is not consumed when use as a photo catalyst meaning that it can be use in the poess without needing to be constantly replaced. In order to remove nitrogen oxide entirely a multi stape process is needed. The process according to the Czestochowa paper start with reaction.

4.4 The mix proportional m30

Cement	Sand	Course agg	Water
394	819.22	1047.30	197
1	2.07	2.65	0.55

4.5 Mix proportional

Mix	Materials		Cement (kg/m³)	TiO2 (kg/m³)	Fine Aggregate (kg/m³)	Coarse Aggregate (kg/m³)	Water (kg/m3)	w/c
	Cement %	TiO2%						
NM	100	-	394.00	-	819.22	1047.30	197	0.55
SAC1	99	1	390.06	3.94	819.22	1047.30	197	0.55
SAC2	98	2	386.12	7.88	819.22	1047.30	197	0.55
SAC3	97	3	382.18	11.82	819.22	1047.30	197	0.55
SAC4	96	4	378.24	15.76	819.22	1047.30	197	0.55
SAC5	95	5	374.30	19.70	819.22	1047.30	197	0.55

5. CONCLUSION

- The study framed that the effect of Concrete made by replacing cement by TiO2 is very effective to reduce harmful pollutants such as COX, HC, particulate matter etc.
- As TiO2 is cementitious nano material so there is no any change in compressive strength of concrete.
- This photocatalytic concrete is quite expensive but it reduces more pollution which can save thounsads of life.
- The percentage replacement of TiO2 in concrete shall be in between 2% to 3%, at which it is most economical and most helpful to reduce harmful pollutants such as HC and CO2.

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