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Innovative Solution to Reduce Air Pollution

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Abstract*: In our Project we are aiming to make a 'Air Pollution Absorbing Material', which contains Titanium dioxide in addition to the conventional ingredients. Titanium dioxide is already commonly used in various toothpastes, Cosmetic Products because it functions as a self- cleaning chemical, meaning the new Material has the additional advantage that it breaks down algae and dirt so its surface stays clean. The Material is made up of traditional cement mixed with titanium dioxide. This unique mixture allows air to pass through while simultaneously capturing nitrogen- oxide particles, a main component of smog. Titanium dioxide functions as a catalyst to the chemical reaction which is activated by UV light. Not only does it filter the air, but the collected smog residue washes off with alight rainfall. This will be very Innovative Way to reduce Air Pollution by using Titanium Dioxide without harming the environment with harmless reaction and Saving Lives by reducing Air Pollution.*

Keywords: Concrete, Nitrogen Oxides, Photocatalyst, Titanium Dioxide, Porous Structure, smoke reduction

I. INTRODUCTION

Titanium dioxide(TiO2) is widely recognize das one of the most prevalent synthetic materials globally, withnearly3tonsconsumedperpersonannually.Its name originates from Latin, meaning "to unite," referring to the process of amalgamating concrete's constituents to form a solid from a liquid state. Unfortunately, pollution remains a significant challenge in modern society. Regul at ory bodies such as the Environmental Protection Agency monitor emissions of harmful air pollutants known To adversely impact both human health and the environment. These pollutants include carbon monoxide, sulfur dioxide, particulate matter, volatile organic compounds(VOCs), nitrogenoxides (NOx),and lead. Worldwide, the levels of these airpollutants are on the rise, especially in densely populated urban areas. Consequently, various health issues are on the rise too, such a scardio vascular diseases an drespiratory ailments.Pollution can also have detrimental effects on the nervous system, affecting functions like learning, memory, and behavior, material. Approximately 4 million tons of TiO2 are utilized annually in various applications including paints, plastics, food, papers, inks, medicines, toothpastes, and sun screens. T iO2existsinthree forms: rutile, an atase, and brook ite, with an at as eexhibiting the highest photo activity. When exposed to heat and light, TiO2 on the surface of concrete utilizes this energy to degrade certain pollutants, such as NOx and VOCs, converting them from harmful to harmless forms.

KEY OBJECTIVE:

- Reduce Air Pollution effectively and economically
- Reduce Diseases caused by Air Pollution
- Use of TiO2 in Construction
- Trying to help governments to save tons of money
- Stopping degradation of Ozone Layer by the project

II. LITERATURE REVIEW

The literature survey The pull- out test, also known as the bond strength test, is a crucial technique in civil engineering for evaluating the bond between reinforcing bars and concrete. It measures the force required to pulla bar out of the concrete matrix, influenced by factors like surface preparation, concrete composition, embedded length, and loading

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rate. The test isused to assess bonding agents, construction techniques, and optimize concrete structure design. Recent advancements in instrumentation and data analysis have improved the accuracy and reliability of pull-out test results. The test is still a fundamental tool for assessing bond strength in concrete structures, and ongoing research is focused on incorporating experimental techniques and computational modeling to improve its reliability and effectiveness.

III. METHODOLOGY

Two sets of concrete blocks were fabricated to assess their suitability for construction applications. The firs tset comprisedstandard150x150x150mmblocks,whilethe second set integrated TiO2into the mix, maintaining the same dimensions. Both sets underwent a 28-day curing period to ensure optimal strength development. The primary focus was to evaluate their compressive strength for potential use in concrete structures. Subsequently, non-destructive and destructive tests were conducted to evaluate their structural integrity. Following the initial testing phase ,additional porous blocks were cast usinga smaller 75 x 75 x 75mm mold. These blocks were exclusively composed of 6mm aggregates and cement, with TiO2 incorporated into one set. After the 28-day curing period, the porous blocks exhibited permeable properties, allowing for the pass a geof water and air.T hey were specifically tailored for an air pollution absorption test, underscoring their potential as Eco-friendly construction materials.

MIX PROPORTION FOR POROUSTiO2 BLOCK.

Table No. 1 Ingredients

SR .No	Material	Proportion	Unit
1	Cement	160	gm
2	Sand	250	gm
3	TiO2	8	gm

RESULT

POLLUTION ABORBSTION TEST

Fig No.1 Before (TiO2 Block)

Fig no. 2 After1Hour (TiO2 Block)

Fig No. 3 Before

Fig No.4 After 1Hour

Fig No. 5 Water Colour

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COMPRESSIVE STRENGTH RESULT

Table No .2 Normal block

SR.NO	PRODUCT	MATERIAL	WEIGHT	STENGTH
1	NORMALBLOCK M20(GRADE)	WATER	650ml	**19 N/mm^2**
		CEMENT	1.360 Kg	
		SAND	2.260 Kg	
		AGGREGATE	4.250 Kg	
		LIME	300Gm	

Table No.3 TIO2 Block

SR.NO	PRODUCT	MATERIAL	WEIGHT	STENGTH
2	TIO2 BLOCK M20 GRADE)	TIO2	68 Gm	**23 N/mm^2**
		CEMENT	1.360 Kg	
		SAND	2.260 Kg	
		AGGREGATE	4.250 Kg	
		LIME	300Gm	

IV. CONCLUSION

In our observations, we've noted that pollution in the air can be effectively absorbed through the integration of TiO2 in concrete blocks. Furthermore, the addition of TiO2 in concrete has shown to enhance the material's strength, allowing for a notable increase in concrete grade from M-20 to achieving the strength equivalent to M-25 grade concrete. Additionally, the porous structure of the blocks we've created presents an opportunity for their use as permeable concrete, ideal for constructing roads that effectively drain stagnant water. More over, this versatile material holds potential for mitigating emissions from thermal power plant chimneys. When utilized in cement manufacturing plants, TiO2aids in controlling the heat of hydration. Notably, concrete incorporating TiO2 as an admixture exhibits remarkable air pollution absorption capabilities with in just one hour. However, it's important to acknowledge that there is a slight initial cost increase of approximately 5% of the construction cost associated with utilizing TiO2 in concrete. Despite this, the utilization of TiO2 in constructing auto claved aerated concrete (AAC) materials presents an opportunity for material savings and potential cost reductions.

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