International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056
Volume: 09 Issue: 07 | July 2022 www.irjet.net p-ISSN: 2395-0072

" The Use Of Titanium Dioxide In Concrete To Reduce Air Pollution"

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ABSTRACT:

In this study shows the results of experiment which is done in laboratory with concrete containing Titanium dioxide. The main aim of this study is to reduce pollution by absorbing the smog into the concrete as well as increase concrete structure strength durability. The favorable results are given by a distinct proportion of titanium dioxide addition. The concrete mixed with different percentage of titanium dioxide of powder content. According to IS 10262: 2009 and IS 456:2000, the M20-grade concrete mix proportions were obtained. In laboratory. The titanium dioxide mixed with concrete with 1%, 2%, 3% and examine the smog absorbing capacity of concrete. At 2% replacement of titanium dioxide (Tio2) by weight of cement, the maximum strength was achieved.

INTRODUCTION:

Concrete is a fundamental constructing block of modern-day life, used in homes, roads, airports, skyscrapers, and more. In fact, it is the most common synthetic structural cloth in the world, with almost 3 tons utilized per character every year. The title itself potential "to grow together" in Latin, referring to the procedure of mixing all of concrete's elements to create a stable from a liquid. Unfortunately, pollution is any other fact of contemporary life. The Environmental Protection Agency tracks emissions of the most hazardous air pollution that negatively influence human health and the environment; these pollutants consist of carbon monoxide, sulfur dioxide, particulate matter, unstable organic compounds (VOC), nitrogen oxides (NOx), and lead. All these air pollutants are increasing worldwide, particularly in crowded cities. As a result, sure health issues are additionally increasing, such as cardiovascular disorder and respiratory issues. Pollution can also affect the worried system in a variety of methods (i.e., learning, memory, and behavior; IQ loss) and contribute to most cancer and premature death. Automobile emissions are a most important supply of air pollution; Figure 1 shows other common sources. A possible answer to the worldwide pollution problem is the use of "smart" concrete that is infused with substances that can wreck down air pollutants and render them harmless. One such fabric is titanium dioxide (TiO2), which is classified as Generally Recognized as Safe (GRAS) by the U.S. Food and Drug Administration. Around 4 million lots of TiO2 are utilized annually in substances such as paints, plastics, food, papers, inks, medicines, toothpastes, and sunscreens. Three forms of TiO2 particles exist: rutile, anatase, and brookite, with anatase particles becoming rutile at excessive temperatures. TiO2 is able to help battle pollution as an additive to concrete, with anatase TiO2 having the fine photo activity. When heat and mild hit the concrete's surface, TiO2 uses this energy to break down certain pollutants, such as NOx and VOCs, altering them from the damaging segment to the innocent phase.

Objective:

- To reduce harmful nitrogen oxides which are formed by vehicles combustion industries.
- To analyse and study the concrete cube formed by using titanium dioxide which is cementations material.
- To study parameters like strength, percentage reduction in pollution or pollutants, durability and disadvantages of smog absorbing concrete.
- To check whether it is useful and economical in India.

METHODOLOGY:

- Making Concrete cube for M20 such as adding titanium dioxide 1%, 2%, 3% weight of cement.
- Making conventional concrete block of M20 to compare with Tio2 blocks
- Taking compressive test on concrete blocks with Tio2 and without Tio2 after 7 days and 28 days.

- Taking smog test in sunlight after 28 days.
- To compare the result by using 1%, 2%, 3% titanium dioxide blocks with conventional blocks.
- In smog test check percentage of tio2 is oxidizing fast air.

Fig No. 1 Titanium Dioxide

Fig No. 2

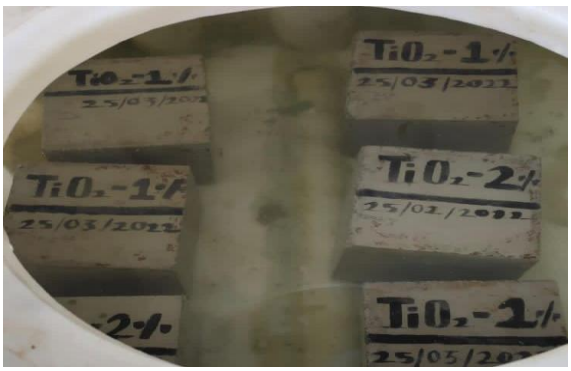


Fig No. 3

EXPERIMENTATION:

Material Selection and its Properties :

Cement: 53 grade PPC conforming to IS 8112-1989 was used for the experimental Programme. The specific gravity of 3.15cement is used. The results conform to IS 12269-1967 recommendations.

Aggregate: Aggregates constitute the bulk of a concrete mixture and give dimensional stability to concrete. To increase the density of resulting mix, the aggregates are frequently used in two or more sizes. The most important function of the fine aggregate is to assist in producing workability and uniformity in mixture. The fine aggregate assist the cement paste to hold the coarse aggregate particles in suspension.

Classification of Aggregate:

. Course Aggregate

. Fine Aggregate

Course Aggregate : Locally available coarse aggregate having the maximum size of (10 -20mm) were used in this project. The aggregate which are passing through the 75mm IS sieve and retain on 4.75mm. IS sieve are known as coarse aggregates.

Fine Aggregate: The fine aggregate used in the project was locally supplied Manufactured sand. Manufactured sand (M. sand) is a substitute of river sand for concrete construction. Manufactured sand is produced from hard granite stone by crushing. The crushed sand is of cubical shape with grounded edges, washed and added to as a construction material. The size of manufactured sand is a less than 4.75mm Table 3.2.1 shows properties of M. sand.

Titanium Dioxide: 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 in harmless pollutant.

Mix Proportion:

Water	Cement	Fine aggregate	Coarse aggregate
0.704lit	1.28Kg	2.02Kg	3.93Kg

Mix proportion of M20= 1: 1.58: 3.06

Material quantity:

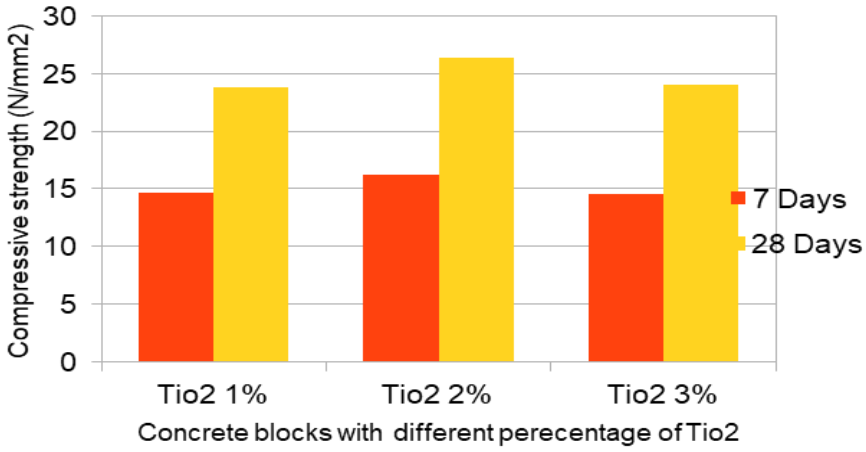
Material	Quantity for 1 block	No of Blocks	Total Quantity
Cement	1.28 kg	6	7.68 kg
Sand	2.02 kg	6	12.12 kg
Aggregate	3.93 kg	6	23.58 kg
Water	0.70 kg	6	4.22 kg

Quantity of Titanium dioxide (Tio_2):

Percentage	Quantity For 1 block	No of Block	Total Quantity
1%	0.128	6	0.768
2%	0.256	6	0.1536
3%	0.384	6	0.2304

RESULT AND DISCUSSION:

Compressive strength After 7 Days and 28 Days:



Smog absorption test:

Fig No. 4 Initially under sunlight

Fig No. 5 After 30 min under sunlight

Fig No. 6 After 1 hour 45 min under sunlight

Fig No. 7 After 2 hour 35 min under sunlight

Conclusion:

- The concrete in which Tio2 is added shows increase in compressive strength.
- Compressive strength of concrete block with 1%, 2% and 3% of titanium dioxide after 28 Days curing is higher than the target mean strength.
- The decolourization increase with increase in titanium dioxide.
- Oxidation process mainly depend upon climate of the environment.
- From above study it is concluded that the use of 2% of titanium dioxide in concrete block gives maximum strength and oxidization increases with increase in concrete.

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