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LIGHT EMITTING CONCRETE BY USING FLUROSCENCE

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Abstract

Light emitting concrete (luminescent concrete) research focuses on the development and application of concrete materials that have the ability to emit light. This abstract provides an overview of the research conducted in this field. Light emitting concrete is a type of concrete that contains luminescent materials, such as fluorescent, radium, phosphorescent. These materials absorb and store light energy from natural or artificial sources and then emit it gradually over time. This unique property makes luminescent concrete suitable for various applications, including architectural and decorative purposes. The research in light emitting concrete aims to explore the potential benefits and limitations of this material, as well as develop innovative techniques for its production and application. The study involves laboratory experiments, numerical simulations, and field tests to evaluate the performance and durability of light emmiting concrete under different conditions. One of the key objectives of this research is to optimize the luminescent properties of the concrete by selecting appropriate luminescent materials and optimizing their concentration and distribution within the concrete matrix. Furthermore, the research explores various methods for incorporating luminescent concrete into architectural designs and urban landscapes. The research also investigates the potential applications of luminescent concrete in safety and way finding systems, such as illuminating pathways, stairs, and emergency exits In conclusion, luminescent concrete research aims to explore the possibilities and challenges of using concrete materials that can emit light. The findings of this research have the potential to revolutionize the field of architecture and urban design by introducing innovative and sustainable lighting solutions.

Keywords: luminescent concrete, phosphorescent, revolutionize, fluorescent

1. Introduction

Concrete has been used since Roman times for the development of infrastructure and housing, but its basic components have remained the same. Three ingredients make up the dry mix: coarse aggregate, consisting of larger pieces of material like stones or gravel; fine aggregate, made up of smaller particles such as sand; and cement, a very fine powder material that binds the mix together when water is added. Just a few decades ago concrete was often misunderstood, disliked and captured by its image fixed due to the rapid urbanization of the 1960s.But since that time; concrete has made considerable progress, not only in technical terms, but also in aesthetic terms. This project presents an investigation of the luminescent property of the concrete by modifying the composition and adding luminescent materials in it. These elements are also proven to be inert and cause minimal harm to the environment. From the results it is also found that the luminescent concrete also possesses considerable compressive strength as like traditional concrete. The emergence of Luminescence concrete (light emitting concrete) has the ability to create a spectacular change in the field of construction and architecture. In many nations, the illumination of highways and rural households are still a biggest challenge. Lack of light in the night leads to many social issues and accidents. In these circumstances the light emitting concrete can play a drastic role. It is not only meant for these instances it can also be used to improve the ambience thereby reducing the cost of electricity used for decorations. This project builds on two existing areas of research in order to introduce new concrete materials. Light emitting concrete (luminescent concrete) is the one which has the ability to trap the solar or artificial light energy during daytime and convert it into visible light in night time. Light emitting concrete is also known as Glow-in the- dark concrete (GID). Luminescence is generally defined as the emission of light, caused when light is absorbed in the form of photons and causes the electrons to jump from their energy levels. The luminescent material can be charged by either natural or by artificial means. The naturally available sunlight can be used to obtain brighter glow in the luminescent material. Light emitting concrete is relatively a new and researched variation. It has the potential for applications in a variety of civil, structural, and design areas. In addition to its potential for aesthetic and creative use, this concrete has its applications in coating buildings, bike lanes, highways, interiors, and even swimming pools in order to improve vehicular and pedestrian safety, as well as in reducing the need for energy Intensive Street and building lighting. Light emitting concrete compositions containing cement, fine aggregates such as sand, and fluorescent materials. This study aims to use the phenomenon of fluorescence (form of luminescence, Atoms or molecules absorb electromagnetic radiation, get excited, and release light almost immediately as they drop to a lower energy level) for making light emitting concrete by modifying the composition of concrete by adding luminescent material in it.

2. Objectives:

a) To study fluorescence.

b) To make light emitting concrete.

c) To suggest applications of light emitting concrete.

3. Literature Review:

1) **Glowing Concrete: Mousheen H M Department of civil engineering Jain institute of technology Davangere, India.** This study aimed to make concrete surfaces glow by replacing some coarse aggregates with resin luminous stones. These are synthetic stones that absorb light and emit it in the dark. They work best in areas without ambient light sources. Concrete is a common and durable construction material that can be used for speed breakers and parking lots. Make it short.
2) **Experimental study on Luminescent Concrete : Prof. S. Sundari, A. Shriswarnambigai, Department of Civil Engineering, Government College of Engineering, Salem-11, Tamil Nadu, India.** This project builds on two existing areas of research in order to investigate new concrete materials. These materials have extensional applications to concrete exterior building walls, pedestrian safety infrastructure, and any number of other design applications where light emission is desired. In the future, a material like this could have the potential to reduce artificial light inside buildings, while also adding an aesthetic design appeal to interior fixtures and building elements. Therefore, the concept of photo luminescent concrete can have a great way to an enormous change in the construction industry.

3) **A Review on Study of Luminous Concrete- Student of Graduation, Department of Civil Engineering, Anjuman College of Engineering and Technology, Nagpur, India.**

This paper provides a comprehensive review of the research and development conducted on luminous concrete, a cutting-edge material that exhibits the unique property of luminescence. Luminous concrete, also known as glow-in- the-dark concrete, is an innovative construction material. This progress opens up further opportunities for their application across a wide range of fields. This review aims to summarize the key findings, methodologies, and challenges encountered in the study of luminous concrete, as well as explore its potential applications and future prospects.

4) **A Study on Materials for Luminescent Concrete Pavement - M.Deepika1, P. Vanitha2R. Shreya3 P. Shanmukh4, 1,2,3,4 UG Students, GMR Institute of Technology, Rajam 532127, India.**

There came out the hypothesis of iridescent cement by involving a few materials in concrete, we can really make it radiant. The hypothesis of brilliant cement is supplanting LP Powder and RP Powder in the concrete substantial asphalt. This is extremely useful to decrease the power at evenings. The materials utilized in this are useful to store the energy at the day time and brilliant around evening time. These iridescent substantial aides in lessening the wastage of power during evenings. The increment of LP content can work on the radiant properties of SLCPM, and the examples can keep great luminosity in the wake of lighting 8 h; albeit the increment of the RP affects working on the underlying brilliance of SLCPM, it can further develop the phosphorescence execution and draw out the glimmer season of SLCPM

4. Research Gap:

After reading many research paper we notice that most of them are based on use of Strontium aluminate for making light emitting concrete and the method of making light emitting concrete are different like they mixed this pigment directly with concrete and another way separate slurry is made and then it is mixed with concrete composition. But we are use Fluorescent tape, fluorescent powder, epoxy resin for making light emitting concrete because this are easily available in market and their price is less as compare to other fluorescent materials for this purpose we use phenomenon of fluorescence to make light emitting concrete.

We select two methods for making light emitting concrete 1st is using fluorescent tape, in this we make small chips of fluorescent tape and then these chips are inserted in concrete surface at the time of casting. Another method is we make paste of pigment using fluorescent powder and epoxy resin as binder than this paste is applied on surface of concrete after casting. So this is main research gap between our research and researches which was made in past time.

5. Methodology:

a. Study of fluorescence.

b. Selection of material and equipment’s required.

c. Procedure of making light emitting concrete.

d. Procedure of testing light emitting concrete

COMPLETE RESEARCH METHODOLOGY

Case study in Fluorescence Phenomenon

- History
- Principal/working of fluorescence.
- how fluorescence works
- glow time, Advantages, Disadvantages.
- Applications
- Future scope.

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- Find Various applications of this Phenomenon in Construction

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Using this phenomenon for making light emitting concrete. Study of Light emitting concrete

- Working/principle
- Scope
- Properties
- Advantages & Disadvantage
- Application

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Selection of mix design for

Selection of light emitting fluorescent material.

(Fluorescent tape , Fluorescent powder)

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Casting ordinary concrete block

- Method 1 - Using Luminescent Chips
- Method 2 - Using Luminescent Paste
- **Curing for 28 days .**

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Tests on concrete

- Compression test
- Light Emitting Test

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Performance evaluation of light emitting and ordinary Concrete

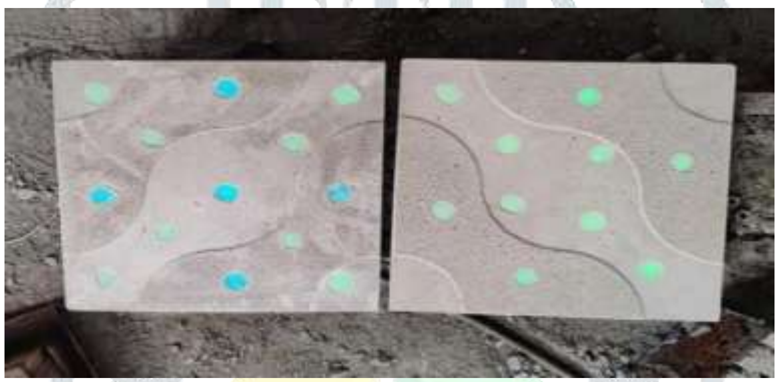
Suggest Applications of light emitting Concrete based on evaluation.

6. Procedure of making light emitting concrete:

Casting of Light emitting concrete is done in following two ways:

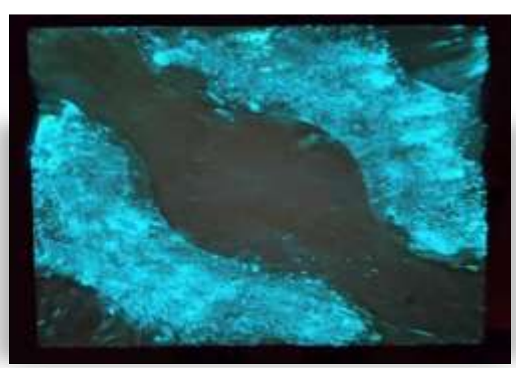
A) Preparation of Light Emitting Concrete (Using Luminescent Chips)

1) The luminescent chips are prepared using florescence tape or a small semicircular mould.
2) Luminescent powder is mixed with Epoxy resin (Resin and hardener in a ratio of 2:1) to manufacture the Luminescent chips. The luminescent chips are kept 48hrs to dry.
3) Take three moulds of 150 mm x 150 mm x 150. Apply oil on its inner surface
4) Prepare the concrete mixture of require grade.
5) Fill the concrete mixture in each mould in 3 layers. Compact each layer 25 times with 16 mm dia. Steel rod.
6) Insert and press luminescent chips on top surface.
7) Keep all the moulds at room temperature for 24 hours for initial hardening and at relative humidity 90 %.
8) Remove the cube moulds and keep concrete cubes under fresh water for curing.



B) Preparation of Light Emitting Concrete (Using Luminescent Paste)

1) Take three mould of 150 mm x 150 mm x 150
2) Apply oil on its inner surface
3) Prepare the concrete mixture of require grade.
4) Fill the concrete mixture in each mould in 3 layers upto 145 mm from base.
5) Compact each layer 25 times with 16 mm dia. Steel rod.
6) Prepare the luminescent paste by mixing luminescent powder, resin and hardener in suitable proportion.
7) After initial setting time, fill the paste in the topmost part of the mould.
8) Keep all the moulds at room temperature for 24 hours for initial hardening and at relative humidity 90 %
9) Remove the cube moulds and keep concrete cubes under fresh water for curing.



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