

**A  
Minor Project II Report**

**on**

**Formulation of Cement Paints  
In Partial fulfilment of the requirement for the award of the degree  
of  
Bachelor of Technology in Chemical Engineering (2019-23)**

**Under the Guidance**

**of**

*Dr. Rakesh Kumar Dubey*

**DEPARTMENT OF CHEMICAL ENGINEERING**



**MADHAV INSTITUTE OF TECHNOLOGY AND SCIENCE,  
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**Department of Chemical Engineering**

## **CERTIFICATE**

This is to certify that Astha Patel Kurmi, Vinay Singh Rathore, Raman Pratap Singh Bhadoria, Mayank Singh Bhadoria Students of Madhav Institute Of Technology and Science, Gwalior (M.P.) has satisfactorily completed Minor Project-II on “Formulation of Cement Paints” For the partial fulfilment of degree course in Chemical Engineering. In this volume, I have submitted a satisfactory report about Chemical Engineering Minor Project-II in the academic year 2021-22.

**Under the Guidance of**

Rakesh Kumar Dubey

## CANDIDATE'S DECLARATION

We Astha Patel Kurmi, Vinay Singh Rathore, Raman Pratap Singh Bhadoria, Mayank Singh Bhadoria hereby declare that the work presented in this report is record of our own work carried out under guidance of Dr. Rakesh Kumar Dubey and Chemical Engineering Department , Madhav Institute of Technology and Science, Gwalior ( M.P.)

I have not submitted the matter presented in this report work for any other degree or diploma.

**Date : 6<sup>th</sup> May 2022**

**Place : Gwalior**

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## ABSTRACT

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Every year we like to paint our home, furniture, etc. for decoration, protection or sanitation. But we forget the harmful impact of paint on environment, and on our body like headaches, asthmatic reaction, skin irritation and increased chances of lung cancer. The emission of Volatile Organic Compounds (VOC) during drying of paint contributes to ozone in environment. VOC participate in the formation of ozone in the presence of Nitrogen Oxides and sunlight, VOC reacts with oxygen in the air to produce ozone, the most toxic component of the form of pollution commonly known as smog. Ozone attacks lung tissue and is very injurious even in very low concentration. Titanium dioxide present in the paint has greatest environmental impact. Its raw materials are derived from scarce resources and during its manufacturing, emissions include CO<sub>2</sub>, N<sub>2</sub>O, SO<sub>2</sub>, NO<sub>x</sub>, CH<sub>4</sub> and VOC and a number of waste streams including spent acid and metal sulphates and emanate from the manufacturing process, each of which carries adverse environmental impact. Heavy metals used in paints have raised concerns due to their toxicity at high levels of exposure since they build up in the food chain. The excess amount of paint which is drained in the water bodies is also a hazard to the environment.

This project is aimed to develop environment friendly water-based Cement Paint with low titanium oxide content together with low quantity of binder and with added benefits of increased durability, water resistance, reduced surface irregularities, anti-peeling and anti-fungal properties. The production of cement paint has eliminated the use of heavy metals such as chromium, lead and mercury in coating mixture.

In this project, Cement Paint has been manufactured by the use of White Cement, China clay, Calcium Carbonate, Melamine Formaldehyde, Zinc Oxide, Aluminium Stearate, Calcium Chloride and Magnesium Carbonate and Colouring agents like TiO<sub>2</sub>, Al<sub>2</sub>O<sub>3</sub> as raw materials. The manufacturing is done by a simple process with the use of equipment like ball mill and a mesh. The final product is produced in powder form and has been passed against various quality checks. Before application, the paint in powder form is mixed with water to achieve right consistency. Manufacturing the paint in powder form has eradicated the problem of wastage of paint which contributed to environmental hazards. The simple manufacturing process of Cement Paint has contributed to its reduced cost as well.

Keywords: Cement Paint, VOC, TiO<sub>2</sub>, heavy metals.

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## **INTRODUCTION**

Cement Paint is a Paint based on Portland cement with the addition of pigments, fillers, accelerators. These paints which have largely superseded the simple Cement washes are supplied as a dry powder and mixed with water before use, but for darker colors ordinary cement could be substituted as base. For external face decoration lighter color paints are in general preferred, because the color is matchless conspicuously affected by the formation of sporadic Fade films of calcium carbonate over the surface. Cement paints are used externally to prevent rain penetration, as well as for decorative purposes, and can retain some water roofing qualities for as long as ten years on vertical surfaces. For making different colors cement paints a certain percentage of pigments are used in the base cement paint. Usually, the grain size of particles is approximately 63 micrometers in cement paint.

## **PRODUCT & APPLICATION**

A wide range of colors and shades in cement paints have been developed and manufactured to meet various choices, moods, service conditions, and methods of application, performance and economic requirements. Cement paints are widely used by general public and Government Departments, and establishments. Cement paints give following excellent properties to any masonry surface:

- 1) Cement paint gives very good protection to all kinds of masonry surfaces from ultraviolet rays present in sun rays.
- 2) It gives very good protection from severe climatic conditions like rain, heat, water, humidity, salt atmosphere near sea-shores, to all types of cemented walls, surfaces.
- 3) It prevents growth of fungus and bacteria on masonry surfaces.
- 4) It gives very good color and pleasing appearance to all types of masonry surfaces.
- 5) Cement paints hides out various surface irregularities, hair lining, roughness etc. thereby giving smooth and pleasing appearance to all cemented masonry surfaces where it is applied. Cement paints normally give smooth and matt finish.
- 6) Machines and equipment for the manufacture of cement paints are indigenously available and are not very expensive also. The process and technology being simple, this item is suitable for development in rural and backward areas. Cement paint produces a smooth, matt finish, is strongly water repellent and weather proof. It is hygienic and an excellent light reflector requires minimum curing with water, without peelings, flaking or rubbing off.

## CONSTITUENTS

### **RAW MATERIAL REQUIREMENTS:**

Basis: 100g of cement paint

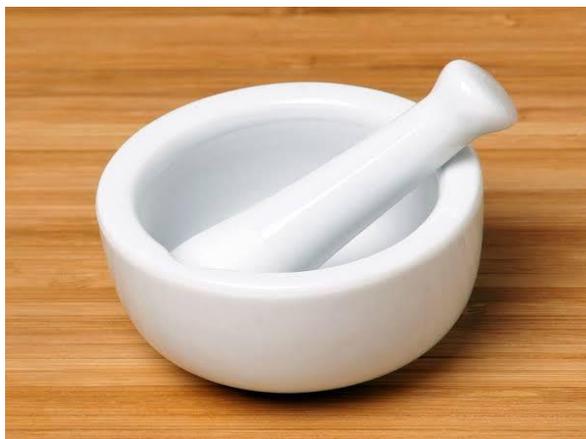
Material	Quantity	Use
White Cement	65 g	White cement is the principal constituent, which serves as a hardener and binder.
China Clay	12 g	Imparts toughness to coating
Calcium Carbonate	7 g	Used as an extender, an agent to alter gloss
Melamine Formaldehyde	1 g	To reduce the water content in concrete while increasing the fluidity and workability of it during handling.
Zinc Oxide	1 g	It adds to opacity and inhibits corrosion.
Aluminium stearate	1 g	Aluminum stearate adds to waterproofing qualities and lubrication to facilitate paint application. They are used as an additive and also as a filler.
Coloring Agents	3 g	Inorganic synthetic oxides are used to add the desired color to cement paint. Example - TiO <sub>2</sub> , Al <sub>2</sub> O <sub>3</sub> etc. Used as pigment
Calcium Chloride	5 g	Increases hardening rate of cement
Magnesium Carbonate	7g	For water retention

Source : <https://patents.google.com/patent/US5281271A/en> Journal - Cement  
Based paint and finishing Composition Inventor - Kishore K. Govani

## EQUIPMENTS REQUIRED:

### 1. Mortar and Pestle:-

- For uniform mixing and grinding of ingredients.



### 2. Mesh Size Required- 200- 230(Aperture Size)

## Availability of Raw Materials:

- Reagent industries- zinc oxide and calcium carbonate
- Anmol paint industries - china clay, calcium chloride, aluminium stearate, coloring agent
- Local India mart dealer -melamine formaldehyde
- Navbharat chemicals- magnesium carbonate
- Local market shop, Maqsudan - white cement



## Preparation Steps of Paint in Laboratory

1. Searching for Good quality ingredients from major market
2. Measurement of ingredients
3. Preparation and pigment dispersion
4. Uniform Mixing
5. Desired level of Grinding
6. Blending
7. Discharging of powder through the sieves
8. Quality Control Testing
9. Packing of prepared sample into container

Source : <https://patents.google.com/patent/US5>

## How Cement Paint solution is prepared?

1. Take 2 parts of cement paint and 1 part of water.
2. Add Cement Paint to Water.
3. After mixing add another 1 part of water.
4. Stir well.



## RESULTS AND DISCUSSIONS

### QUALITY TESTS FOR CEMENT PAINT

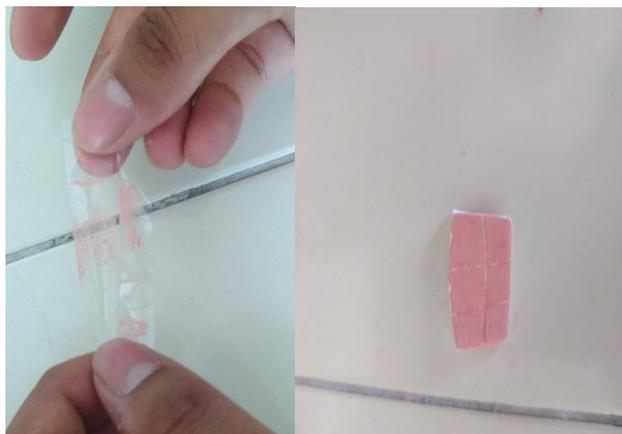
#### 1. Drying Time

- The drying time for cement paint is normally around 24 hours.
- A white cement slab is coated with the material uniformly and its drying time is determined.



#### 2. Adhesion Test

- **EQUIPMENTS NEEDED:** Sharp knife, Adhesion tape, Freshwater, Clean rag.
- **PROCEDURE:** Using the Sharp Knife and wooden stick as a guide, cut vertical lines approximately, then repeat the same cuts horizontally across the vertical cuts already made. Place adhesion test tape over the grid area and rub down with curved blunt end of knife or stick. Leave the tape fixed to the surface for 90 seconds and then pull off at a consistent medium speed at a 45° angle.



**Besides these tests, some other tests which were done in the lab are:-**

- **Colour Test of Cement**  
The colour of the cement should not be uneven. It should have a uniform colour.
- **Presence of Lumps**

The cement should not contain any hard lumps. These lumps are formed by the absorption of moisture content from the atmosphere. The cement bags with lumps should be avoided in construction.



- **Cement Adulteration Test**

The cement should be smooth if you rubbed it between fingers. If not, then it is because of adulteration with sand.

- **Float Test**

The particles of cement should flow freely in water for sometime before it sinks.





## CONCLUSIONS

### Market Potential And Marketing Issues

It has been observed in almost all the masonry constructions water penetrates into and seeps through quite readily-when it does, the beauty and durability of the masonry constructions is affected. The absorbed water dissolves water soluble salts within the masonry and while drying up it creates an unsightly sporadic fade film of calcium carbonate. When water passes entirely through the masonry it will dump the interior walls, crack plaster, peel off the paint and wall coverings. In cold areas the water freezes within masonry and expands, causing cracking and spoiling, which makes the appearance of the surface scarred and chipped. To overcome this problem one has to bear a constant recurring expenditure on the maintenance of building. The cement paint has a property to prevent rain water penetration as well as can retain water proofing qualities as long as ten years, thus enabling the users to maintain the evergreen look of the building for years together without recurring investment. Moreover, keeping pace with the present economic reform people of India is thinking real estate investment is a better investment and opting for construction of house, this cement paint has many connotation values and in spite of tough economy, people will search for this product because of its multi directional benefits of costs.

### Benefits

- Economical
- Better performance for outdoor protection and decoration.
- Availability of various colors.
- Has matt finish, and inexpensive way to cover large areas such as cellars and garage.
- No chance of drying up since it is available in powder form.

### Limitations

- Not durable in comparison to Acrylic paints.
- Color fades away easily giving displeasing look.

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