

## Experimental Study on Athangudi Tiles by Using Zirconium Di Oxide

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### ABSTRACT

The handmade tiles are manufactured in Athangudi, Sivagangai district. We observed that these tiles are reducing foot pain and appearing aesthetic look. But one disadvantage was that these Athangudi tiles were getting easily cracked. We studied that these tiles are getting cracks. Due to its lesser resistance. It shows some cracks on surface of tiles after setting and hardening process. In this project, we gave solution to rectify the problem for this purpose we adding the zirconium di oxide to cement paste at the time of manufacturing process. Because the zirconium di oxide possess high crack resistance property in these tiles. The field test (water penetration test), abrasion test, water absorption test and acid resistance test were conducted on Athangudi tiles with zirconium di oxide and without zirconium di oxide. Then the test result was compared between normal tiles and zirconium di oxide used tiles. Hence we conclude that zirconium di oxide used tiles are somewhat better than normal Athangudi tiles from the above result. We will conduct more tests and come with the conclusion that zirconium di oxide used tiles having better cracking resistance in future.

**Keywords:** *zirconium di oxide, Athangudi tiles, cracking resistance.*

### INTRODUCTION

Athangudi or Athangudi is a small village in Sivagangai District of Tamilnadu, India. The village has a population of about 2,000 inhabitants and is mainly famous for chettinad furniture, tiles and various foods. The place is known for its floor tiles called as "Athangudi tiles". The tiles are handmade and have traditional patterns as design. It is durable and eco-friendly. The people of the area learned the art of tile-making and made a trademark of their own in Athangudi. Most of the families in this place are involved in making tiles. There are numerous ones worth remembering because of their geographical position and a good number because of their significant role and participation in National Building. If cities are shining with talent a bound, it is quite natural because of the facilities available in them. But if a village has to excel and stand in the forefront with buzzing economic activity, it is like a light shining in pitch darkness. The artisans say the charisma of these tiles is due to the sand, which is of just the right composition. The Athangudi tiles are hand-made. Even before invasion of mechanized making of floor tiles such as ceramic, vitrified, marble and granites, these flowering tiles of Athangudi were a match of its own class and they competed with imported ones of Japan and Italy. Gres Porcelain stoneware is a ceramic with a compact, hard, coloured and non-porous body. It is largely used as building materials, for a quality architecture, offering high resistance to impact, stress, wear, scratching,

frost, chemical attack and stains. It is produced in flat tiles, billions of tons per year. A very prominent technology, based on a pyro clastic deformation, permits to obtain bended porcelain tiles as innovative solutions for a modern architecture.

## CEMENT

Cement is a binding material, generally in powder form, that can be made into paste usually by addition of water. 53 grade Ordinary Portland Cement (OPC) (conforming to IS 8112) is used for this investigation. The specific gravity of OPC is 3.15. It should be free from lumps and may be greenish grey or brown or black color. Specific gravity of cement is 3.15 and fineness modulus = 6.6%.

## FINE AGGREGATES

The natural river sand is used as fine aggregates for casting the specimens. The fine aggregate is passing through 4.75 mm sieve and it has a specific gravity of 2.60. Fine aggregate in building and construction material used for mixing with cement, lime, gypsum or other adhesive to form concrete or mortar. Fine aggregate size conforming to sieve passing through 2.36 mm. Specific gravity - 2.23. Fineness modulus - 3.25

## WATER

Quantity of water in the mix plays a vital role on the strength of the concrete. Mostly the pure water is suitable for the concrete mixing.

## ZIRCONIUM DI OXIDE

Zirconium di oxide sometimes known as zirconium is a white crystalline oxide of zirconium. Its most naturally occurring form, with a monoclinic crystalline structure, is the mineral baddeleyite. Its melting point is 2715<sup>0</sup>C. Zirconium di oxide nanoparticles are available in the form of handouts, nanofluids and Nano crystals having a white surface area. They are often doped with yttrium oxide, calcia or magnesia. This article will look into the properties and applications of zirconium di oxide Nano particles.

## WATER ABSORPTION TEST

Totally four tiles specimens were casted, after one day water absorption of the tiles tested.

*Table 7.1 shows results of water absorption test*

Test	Athangudi Tiles Without Zirconium Di Oxide (%)	Athangudi Tiles With Zirconium Di Oxide Tiles (%)
Percentage of water absorption(s1)	8.53	6.23
Percentage of water absorption(s2)	8.65	6.56

## Surface Abrasion Test

Totally two tiles specimens were casted, surface abrasion of the tiles tested.

*Table 7.2 shows results of surface abrasion test*

Test	Athangudi Tiles Without Zirconium Di Oxide (%)	Athangudi Tiles with Zirconium Di Oxide Tiles (%)
Abrasion value (cm)	2.12	1.23

## Field Test

Totally two tiles were tested in the field. The test results were shown below table.

*Table 7.3 shows results of Field Test*

Test	Athangudi Tiles Without Zirconium Di Oxide (%)	Athangudi Tiles with Zirconium Di Oxide Tiles (%)
Field Test	Percolation of water and cracks are more.	Percolation of water and cracks are less.

## CONCLUSION

- ❖ After the completion of the entire test, it was observed that the resistance properties of Athangudi tiles have been increased.
- ❖ It was found that the major problem faced by the manufacture of Athangudi tiles has been overcome by mixing nonmaterial like zirconium di oxide to cement paste.
- ❖ The use of zirconium di oxide in Athangudi tiles has reduced the water absorption. These tiles prevent crack formation and water percolation into the tiles.
- ❖ Finally, it was conclude that these handmade tiles made using zirconium di oxide have more supremacy than normal Athangudi tiles.

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### Conflict of Interest

None of the authors have any conflicts of interest to declare.

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