

Detailed Case Study About Smog Eating Tiles

Syed Mohammad Saad¹

Prof. Anurag Singh Gahalod²

¹ M-tech Student G.H Rasoni College of Engineering and Technology, Amravati

² Assistant Professor G.H Rasoni College of Engineering and Technology, Amravati

Abstract - Our Project is about to study the ill effects of smog and air pollution and control it by using smog eating tiles. Our aim is to study the economy of this construction and contribute our part in „SWACHABHARAT ABHIYAN“. The rapid growth in pollution is due to excessive use of vehicles. Previous and growing Industries such as steel industries, thermal electric power plants, etc. These tiles are normal roofing tiles which are installed on the roof. The only thing which differs is titanium dioxide on it. The coating of titanium dioxide (single coat) is applied on the tiles which can be done in the form of paint. Titanium dioxide is available in the form of powder it is mixed with water and prepared in the form of paint. It is applied on the roofing tiles with painting tools. Cost of these tiles is just 25% more than the normal roofing tiles

Key Words: Smog, Titanium Dioxide, Mangalore tiles

1.INTRODUCTION

Photocatalytic tiles, also referred to as smog-eating tiles, serve as a type of architectural material aimed at mitigating air pollution in urban environments. These tiles are specially coated with a thin layer of titanium dioxide (TiO₂), which acts as a photocatalyst.

When the tiles are exposed to sunlight, the titanium dioxide triggers a chemical reaction known as photocatalysis. During this process, nitrogen oxides (NO_x) and volatile organic compounds (VOCs), the primary constituents of smog, are broken down into harmless substances like water and carbon dioxide.

By harnessing the power of photocatalysis, smog-eating tiles contribute to the reduction of air pollutants. This technology is particularly beneficial in areas with high levels of air pollution caused by factors such as vehicle emissions and industrial activities.

The economic feasibility of smog-eating tiles is notable as well. Their manufacturing costs are only slightly higher compared to regular roofing tiles, making them a viable option for construction projects. Moreover, their

implementation aligns with initiatives like the Swachh Bharat Abhiyan (Clean India Campaign), promoting environmental cleanliness and sustainability.

Overall, smog-eating tiles present an innovative solution to combat air pollution. Through their ability to facilitate photocatalysis, these tiles offer the potential to create cleaner and healthier living environments, especially in urban areas.

2. working

The smog-eating tile is a revolutionary product in the roofing industry, unique to the United States. It incorporates titanium dioxide (TiO₂) into a micro mortar coating on the upper tile body. Titanium dioxide, a common ingredient in consumer and industrial products, acts as a catalyst when exposed to sunlight. This catalyst enhances the oxidation process of nitrogen oxide (NO_x), a major component of smog prevalent in heavily populated areas with high levels of vehicle emissions.

The smog-eating tile works by oxidizing harmful NO_x molecules released from vehicles, contributing to cleaner air. The roof coating contains a photocatalyst that is activated by daylight, facilitating the conversion of harmful nitrous oxides into calcium nitrates. When it rains, the calcium nitrates are washed off the roof, further reducing their impact on the environment.

NO_x emissions resulting from combustion processes are linked to significant health issues. Over the course of a year, 2,000 square feet of the smog-eating tile can oxidize the same amount of NO_x as a car produces from driving up to 10,800 miles. By utilizing these tiles, builders and homeowners can actively contribute to reducing smog and the associated health problems it causes.

The smog-eating tiles improve air quality by neutralizing smog-forming nitrogen oxides emitted by vehicles. The titanium dioxide coating on the tiles acts as a photocatalyst, breaking down nitrogen oxides in the air and transforming them into harmless calcium nitrate.

Additionally, the Boral's Energy Efficient Roof System, incorporating these tiles, offers energy savings of up to 22%. It helps regulate home temperatures, keeping them warmer in winter and cooler in summer, thereby reducing heating and air conditioning costs.

It's worth noting that while the smog-eating tiles provide numerous benefits, they are a high-tech solution and come at a higher price compared to standard tile roofs, with an approximate cost increase of \$650 for a 2500 square feet roof. However, the long-term environmental and health advantages make them a compelling choice for those seeking sustainable roofing solutions.

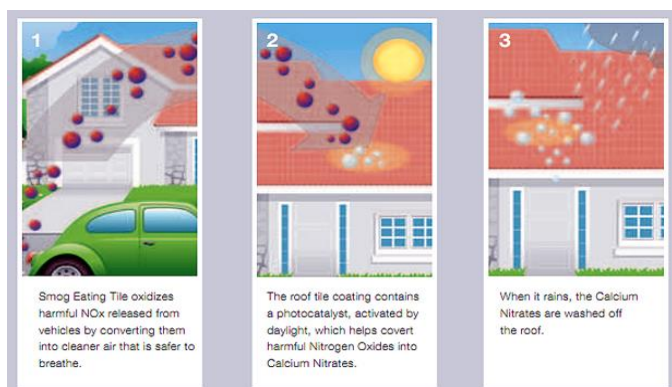


Fig-1 working

3. CONCLUSIONS

- Benefits outweigh the costs.
- Smog level reduction creates a healthier environment and inhabitants.
- Tiles reduce home heating and cooling costs.
- Recyclable tiles mitigate the amount of landfill waste.
- It has been observed that smog has been reduced to minimum level due to Titanium dioxide. Therefore, it is an eco-friendly advice to the industries that they should install this on their roof which are the larger producers of smog. This idea can be useful for our future and it should be implemented in India at various polluted cities such as DELHI, CHANDRAPUR, MUMBAI etc. To reduce or minimize number of air pollutants to achieve clean air to breath.
- This project is move towards our contribution for eco-friendly environment in metro cities subjected to high level of pollution due to industries and traffic.
- An on the conclusion of our project is to give contribution in „SWACHHA BHARAT ABHIYAN“ like the country in which we are

living, not only its land should be cleaned but also its air should be purified with every polluting agent w

ACKNOWLEDGEMENT

I would like to express our gratitude to all those who have contributed to the research on smog-eating tiles. I acknowledge the support and guidance of my guide prof. Anurag Singh Gahalod and the resources provided by academic institutions and research organizations. I also appreciate the valuable contributions of researchers and experts in the field, the feedback from reviewers and editors, and the support of my friends and family. Without their assistance, this research would not have been possible. Thank you.

REFERENCES

- [1] Beeidens Anne Environmental friendly Concrete pavement blocks air purification in the centre of Antwerp, presented at the 8th international conference on concrete paving, NOV 6-8 .
- [2] San francisco, CA Chai-Mei Yu jimmy. Deactivation and regeneration of environmentally exposed titanium dioxide based products. Testing report prepared for environmental protection department HAKAR June 2006.
- [3] Chusid Michael "Next Step: Self Cleaning Concrete! Photo catalysts can keep concrete clean and reduce air pollution." New Technology. Aug/Sept 2005.chusid Michael "words you should know: depollution, photo catalysis" precast solutions Magazine, Nov.2006http://www.precast.org/publications/solutions/2006_fall/feature_words.htmElegant Embellishments product information at <http://www.elegantembellishments.net/eraser,Lance>. "Titanium Dioxide; Environmental White Knights?" Environmental Health Perspectives. Vol 109, Number 4, April 2001.
- [4] Maggots, T , Kitties J., Bartziz j., Leva R Bellintani, A., and Vasilakos, C. " Invwtigations of Tio2 – Contaning Materials for decompositions of NOxIn Environment Chambers". http://www.jrc.cec.eu.int/pce/documentation/eur_reports/Investigations_Tio2_UAQ2005.pdfMamaugh , Geoff Urban Grids /Respiratory Oasis. World Changing.Oct 10, 2006.