



WINONE
Product Technologies

WINONE PRODUCT TECHNOLOGIES PVT LTD

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WINONE

NANO TiO₂

(TITANIUM DIOXIDE)

**Self Cleaning and Pollution Control
Coating Solution**

**A short report on how Nano TiO₂ can be a potential
technology in reducing and controlling pollution in
India without consuming any external energy**

I. AIR POLLUTION: A MAJOR THREAT TO INDIAN ECONOMY

Air pollution is an environmental problem that has significant negative health implications for humans as well as other living organisms. Major primary pollutants that are produced by human activity include nitrogen oxides (NOx), Sulphur dioxide (SO2) and volatile organic compounds (VOCs) which are emitted from combustion at high temperatures.

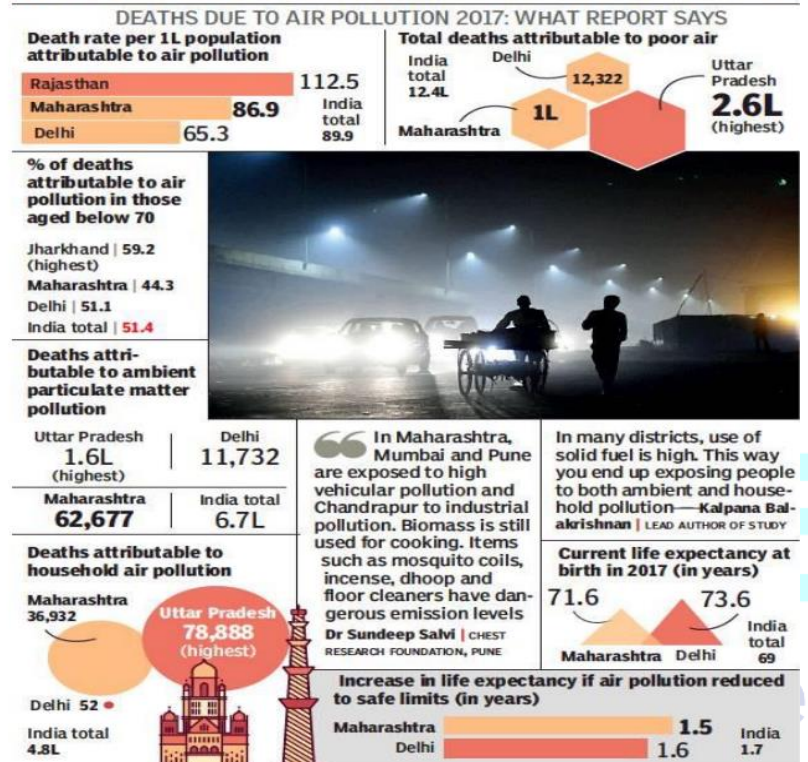
Times Of India 07/12/2018

Air pollution causes 1 in every 8 deaths in India: ICMR report 'Deadlier Than Smoking In Causing Illness'

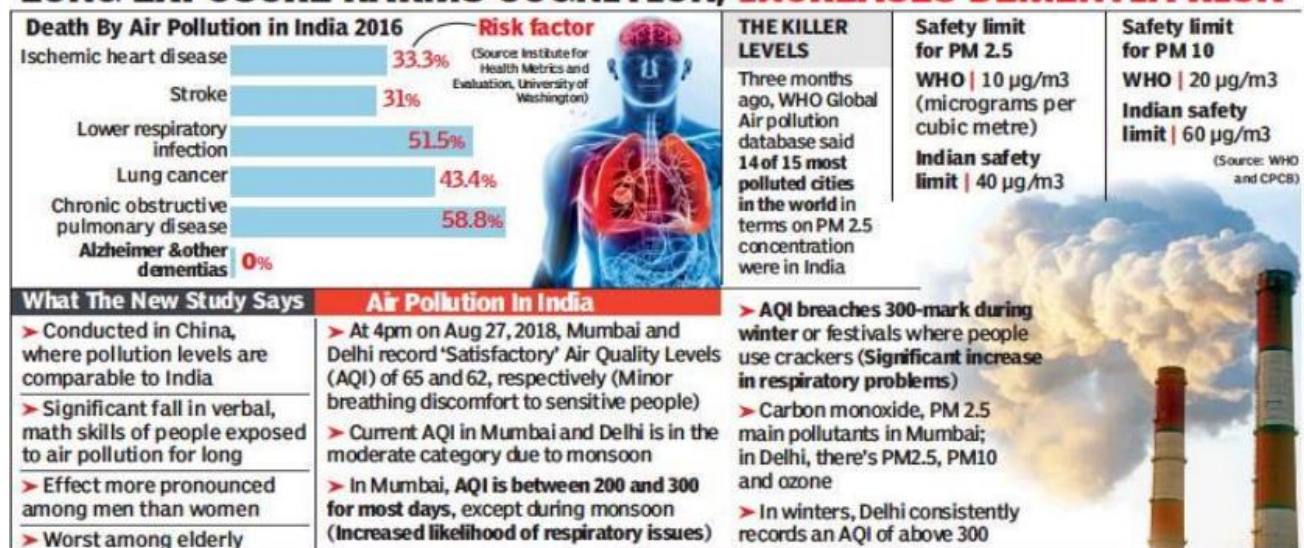
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- 50% pollution deaths in under-70 age group
- In 2017, air pollution accounted for 12.4 lakh deaths in India, which included 6.7 lakh deaths due to outdoor particulate matter air pollution and 4.8 lakh deaths due to household air pollution
- In 2017, India witnessed 1.10 lakh premature deaths of children due to air pollution, highest in the world in the category of kids under five years of age.

HOUSEHOLD POLLUTION CAUSE FOR WORRY



'LONG EXPOSURE HARMS COGNITION, INCREASES DEMENTIA RISK'



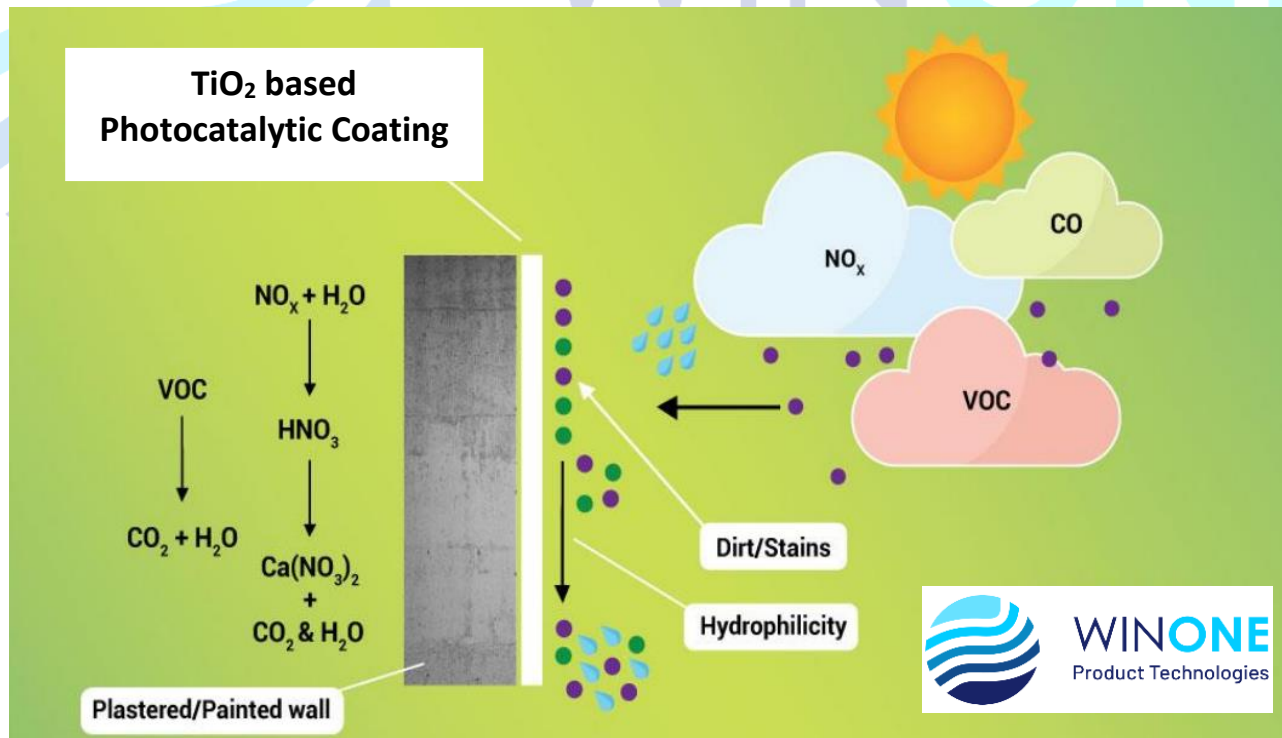
II. Nano TiO₂: As a Sustainable and Affordable Solution:

Titanium Dioxide based coatings are a technology that could help mitigate air pollution and ultraviolet rays. Photocatalytic components like TiO₂ use energy from sunlight (or other ultraviolet light sources) and convert into harmless substances. This coating reduces NO_x, SO_x, tobacco smoke, Bacteria etc. from the atmosphere and also serves as self-clean material. TiO₂ based coatings help to mitigate air pollution directly.

III. How Nano TiO₂ works?

When the coating absorbs ultraviolet radiation from the sun, hydroxyl radicals and superoxide anions are created that have the ability to react with pollutant molecules such as NO_x to convert them to other, less harmful substances. This could be particularly advantageous in areas with high levels of air pollution. Several studies have found that the most efficient photocatalytic material for removing NO_x and VOCs is titanium dioxide (TiO₂) in anatase phase.

TiO₂ is activated by ultraviolet (UV) radiation ($\lambda < 390$ nm) to oxidize air pollutants, such as nitrogen oxides (NO_x) and volatile organic compounds (VOCs), into other inorganic compounds. In a photocatalytic reaction with TiO₂, No chemical reactants are used. The TiO₂ does not get consumed in the reaction; so it can be used indefinitely.



Nano TiO₂ converts harmful gases into harmless CO₂ and H₂O without any external energy

IV. BENEFITS OF PHOTOCATALYTIC COATINGS:

Structures Coated with Nano TiO₂ can acts as Trees: Which help in reducing pollution and control the PM levels continuously without any external Energy

- Air Purification, Pollution Control:** The coating has the property to reduce the pollutants in the air like NO_x and SO_x in the air into harmless compounds like water vapor and CO₂. The reaction does not consume any part of the coating and hence will go on as long as the coating stays on the surface.
- Self-Cleaning Structures:** The photocatalytic coating helps split the organic dirt in the presence of UV light, and diffuses water to the whole surface with its additional hydrophilic properties, which helps clean the structure with very minimal water.
- Antibacterial, Antiviral and Antifungal Properties:** A build-up of unsightly black algae is a very common issue that can be even worse in damp areas that have less sunlight. With the current design trend of white and very light-colored facades, exposed concrete and bricks being used, this is even more of a problem. By utilizing our coating system, the concrete will be sealed and water resistant and the active Photocatalyst in our coating will inhibit the growth of black algae coupled with self-cleaning, anti-carbonation and other benefits.
- Water based Green Technology:** With a 100% water based formulation, this is a step towards sustainable innovation where the coating enables the world to be used for multiple applications with no damage to the environment.

COMMERCIAL APPLICATIONS –

- Residential Buildings
- Flyovers, Bridges and Tunnels
- Industrial and Commercial Buildings
- Roads and Allied structures
- Any concrete and stone surfaces
- UV based Air purifiers

Borgo Palazzo street – Bergamo, Italy

The project involved the requalification of about 500 m of Borgo Palazzo street in Bergamo, accounting for an active surface area of about 7,000 m² with grey paving stones for the road and red ones for the sidewalks.



Umberto Tunnel – Rome Italy



Tunnel after renovation

Commercial application of Nano TiO₂ in a tunnel in Italy



V. OUR TiO₂ TECHNOLOGY AND INVENTION IN INDIA

Polymeric Titanium Oxide Nano-Strands with unusual properties

Chemical composition : 99.71% water, 0.29% solid

Ti-Oxide : Water (Molar ratio) 1 : 1000

Viscous material & Soluble in water.

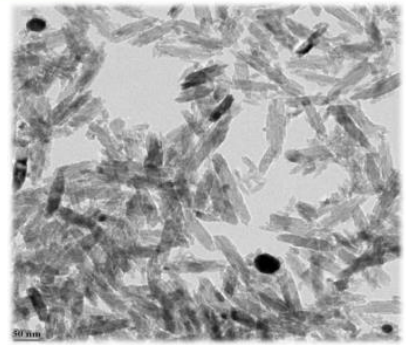
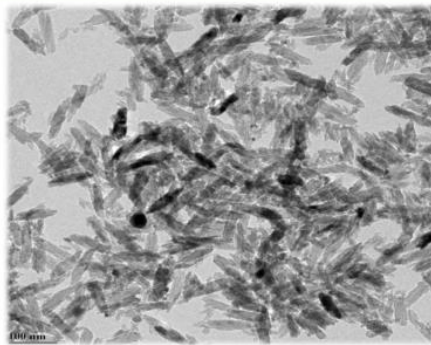
Viscosity : 8000-12000 cps

Zeta potential : -30 to -80 mV

Stability : Stable and reusable.

Photocatalyst : Very active in solarlight.

Titanium Oxide Nano Strands



Titanium Oxide Nano Strands



Scaled up production of Nano TiO₂ with affordable cost and application on concrete surfaces

VI. TEST REPORTS: NATIONAL CHEMICAL LABORATORY

National Chemical Laboratories, Pune: For Anti-pollution and pollution disintegrating properties.



सीएसआईआर - राष्ट्रीय रासायनिक प्रयोगशाला

(वैज्ञानिक तथा औद्योगिक अनुसंधान परिषद)

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CSIR - NATIONAL CHEMICAL LABORATORY

(Council of Scientific & Industrial Research)

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Sr. Scientist, Catalysis Division (Environmental Catalysis Group)

Date: 22nd June 2018



Test composition:

1. CO 1200 ppm + C₃H₆ 1200 ppm + 40% O₂ + 40% CO₂. Sunlight exposure: 5 h
2. NO 936 ppm + 11% O₂ Sunlight exposure: 5 h
3. Toluene 2000 ppm (VOC)

	CO	C ₃ H ₆	NO	Toluene
CONVERSION	98%	100%	100%	100%
DEGRADATION EFFICIENCY	3840 µg/m ² /h	5700 µg/m ² /h	3100 µg/m ² /h	23000 µg/m ² /h

INDIAN PATENT FILED AND GRANTED SUCCESSFULLY



INTELLECTUAL PROPERTY INDIA
PATENTS | DESIGNS | TRADE MARKS
GEOGRAPHICAL INDICATIONS



भारत सरकार
GOVERNMENT OF INDIA
पेटेंट कार्यालय
THE PATENT OFFICE
पेटेंट प्रमाणपत्र
PATENT CERTIFICATE
(Rule 74 Of The Patents Rules)

क्रमांक : 022110926
SL No :



पेटेंट सं. / Patent No. : 352865

आवेदन सं. / Application No. : 201621029501

फाइल करने की तारीख / Date of Filing : 30/08/2016

पेटेंटी / Patentee : Malati Fine Chemical Pvt. Ltd.

प्रमाणित किया जाता है कि पेटेंटी को उपरोक्त आवेदन में यथाप्रकटित POLYMERIC NANO TITANIA PHOTOCATALYTIC PAINT FOR PROTECTIVE AND ENVIRONMENT COATINGS. नामक आविष्कार के लिए, पेटेंट अधिनियम, 1970 के उपबन्धों के अनुसार आज तारीख 30th day of August 2016 से बीस वर्ष की अवधि के लिए पेटेंट अनुदत्त किया गया है।

It is hereby certified that a patent has been granted to the patentee for an invention entitled POLYMERIC NANO TITANIA PHOTOCATALYTIC PAINT FOR PROTECTIVE AND ENVIRONMENT COATINGS. as disclosed in the above mentioned application for the term of 20 years from the 30th day of August 2016 in accordance with the provisions of the Patents Act, 1970.

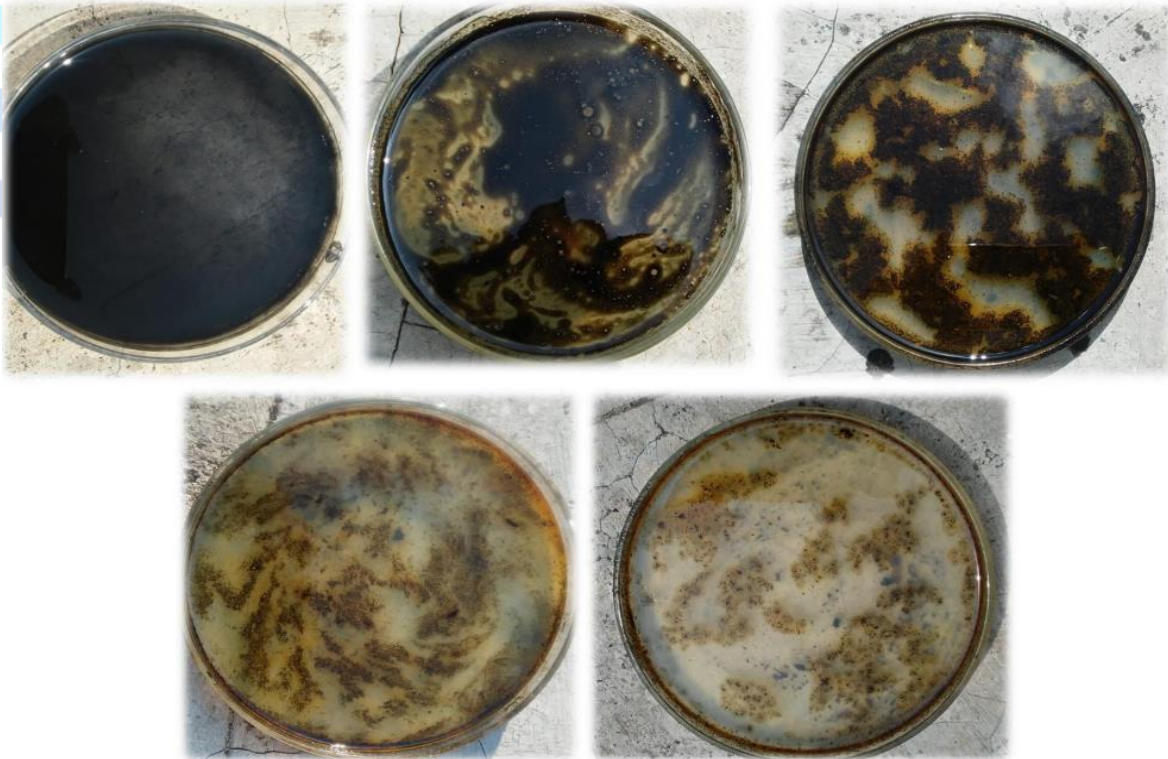


1. Mold Formation reduction on Natural Rock



Photos showing efficiency of TiO_2 to breakdown organic matter in presence of sunlight

2. Oil Degradation of Used Engine Oil and Oil stains



Fresh Nano TiO_2 mixed with used oil. In presence of sunlight, the organic content in oil breaks down into non harmful substance.

PROVEN CASE STUDIES of TiO₂ applied on structures AROUND THE WORLD since 2010

- 1. Los Angeles Community College District – Build Green**
- 2. Air France Headquarters**
- 3. Umberto Tunnel – Rome Italy**
- 4. 570 Broome – New York, USA**
- 5. Dives in Misericordia Church – Rome**

VII. THE WAY FORWARD-

The World Health Organization estimates that every year, 2.4 million people die as a result of air pollution. If titanium dioxide based photocatalytic coatings were applied to buildings on a wide scale, cities could employ an additional tool to tackle the high levels of pollution produced on a daily basis.

The effectiveness of titanium dioxide as a photocatalytic material has been analysed with the help approximately 100 published articles and 12 field trials, and numerous real time applications, and titanium dioxide based photocatalytic coatings have in fact shown to be highly effective at reducing harmful pollutants when using well-formulated products applied to sufficiently large surface areas, which are also exposed to adequate natural light levels.

While we are still some way from applying this thinking to all building materials, more and more buildings across the world are using this titanium dioxide-based coating technology within their construction process.

When used in a particular way, titanium dioxide based photocatalytic coating's ability to remove pollutants directly from the air offers a huge opportunity in the fight to cut pollution levels. This is particularly relevant in cities, which have both high levels of pollution and a huge number of buildings.

TiO₂ provides a low-maintenance and cost-effective way to positively affect the living conditions of millions of urban-based people through improved local air quality.

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