Passionate about Titanium Dioxide

Passionate about Sustainability
For a Brighter Future

Titanium dioxide has been manufactured and used safely around the globe for almost 100 years to primarily add whiteness to thousands of everyday products. It is a brilliant product.

Many of the leading players in the industry are part of the Titanium Dioxide Manufacturer’s Association (TDMA) - a sector group of the European Chemical Industry Council (Cefic).

The TDMA strives for the responsible, safe and sustainable manufacture and use of Titanium dioxide.

Our members work to:

- Implement the Responsible Care® commitment to continuous Environmental, Health and Safety improvement
- Reduce Greenhouse Gas (GHG) emissions / Carbon Footprint in the TiO₂ industry
- Inform and educate downstream users on efficient and effective use of titanium dioxide and how it can help reduce their GHG emissions and Carbon Footprints
- Carry out scientific research
- Work with regulatory bodies towards science based policy
- Stimulate innovation in titanium dioxide – keeping European titanium dioxide manufacturing competitive

Sustainability is a core focus for the TDMA. We aim to make titanium dioxide based products that deliver sustainability benefits for our customers and we do this while working to reduce our own environmental footprints too. We are passionate about it.

So much so, we pioneered a carbon footprint methodology that helped us to calculate an industry average cradle-to-gate carbon footprint so that we can monitor and measure our performance in this important area[2].

Titanium dioxide is ubiquitous in our society and we, the TDMA, want to share what a brilliant and versatile ingredient it is – at the same time promoting how it can make a positive contribution to the sustainability of the products it helps to create.

Signed:

The TDMA

[1] See www.tdma.info/

The Science Behind the Brilliance

What is titanium dioxide?

Titanium dioxide is made from ores containing titanium - the ninth most abundant element on our planet. It is unique and versatile and safe in its intended uses[3]. It is thermally stable, chemically inert and non-flammable. For the majority of applications there is no viable alternative[3].

Over 99% of all titanium dioxide sold is known as pigmented TiO₂. A second form is ultratine. The two types are differentiated by particle size and intended functionality.

What does it do and where is it used?

Titanium dioxide primarily delivers outstanding whiteness, brightness and opacity by scattering light. It bends light better than diamond – and there is no other white pigment in the world that can provide opacity or “hiding power” as efficiently as pigmented titanium dioxide[3].

The majority of Titanium dioxide is used in paints, followed by plastics. It is used in thousands of products in other applications too – ranging from packaging, paper and textiles to foodstuffs and cosmetics.

Read on to discover some of the many important roles titanium dioxide plays in creating a more sustainable world.


The European titanium dioxide industry has invested about €1.4 billion in various environmental improvement measures during the past 20 years[3].
Titanium Dioxide Benefits to Coatings – Inside and Out

Brightening our lives
Titanium dioxide is designed to deliver brilliant whiteness in interior coatings which can generate the feel of cleanliness or increased space.

Saving energy
Titanium dioxide used in white and light coatings is manufactured so that the particles scatter as much light as possible around rooms and internal spaces. Thanks to the brightness and whiteness imparted by titanium dioxide, we can light rooms using less energy. This can be either by using lower energy bulbs or by using less lighting—whether that be in homes, at work, or at school.[2]

Delivering unique hiding power and maximizing resource efficiency
The coatings industry uses titanium dioxide pigment for its ability to provide opacity to their paints. Coatings with more hiding power, resulting from a high concentration of titanium dioxide, require less paint to achieve desired coverage—reducing the number of coats needed, increasing productivity and resource efficiency.

Keeping it cool
In warmer climates where heat in buildings can be a problem, white or light coloured ‘Cool Roofs’ significantly reduce heat-gain[4]. This can increase comfort levels for the people inside the building and, if air conditioning is used, power consumption can be reduced.

The ‘urban heat island effect’ is a growing problem in many cities across the world. The absorption of heat by concrete and construction materials means that temperatures can be significantly higher in cities than in their rural surroundings. Painting surfaces white is an effective way to reduce this effect, making city life in hot climates much more bearable[5].

Recent studies[3] show increasing surface reflectance can minimise energy consumption for lighting in buildings.

Did you know white cars reflect more of the sun’s heat?
According to Lawrence Berkeley Laboratory there are potential benefits of solar reflective car shells in terms of cooler cabins, fuel savings and emission reductions[6].
Titanium Dioxide adding Value to Plastics

Creating intelligent solutions with minimal resources

Brilliantly white titanium dioxide helps to create visually clean packaging, offering aesthetic appeal to the consumer. With the superior hiding power of titanium dioxide, packaging opacity targets can be reached at reduced film thickness. This can help the plastics industry in their commitment to the continuous reduction of plastics used in products[7].

Preserving food and protecting produce

Titanium dioxide’s ability to scatter visible light and absorb and scatter UV radiation brings light-barrier functionality to packaging. The opacity of the packaging is enabled by titanium dioxide. It can help protect light-sensitive food ingredients and preserve food quality. This may result in extended shelf life and less food spoilage. For example, studies suggest that an adequate light barrier avoids light-induced milk degradation[8].

Titanium dioxide also helps to protect our crops. Plastic mulch films are laid at ground level to suppress weed growth, maintain humidity and protect the crops from temperature extremes. White films containing titanium dioxide are used in warmer regions, to reflect heat where lower soil temperatures are desired.

In addition to keeping the soil cool underneath the white film, reflected light is captured by the lower plant leaves leading to increased food yields and productivity.

Continually Innovating with Titanium Dioxide

Purifying

Non-pigmentary titanium dioxide is being used in the innovative purification of air, water and manufactured surfaces and can aid self-cleaning. For example, titanium dioxide plays a key role as part of catalyst systems that remove pollutants from power plants and vehicle exhausts[9].

Research is being conducted using water treatment technologies that combine tailored titanium dioxide with solar / light energy[10]. In the future this could enable a healthier living environment in highly populated areas of the world.

Hospitals and surgeries can also reap sustainability benefits from titanium dioxide where it might be used to minimize the risk of infections via light activated sterilization and self-cleaning surfaces[11].

Generating clean energy

Solar electricity can be generated using titanium dioxide based dye-sensitised solar cells[12]. Moreover, research has shown that non-pigmentary titanium dioxide can be used to produce hydrogen from water using only sunlight[13, 14].

[15] Photocatalytic Gasden't, with Texturing and 3d Textuing properties by Project partners, In the European Project PICASO official presentation, EC-IERES 2001 -4044, February 2005

A European Union project has shown that when incorporated into concrete or paint on the exterior of buildings, titanium dioxide can be used as a photocatalyst to reduce air borne emissions[16].
Passionate about Titanium Dioxide
Passionate about Sustainability

You can rely on the TDMA to continue to push boundaries and to find the best way to use this brilliant ingredient - and to deliver maximum value from it.

We actively engage with industry associations and downstream users on sustainability and we would be delighted to involve you in that dialogue if you have any questions.

Members

Full Members
- Cinkarna Celje d.d
- Cristal
- Evonik Industries
- Grupa Azoty Zaklady Chemiczne “Police” S.A.
- Huntsman Pigments
- KRONOS Worldwide Inc.
- Precheza AS
- Sachtleben GmbH
- Tronox Pigments (Holland) BV

Associate Members
- E. I. du Pont de Nemours and Company
- Ishihara Sangyo Kaisha, Ltd.
- Tayca

For more information please contact:
Titanium Dioxide Manufacturers Association (TDMA) at European Chemical Industry Council (Cefic)
Avenue E. van Nieuwenhuyse 4
B - 1160 Brussels
Belgium
Tel:   +32 2 676 72 59
Fax:   +32 2 676 73 59
Email: mgo@cefic.be