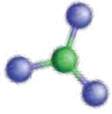


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KRONOClean – The innovation in catalytic pollutant degradation

KRONOClean 7000 and **KRONOClean 7050** are photocatalysts based on titanium dioxide. They catalyse, i.e. promote and accelerate, the degradation of organic molecules and the mineralisation of nitrogen oxides (NO_x), etc. when irradiated with visible light or exposed to ultraviolet (UV) radiation (sunlight). Pollutants are converted into harmless substances, such as water and carbon dioxide, or nitrate that acts as a fertilizer for nearby plants.

KRONOClean 7000 steps in where conventional catalysts are ineffective. **KRONOClean 7050** has the same effect as **KRONOClean 7000**, but only when exposed to UV radiation.

KRONOClean 7000 works :

- behind glass
- with standard light bulbs and energy-saving lamps
- in twilight
- in scattered light
- in UV radiation.

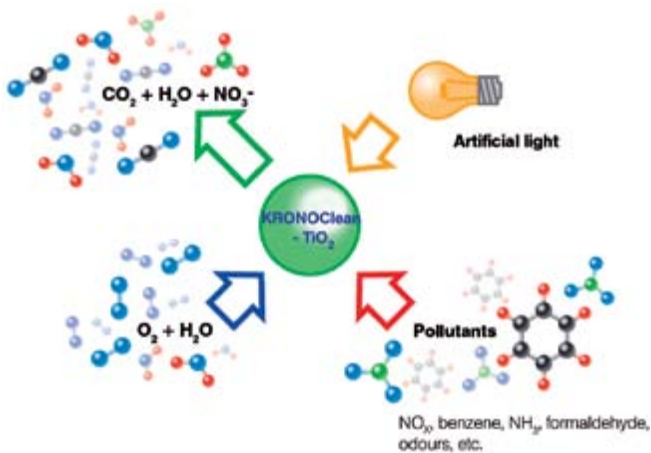
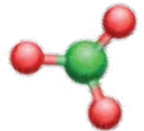


Fig. 1 : Degradation of pollutants by means of artificial light sources

KRONOClean 7000 effectively eliminates numerous pollutants in fields of application where conventional UV catalysts are already to be found.

KRONOClean 7000 is used to eliminate undesirable odours and to degrade organic stains and dirt on surfaces. Its efficacy in the elimination of a host of pollutants has been confirmed :

- Nicotine and tar
- Ammonia and amines
- Aldehydes and alcohols, e. g. formaldehyde, acetaldehyde and methanol
- Phenols and other aromatic compounds, e. g. benzene, p-chlorophenol, PCBs
- Nitrogen oxides and carbon monoxide



As a catalysing component, it can contribute to NO_x degradation, e.g. in order to improve air quality in towns. Moreover, systems containing **KRONOClean 7000** have been found to display less susceptibility to attack by various algae, fungi and bacteria.

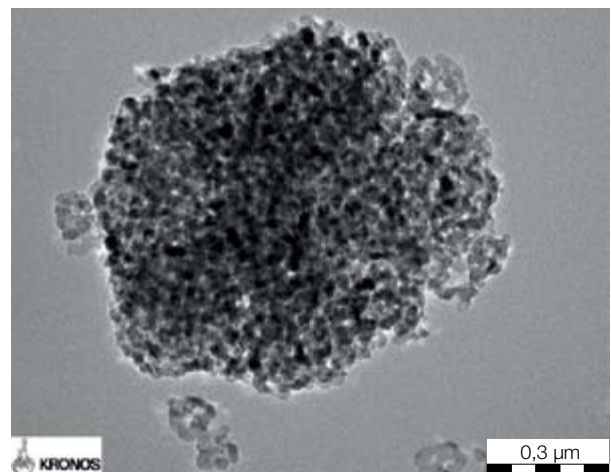


Fig. 2 : Transmission electron microscope (TEM) photo of KRONOClean 7000

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Functional principle The degradation mechanism of KRONOClean 7000

Titanium dioxide is known as a pigment and a UV absorber, and protects the polymer matrix against direct destruction by UV radiation. Titanium dioxide pigments are optimised to obtain the lowest possible level of photocatalytic activity. In this case, the energy from the absorbed light is converted into heat, whereas photocatalysts exploit the energy particularly effectively to form radicals, such as $\cdot\text{OH}$ and $\text{HO}_2\cdot$, on the TiO_2 surface.

KRONOClean 7000 provides these radicals for degrading undesirable substances. In contrast to conventional TiO_2 photocatalysts, no UV radiation is necessary for this purpose.

The decisive difference

Conventional photocatalysts usually only make use of the UV radiation, i. e. the radiation up to a wavelength of approx. 400 nm. Consequently, they exploit less than 6 % of the irradiated solar energy reaching the Earth. And yet the range of visible light alone, between 400 nm and 800 nm, accounts for approx. 52 % of the energy supplied by the sun.

Thanks to a special modification, **KRONOClean 7000** is in a position to use not only UV radiation, but also part of the visible light spectrum with a wavelength > 400 nm.

It therefore, greatly enlarges the effective range of TiO_2 photocatalysts. Now, even twilight periods can be used, a time when conventional photocatalysts fail. KRONOS photocatalysts for visible light are already being used successfully indoors.

Packaging of KRONOClean

KRONOClean photocatalysts are supplied in:

- 20 kg cardboard boxes with PE-inliner
- Flexible bulk containers

The packaging complies with the requirements of Directive 94/62/EC on packaging and packaging waste.*

* In the currently valid version (3/2009)

