

**NEW PRODUCT**

# Quartzel® PHOTOCATALYTIC FELT FOR AIR TREATMENT

Saint-Gobain Quartz has launched a new innovative photocatalytic substrate made from Quartzel® fused Silica fibers. Quartzel® photocatalytic substrates have high photocatalytic efficiency and can be used in air purification systems, from stand-alone, HVAC residential to large building systems.

This substrate is the result of Saint-Gobain research in the domain of environment friendly materials such as BIOCLEAN® self cleaning glass.

This substrate presents a large range of technical advantages for a high reduction of VOC, bacteria, fungi, bad odors, ozone.

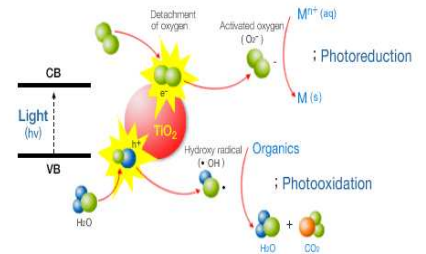
Different parameters in particular the nature of substrate, chemistry, physical aspect, UV resistance, have a great impact on the photocatalytic air purification efficiency. Saint-Gobain Quartz solution uses ultra pure and continuous fused Quartz fibers coated with a TiO<sub>2</sub> photocatalytic material .

## Substrate critical parameters

- *Pressure drop*
- *Specific surface area*
- *TiO<sub>2</sub> pollutant removal efficiency*
- *Substrate tortuosity*
- *UV transmission*
- *UV and chemical substrate resistance*



## What is photocatalysis ?



Photocatalysis is an oxidation process involving a photocatalyst (TiO<sub>2</sub>) and UV rays as activator

## Our Quartzel® Substrate solution

Low pressure drop (100 Pa at 2m/s air velocity)

More than 100 m<sup>2</sup>/g of active surface for high absorption capacity

Saint-Gobain technology

Long continuous curly fused quartz fibers

Excellent UV transmission within fused Quartz fibers and felt structure

Mineral material, not sensitive to oxidation, UV effect & ageing

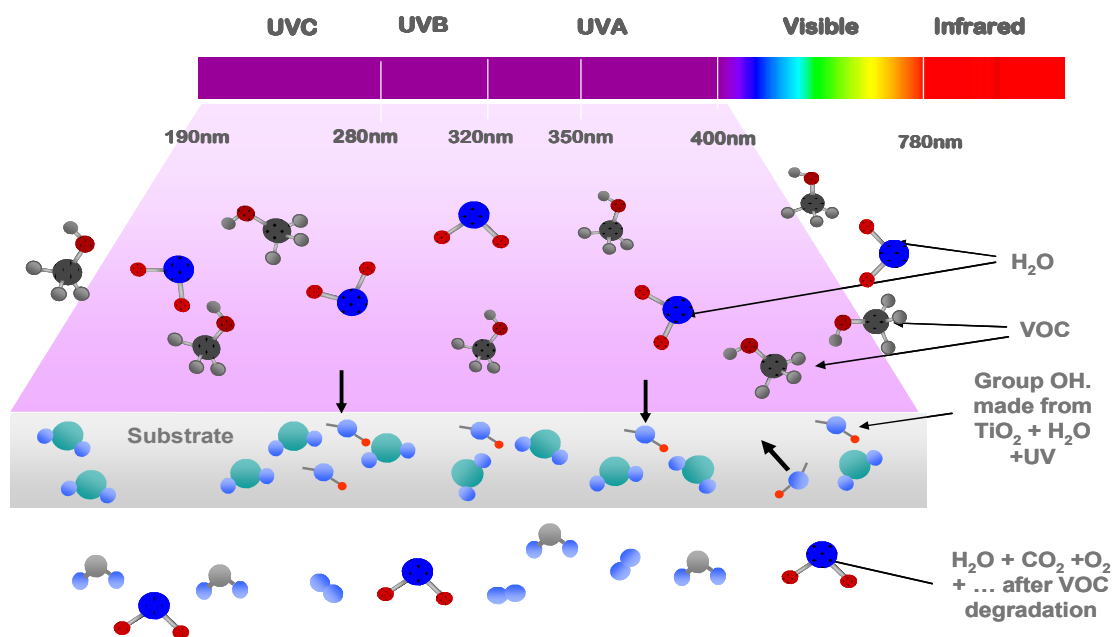
# Quartzel® PHOTOCATALYTIC FELT FOR AIR TREATMENT

## Photocatalysis - How does it work?

The combined action of UV rays and  $\text{TiO}_2$  creates from the  $\text{H}_2\text{O}$  present in the air,  $\text{OH}^\cdot$  radicals.

These  $\text{OH}^\cdot$  radicals have an oxidation power 2 times higher than Chlorine and are able to decompose organic compounds and microorganisms as bacteria, into basic  $\text{CO}_2$  and  $\text{H}_2\text{O}$  molecules, and reduce the odours as a result.

Whereas systems based on activated carbon only absorb pollutants and need frequent replacement and maintenance operations, systems based on photocatalytic media operate continuously due to self-regenerating property of catalyst involved by transformation of pollutants into volatile compounds .



## Efficiency of photocatalysis

### The following pollutant families can be treated using photocatalysis

- Main pollutants of indoor air
  - ◇ Chemical pollutants (VOCs) : Formaldehyde and Aldehydes , Hydrocarbons as Toluene, Benzene,
  - ◇ Xylene, Styrene
  - ◇ Microbiological pollutants : Bacteria , molds and virus
- Ozone
- Malodoring molecules as Ammonia, Methyl Mercaptan for instance
- More generally : Most Hydrocarbons (Alcane except Methane, Alcene, Alcyne), Alcohol compounds, Carboxylic Acids, Ketones
- Among hydrocarbons : Ethylene involved in fruits, vegetables and flowers ripening

## Quartzel® photocatalytic available products

Saint-Gobain Quartz current standard product has an areal weight of 100 g/m<sup>2</sup>, a nominal thickness of 15-20 mm and typically a specific surface area of more than 100m<sup>2</sup>/g .

Due to Quartzel® substrate physical and mechanical properties, it can be used in 1 or 2 layers, and with flat or tubular design.

# Quartzel<sup>®</sup> PHOTOCATALYTIC FELT FOR AIR TREATMENT

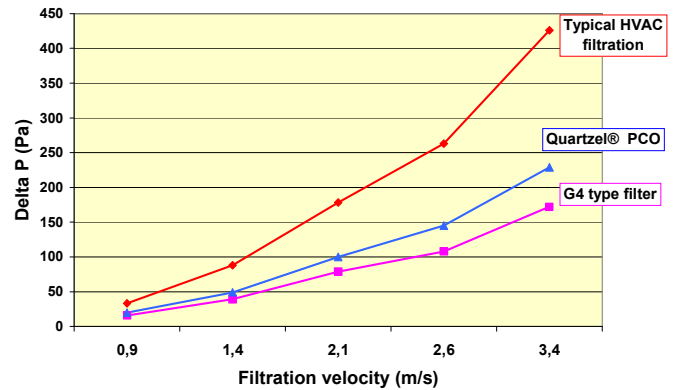
## Technical data

### Pressure Drop

Photocatalytic Quartzel<sup>®</sup> substrate has a very low density < 10kg /m<sup>3</sup> resulting in the lowest pressure drop available on the market.

It reduces fan size design, energy consumption.

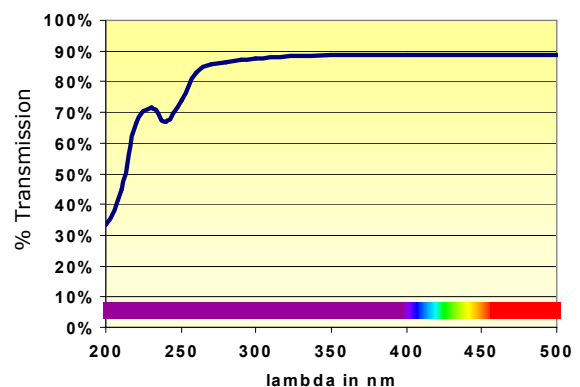
The 100 Pa at 2m/s air velocity is lower than residential HVAC filters.



### UV transmission

Silica fibers propagate UV light, like in optical fibers, and the TiO<sub>2</sub> activation is optimal through the full thickness of the substrate.

UV transmission performance



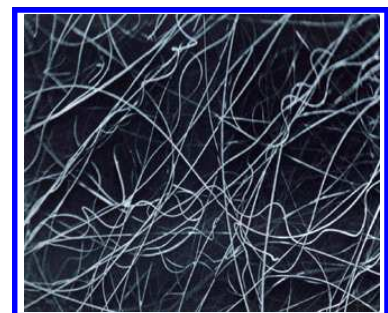
### TiO<sub>2</sub> Adhesion and Specific Surface Area

Saint-Gobain has developed an innovative technology for an optimal TiO<sub>2</sub> coverage and adhesion with a specific surface area of typically 120 m<sup>2</sup>/g.

This large surface area provides excellent pollutants/malodorants adsorption capability and bacteria/molds trapping.

The entangled, curly and continuous Quartzel<sup>®</sup> fiber structure offers a tortuous path for the airflow.

This significantly increases the probability of pollutant trapping and destruction.



### UV and chemical substrate resistance

The Quartzel<sup>®</sup> substrate is 100% mineral and is not subjected to UV or chemical degradation. It is compatible with all UV sources more specifically with UV-C, with the advantage to combine germicidal and photolysis effect to photocatalytic one.

The high purity nature of the material ensures no poison for TiO<sub>2</sub> catalyst.

# Quartzel® PHOTOCATALYTIC FELT FOR AIR TREATMENT

## Technical data

### VOC reduction : Laboratory Test

The efficiency of Quartzel® substrate is measured at 23°C in a laboratory photocatalytic reactor containing a 1.85" disk substrate. It is compared with performance of other substrates: Fiber glass and cellulose honeycomb.

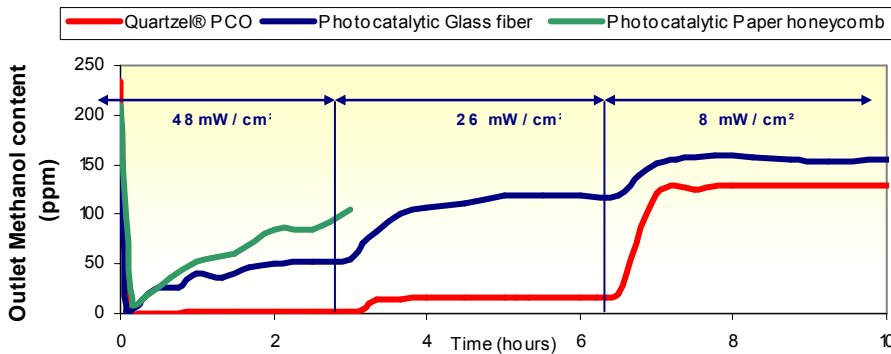
UV lamps spectrum in UV-A (300-400nm) with main contribution at 365nm. The light intensity is modified to evaluate the influence of this parameter.

The photocatalytic reactor is equipped with flow meters and chromatography equipment (GPC).

Methanol content in the flow is continuously measured, as CO<sub>2</sub> to follow chemical oxidation and not only absorption by the substrate.



**Reactor inlet= 250ppm of methanol at 64ml/min under different illumination**



⇒ **Quartzel® substrate offers the best efficiency whatever the UV power.**

⇒ **Optimal efficiency is indifferently obtained with UV-C or**



### VOC reduction : Test performed in a 1 m<sup>3</sup> box

A photocatalytic air purifier is introduced inside a closed box

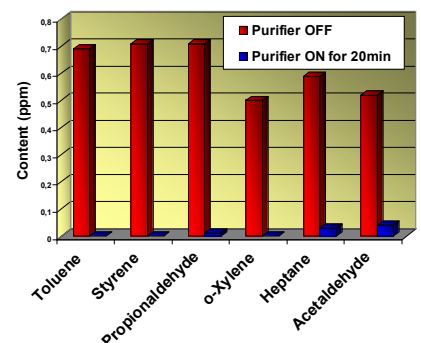
A mix of various odoring VOC compounds is introduced inside the box up to saturation.

Analysis of chemicals content is performed continuously by GC-PID

Olfactometric measurements are performed by a panel of 4 trained people before and after experiment

⇒ **All pollutants are destroyed within 30min of purification**

⇒ **The system is able to remove more than 99.9% of the starting odor level**



# Quartzel® PHOTOCATALYTIC FELT FOR AIR TREATMENT

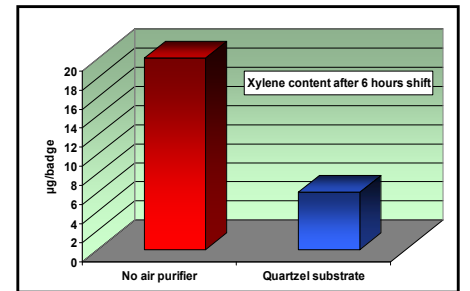
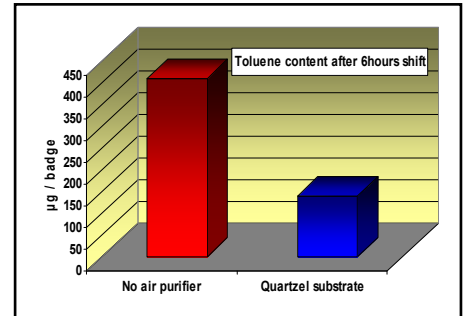
## VOC reduction : Test Results in real environment

### Test conditions

Air purifier equipped with Quartzel® photocatalytic felt  
Test in Histopathology laboratory (toluene and xylene emission).  
Comparison of efficiency after 6 hours of air purification.

- Room volume : 90 m<sup>3</sup>
- Airflow of 300 m<sup>3</sup>/h
- Air velocity of 0,8-1,5 m/s
- Size of Quartzel® photocatalytic filter (100g/m<sup>2</sup>):310x310mm
- 2 UV lamps - 2,4mW/cm<sup>2</sup> at 253 -365 nm UV illumination

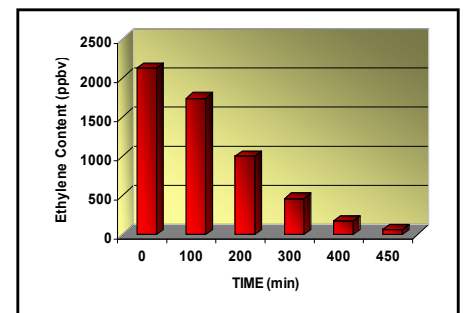
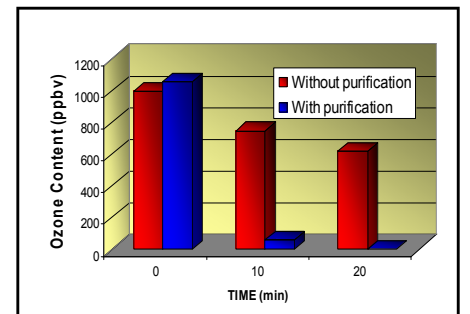
⇒ After 6 operation hours, pollutant content is reduced by 75 %



## Ozone & Ethylene reduction in a 1 m<sup>3</sup> box

Air purifier equipped with Quartzel® photocatalytic felt

- ⇒ The system drastically increases ozone abatement rate
- ⇒ Photocatalytic system allows reduction of ethylene content



## Application Fields

### Building Application

- Stand alone purifier systems
- HVAC residential purifier systems
- Large building integrated purifier systems



### Domestic odors reduction

- Pets
- Cooking odors
- Tobacco smoke



### Transportation air purification

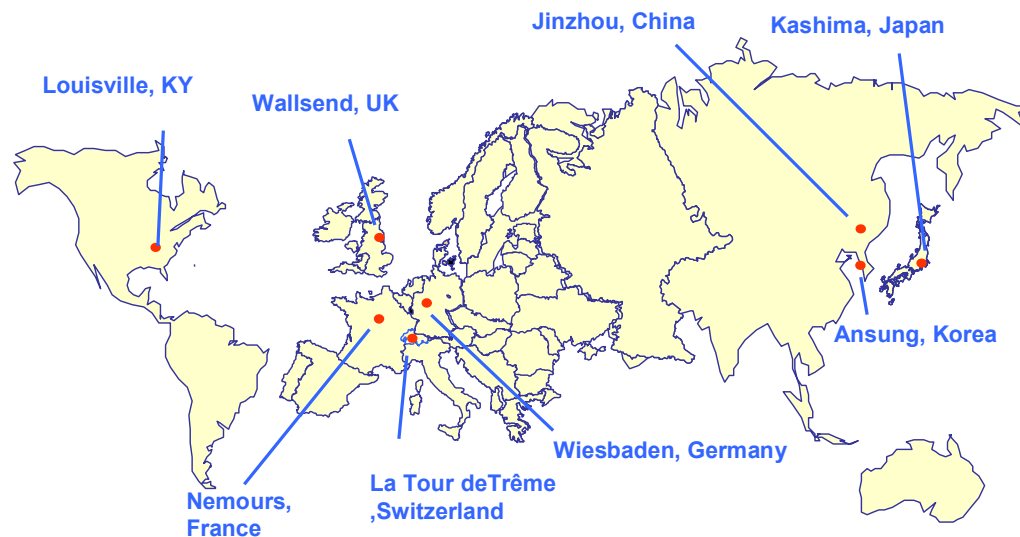
- Aircraft
- Subway, Railways
- Automotive



### Fruits, vegetables and flowers storage



8 locations



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