Comparison on PURESPACE with other technologies

For this study we take out technologies that are known to be dangerous or not efficient, in these categories the most famous ones are:

Air Ozone generators

Ozone has been extensively used for water purification, but ozone chemistry in water is not the same as ozone chemistry in air. Inhaling ozone poses serious health risks for humans, animals and plants. It is highly cancerigenous.

Manufacturers and vendors of ozone devices often use misleading terms to describe ozone. Terms such as "energized oxygen" or "pure air" suggest that ozone is a healthy kind of oxygen. Ozone is a toxic gas with vastly different chemical and toxicological properties from oxygen. Several federal agencies have established health standards or recommendations to limit human exposure to ozone.

Available scientific evidence shows that, at concentrations that do not exceed public health standards, ozone is generally ineffective in controlling indoor air pollution (virus, bacteria, mold, odors).

Ozone can adversely affect indoor plants, and damage materials such as rubber, electrical wire coatings and fabrics and art work containing susceptible dyes and pigments (U.S. EPA, 1996a).

Ozone is forbidden in european hospitals if not used with another system to take out 100% of ozone after treatment, making the treatment long and expensive. Even really low quantities of ozone are dangerous, and without a specific ozone destroyer protocol or strong ventilation, ozone can still be found after 3 days.

Source EPA US government environmental agency : https://www.epa.gov/indoor-air-quality-iaq/ozone-generators-are-sold-air-cleaners

INRS (health French research) (French): http://www.inrs.fr/dms/ficheTox/FicheFicheTox/FICHETOX_43-2/FicheToxSynthetique_43.pdf

Formaldéhyde

In June 2004: the International Center for Research on cancer (CIRC) publishes an assessment that ranks the formaldehyde as a "carcinogen for man "(Group 1)

The decree of July 13, 2006 adds the exhibiting works formaldehyde on the list of substances, carcinogenic preparations and processes fixed by decree of January 5, 1993. Applicable on January 1, 2007

Bioterrorism Guide (2006): "It is recalled that DVA using formaldehyde-based products is not recommended »

Titanium dioxide nanoparticles

Titanium dioxide was widely used in paint solvants, and is the main reason for professional painters to wear protective gas masks today.

It is quite new in nanoparticle form for disinfection**, the studies are not yet finished for the risks linked to it.**

The U.S. National Institute for Occupational Safety and Health has classified inhaled ultrafine TiO2 as a potential occupational carcinogen due to lung cancer risk in studies on rats, with a recommended exposure limit of 0.3 mg/m3 in 40 days.

ECHA's Committee for Risk Assessment (RAC) concluded that the available scientific evidence meets the criteria in the CLP Regulation to classify titanium dioxide as a substance suspected of causing cancer through the inhalation route

French ANSES , CIRC and other study centers agrees on the probable cancerigen factor of nano TIO2

TIO2 nanoparticles were found neurotoxic too from indian department of zoology recently. Source :

Center for disease control and prevention : https://www.cdc.gov/niosh/docs/2011-160/

European chemicals agency : https://echa.europa.eu/fr/-/titanium-dioxide-proposed-to-be-classified-as-suspected-of-causing-cancer-when-inhaled

Toxicological aspects of TIo2 nanoparticles http://meddocsonline.org/ebooks/ebook-nanotechnology/Toxicological_aspects_of_titanium_dioxide_nanoparticles.pdf

Direct comparison on other methods

	PURESPACE	**Aerial disinfection tech**	**Classic manual cleaning**
PERFORMANCE			
number of products for disinfecting a Room	1	Many	Many
Product used	hydro. peroxyde + silver	other (vapor, …)	chlore and other chemicals
broadcasting technology	Patented syst. Of Nébulization	various	manual, mix
Solution	Patented dry mist	Humid vapor solutions	Liquid solutions
Temperature of the environment to be treated	Normal temp	various	Normal temp
Size of the sprayed drops	0,5 to 5 micron	10 + micron	Diluted liquid
Surfaces covered	Everything – no gaps	gaps/imperfections	Badly covered
Amount of product for 100 M3	0,1L	1L	aleatory
Disinfection quality	perfect (99,99% everywhere)	Medium to good	bad
treatment	Deep disinfection of air and surfaces	surfaces or air, not both	some surfaces
virucidal activity	complete	partial	imperfect
bactericidal activity	complete	partial	imperfect
fungicidal activity	complete	partial	imperfect
sporicidal activity	complete	partial	imperfect
biofilm activity	complete	partial	imperfect
acaricide activity	complete	no	no
human dependence on the quality of cleaning	No dependance	low	strong
SECURITY			
Risk to users over time	low	strong	strong
Risk to the Environment	Nearly Non existant	strong	Really strong
Présence of Medical filter	yes	aleatory	no
Post processing Allergies	Non existant	Non existant	medium
Possibility of customer infection after treatment	Non existant	low	strong
Aggressiveness on materials	Non existant	strong	strong
Use on all materials without degradation	yes	no	no
use on electronic	No risk	no	no
Disinfection on Fabrics	yes	no	complex
Carpet disinfection	yes	no	complex
residues	no	humid	Humid and chemical
ECONOMY			
human time for partial disinfection of 1 Room	30 sec	3 min	Long (20 min)
human time for full disinfection of 1 Room	30 sec	3 min	long(1h and +)

waiting time before reuse of a room	low (30 - 40 min)	Really important (+2h)	changing (20 min to 1h and +)