EARTH & SEA GROUP

Innovative Integrated Services

is proud to present

VICTORY™

the bacteria's killer

DISPOSITIVO MEDICO CLASSE 1

It is not a drug, but an innovative system used to sanitize, air and waters, in order to prevent the proliferation of bacteria - even the antibiotic-resistant ones - viruses and fungi, vocs e pops.

The scientific principle

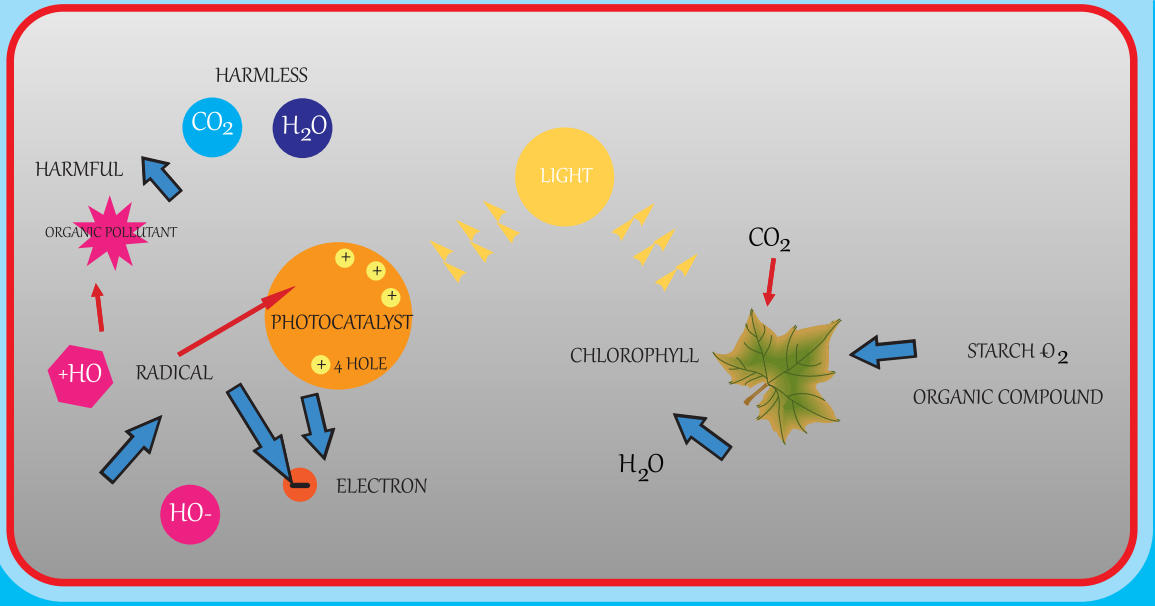
The photocatalysis

"The action under which some semiconductor materials, under the influence of light, may trigger a process leading to the reduction or oxidation of undesirable substances, even present in small amounts"

TRECCANI
LA CULTURA ITALIANA

In detail, we discover that its operating principle imitates a natural phenomenon: chlorophyll photosynthesis
(transforming substances considered harmful to man into inert substances).

The underlying chemical process is, in fact, an oxidation which is activated thanks to the combined action of the light and the moisture content in the air.



The photocatalyst

It is a substance that alters the speed of a chemical reaction through the action of the natural or artificial light. For years, the most used photocatalyst has been the titanium dioxide (TiO_2). However it could act only with the UV rays while now its use is sub iudice.

Our photocatalyst

Victory the bacteria's killer
Uses a new photocatalyst

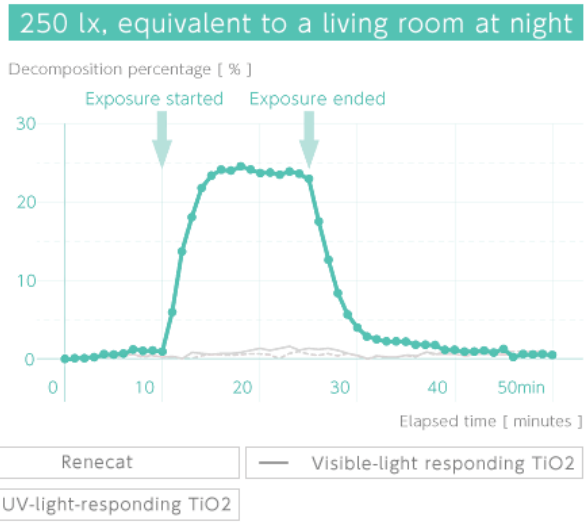
The tungsten trioxide together with a platinum paste (WO_3 /Pt), in nanometric range, present some advantages:

- It provides for a complete removal of Gram-positive/negative bacteria and a deodorizing service, about 30 times higher than TiO_2
- It has a unique photocatalytic activity, even in low or artificial light conditions
- It is not considered to be hazard for human health
- It does not lose its properties with times, as it acts only as a process activator. It does not bind to pollutants and is available for new photocatalysis cycles.
- through the photocatalysis process, the pollutant and toxic substances are transformed into: sodium nitrate ($NaNO_3$), sodium carbonate (Na_2CO_3), calcium carbonate ($CaCO_3$), carbon dioxide (CO_2), water vapour.

■ Testing conditions
In conformance with JIS R 1702

Light source	White LED light 250 lx (with UV filter)
Initial acetaldehyde concentration	5ppm
Substrate	Glass plate (50 x 100 ㎟)
Exposure volume	50 × 100 × t3mm
Format	0.2 g powder coating
Flow	0.4 L / min

Testing institute:
Measured by Toshiba Materials



Health sector applications and hospital approach

The photoactivity may be used to purify the air in indoor environments from the possible emissions of volatile organic compounds (VOCS), such as formaldehyde and toluene present in some building materials or home furnishings, and from unpleasant smells and allergens (mites, moulds, dust, pollens).

As for hospitals, one of the most serious problems now is the presence of antibiotic-resistant bacteria (klebsiella pneumoniae - clostridium difficile – Escherichia coli - streptococcus pneumoniae - staphylococcus aureus etc...).

In scientific area the cause of these bacteria upsurge is determined by the indiscriminate use of broad-spectrum antibiotics. At present, despite the use of new and also very expensive molecules, the results are still discouraging and still cost too many lives. In money terms, the abuse of inappropriate antibiotics is a huge cost that further grows, when some other more specialized antibiotics are used. In addition, medical and blood tests as well as the prolonged days in hospital should be included.

The levels of our intervention

There are several sectors to be “sanitized”.

Our system takes into account the diversities among the various structures, the transmission types of different bacteria and can adapt to the particular needs.

Our system even acts in the presence of patients and staff

We can sanitize: air, incoming waters, waste waters, surgical instruments and medical equipment.

We can act on stretcher transportation, clothing and on everything that can create a vehicle for transmitting bacteria, viruses and so on...

Victory the bacteria’s killer

uses devices that can be easily stored and transported. Only the shape and the dimensions are different, and adapt to the volume to be treated, with a really minimal maintenance.

Scientific experiences

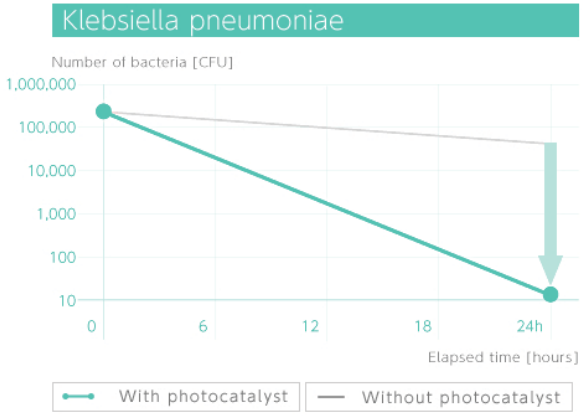
Some tests, carried out by scientific institutes about the photocatalysis effect on several bacteria strains, have been shown below.

Klebsiella pneumoniae

■ Testing conditions
In conformance with JIS R 1702

Antibacterial activity test method	Film adhesion
Light source	Fluorescent light 6000 lx (UV light is cut with a filter)
Test duration	24 hours
Test sample amount / size	10 mg / 5 cm x 5 cm

Testing institute:
Kitasato Research Center for Environmental Science

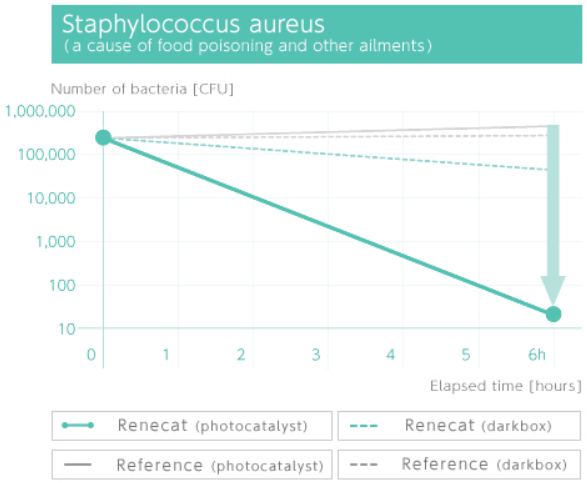


Staphylococcus aureus (a cause of food poisoning and other ailments)

■ Testing conditions
In conformance with JIS R 1702

Antibacterial activity test method	Film adhesion
Light source	Fluorescent light 6000 lx (UV light is cut with a filter)
Test duration	6 hours
Test sample amount / size	10 mg / 5 cm x 5 cm

Testing institute:
Kitasato Research Center for Environmental Science

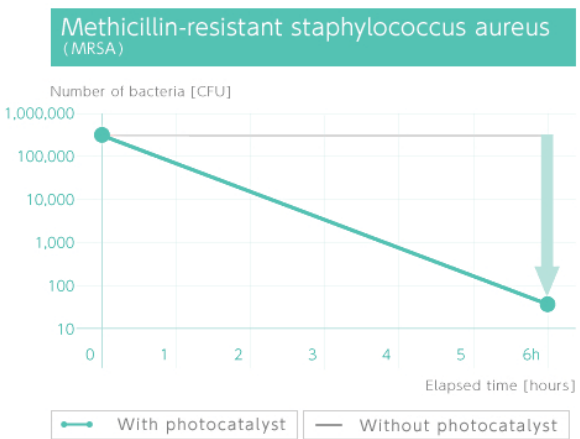


Methicillin-resistant staphylococcus aureus (MRSA)

■ Testing conditions
In conformance with JIS R 1702

Antibacterial activity test method	Film adhesion
Light source	Fluorescent light 6000 lx (UV light is cut with a filter)
Test duration	6 hours
Test sample amount / size	10 mg / 5 cm x 5 cm

Testing institute:
Kitasato Research Center for Environmental Science

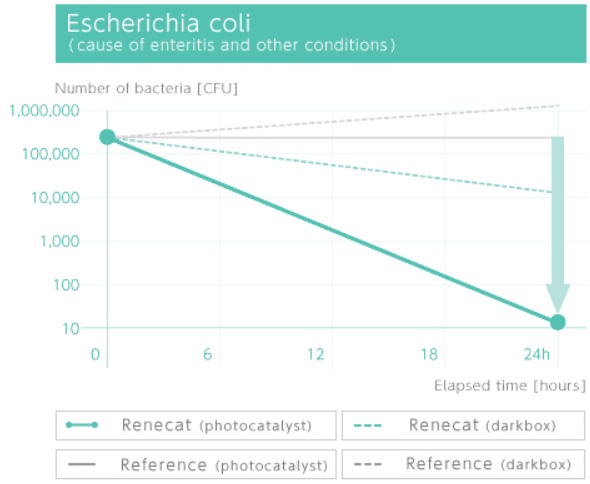


Escherichia coli (cause of enteritis and other conditions)

■ Testing conditions
In conformance with JIS R 1702

Antibacterial activity test method	Film adhesion
Light source	Fluorescent light 6000 lx (UV light is cut with a filter)
Test duration	24 hours
Test sample amount / size	10 mg / 5 cm x 5 cm

Testing institute:
Kitasato Research Center for Environmental Science

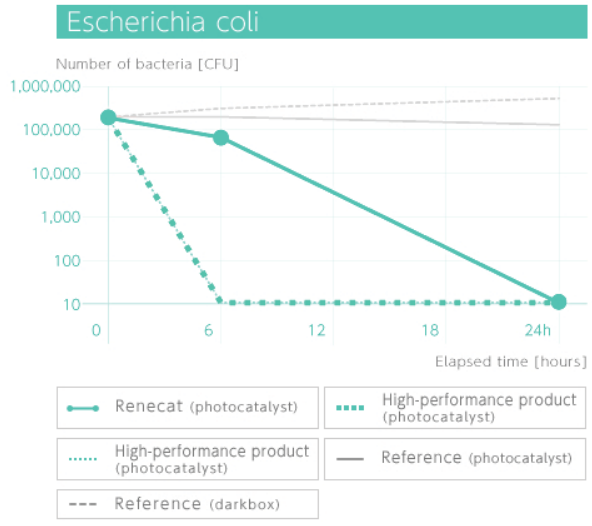


Escherichia coli

■ Testing conditions
In conformance with JIS R 1702

Antibacterial activity test method	Film adhesion
Light source	Fluorescent light 6000 lx (UV light is cut with a filter)
Test duration	6 and 24 hours
Test sample amount / size	5mg/2.5×5cm

Testing institute:
Kitasato Research Center for Environmental Science

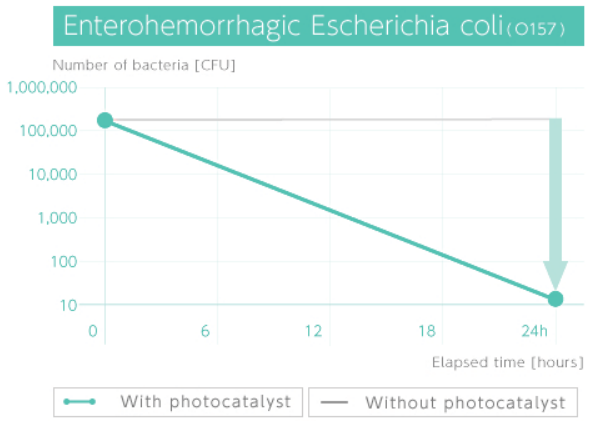


Enterohemorrhagic Escherichia coli (O157)

■ Testing conditions
In conformance with JIS R 1702

Antibacterial activity test method	Film adhesion
Light source	Fluorescent light 6000 lx (UV light is cut with a filter)
Test duration	24 hours
Test sample amount / size	10 mg / 5 cm x 5 cm

Testing institute:
Kitasato Research Center for Environmental Science



Pseudomonas aeruginosa

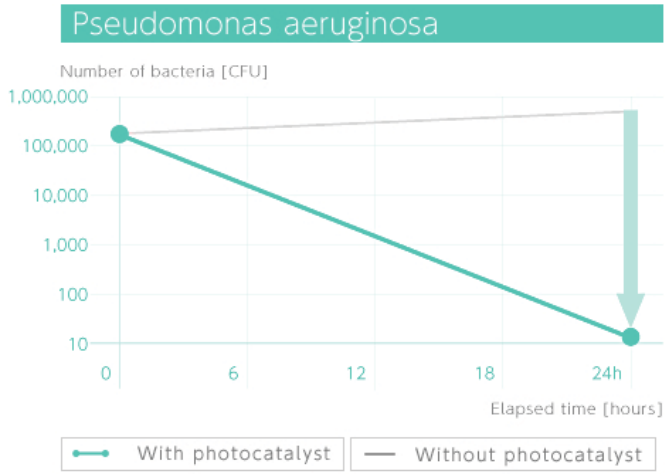
■ Testing conditions

In conformance with JIS R 1702

Antibacterial activity test method	Film adhesion
Light source	Fluorescent light 6000 lx (UV light is cut with a filter)
Test duration	24 hours
Test sample amount / size	10 mg / 5 cm x 5 cm

Testing institute:

Kitasato Research Center for Environmental Science



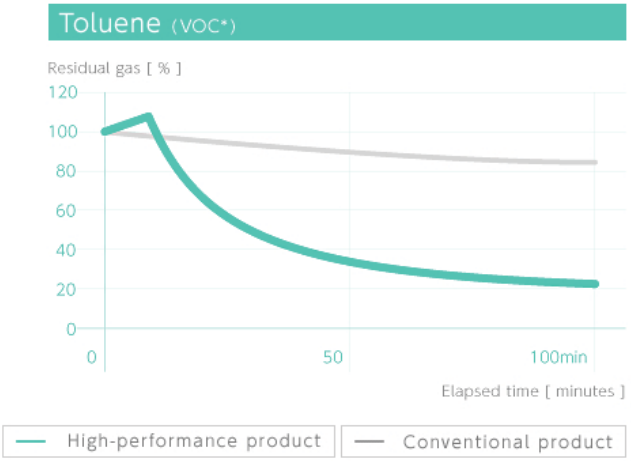
Toluene (VOC*)

■ Testing conditions

Light source	Fluorescent light 6000 lx (with UV filter)
Substrate	Glass plate (50 x 100 ㎟)
Renecat applied	150mg
Initial concentration of introduced gas	60ppm

Testing institute:

Measured by Toshiba Materials



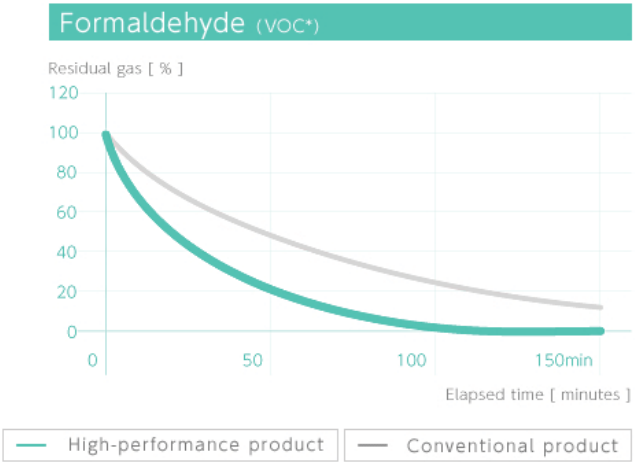
Formaldehyde (VOC*)

■ Testing conditions

Light source	Fluorescent light 6000 lx (UV light is cut with a filter)
Substrate	Glass plate (50 x 100 ㎟)
Renecat applied	200mg
Initial concentration of introduced gas	10ppm

Testing institute:

Measured by Toshiba Materials



Scientific experiences of Strasburg and Rome Universities

Legionella Pneumophila

about 84% bacteria removal can be detected after 30 operating minutes, for a concentration of $1.5x10^5$ legionellae/L of air: the effectiveness reaches 99,9% after 90 operating minutes.

H1N1-Swine flu virus

100% bacteria removal can be detected after 4 operating hours.

Some effectiveness examples

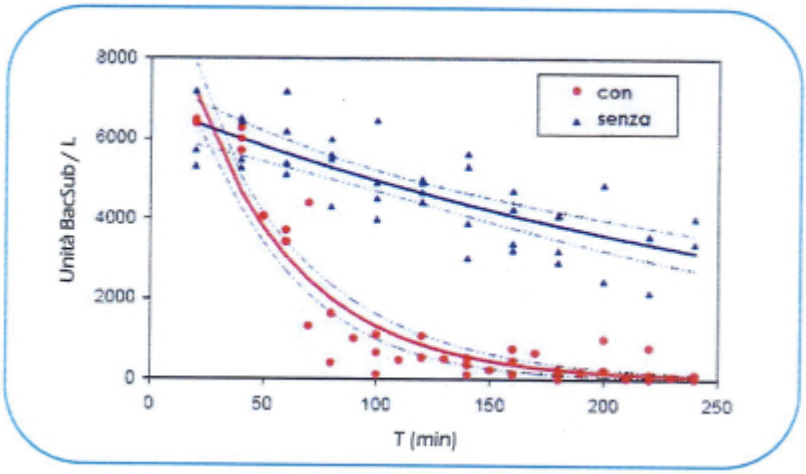
(From tests and researches carried out by Pasteur Institute in Lille)

Bacillus Subtilis

99% bacteria removal can be detected after 200 operating minutes for a concentration of $1.5x10^5$ Bacillus Subtilis/L of air.

H5N1-Avian influenza virus

100% bacteria removal can be detected after 3 operating hours.



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Influences of Porous Structurization and Pt Addition on the Improvement of Photocatalytic Performance of Wo3 Particles

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Photocatalytic Remote Oxidation Induced by Visible Light

Fei Yang, Yukina Takahashi, Nobuyuki Sakai, and Tetsu Tatsuma Institute of Industrial Science, University of Tokyo, 4-6-1 Komaba, Meguro-ku, Tokyo 153-8505, Japan J. Phys. Chem. C, 2011, 115 (37), pp 18270–18274 DOI: 10.1021/jp205600m Publication Date (Web): August 12, 2011 Copyright © 2011 American Chemical Society*

Solid-base loaded WO3 photocatalyst for decomposition of harmful organics under visible light irradiation

Tetsuya Kako, Xianguang Meng, and Jinhua Ye, Citation: APL Mater. 3, 104411 (2015); doi: 10.1063/1.4927607

Synthesis of WO3−xnanomaterials with controlled morphology and composition for highly efficient photocatalysis

Zhenguang Shen, Zengying Zhao, Jingwen Qian,Zhijian Peng... DOI: https://doi.org/10.1557/jmr.2016.106 Published online: 01 April 2016

Low temperature synthesis and photocatalytic performance of tungsten trioxide film

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Robust Co-catalytic Performance of Nanodiamonds Loaded on WO3 for the Decomposition of Volatile Organic Compounds under Visible Light

*Hyoung−il Kim1, Hee-na Kim1, Seunghyun Weon1, Gun-hee Moon1, Jae-Hong Kim2, and Wonyong Choi*1. 1 Division of Environmental Science and Engineering/Department of Chemical Engineering, Pohang University of Science and Technology (POSTECH), Pohang 37673, Korea. 2 Department of Chemical and Environmental Engineering, School of Engineering and Applied Science, Yale University, New Haven, Connecticut 06511, United States ACS Catal., 2016, 6 (12), pp 8350–8360 DOI: 10.1021/acscatal.6b02726 Publication Date (Web): November 17, 2016 Copyright © 2016 American Chemical Society*

Influences of Porous Structurization and Pt Addition on the Improvementof Photocatalytic Performance of WO3 Particles

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61, Gumi, Gyeongbuk 730701, Korea ACS Appl. Mater. Interfaces, 2015, 7 (5), pp 3009–3017 DOI: 10.1021/am507935j Publication Date (Web): January 21, 2015 Copyright © 2015 American Chemical Society

Platinized WO3 as an Environmental Photocatalyst that Generates OH Radicals under Visible Light

*Jungwon Kim1, Chul Wee Lee2 and Wonyong Choi*1. School of Environmental Science and Engineering, Pohang University of Science and Technology (POSTECH), Pohang 790-784, Korea, and Green Chemistry Division, KRICT, Daejeon 305-600, Korea*
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Ultrahigh-efficiency photocatalysts based on mesoporous Pt–WO3 nanohybrids

*Zhenhai Wen,ab Wei Wu,ac Zhuang Liu,a Hao Zhang,a Jinghong Li*a and Junhong Chen*b Cite this: Phys.Chem. Chem. Phys., 2013, 15, 6773 Received 13th February 2013, Accepted 14th March 2013 DOI: 10.1039/c3cp50647a*

WO_3/Pt nanoparticles are NADPH oxidase biomimetics that mimic effector cells in vitro and in vivo

Andrea J Clark, Emma L Coury, Alexandra M Meilhacand Howard R Petty. Published 18 December 2015 • © 2016 IOP Publishing Ltd Nanotechnology, Volume 27, Number 6

WO_3/Pt nanoparticles promote light-induced lipid peroxidation and lysosomal instability within tumor cells

Andrea J Clark and Howard R Petty Published 20 January 2016 © 2016 IOP Publishing Ldt Nanotechnology, Volume 27, Number 7

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Photocatalytic Coatings

P. Pichat Current as of 28 October 2015

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Saneamento e Ambiente, Universidade Estadual de Campinas (UNICAMP). 2 Faculdade de Engeharia Civil, Departamento de Saneamento e Ambiente, Universidade Estadual de Campinas (UNICAMP).

INACTIVATION OF KLEBSIELLA PNEUMONIAE IN SEWAGE BY SOLAR PHOTOCATALYSIS AND INVESTIGATION OF CHANGES IN ANTIBIOTIC RESISTANCE PROFILE

BIKOUVARAKI M.1, GOUNAKI I.1, BINAS V.2, 3, ZACHOPOULOS A.2, KIRIAKIDIS G.2, 3 MANTZAVINOS D.4 and VENIERI D.1 1School of Environmental Engineering, Technical University of Crete, GR-73100 Chania, Greece, 2Institute of Electronic Structure and Laser (IESL), FORTH, Vasilika Vouton, GR-71110 Heraklion, Greece, 3Quantum Complexity & Nanotechnology Center (QCN), Department of Physics, University of Crete, GR-70013 Heraklion, Greece, 4Department of Chemical Engineering, University of Patras, Caratheodory 1, University Campus, GR-26504 Patras, Greece.

Report analisi abbattimento carica batterica/fungina tramite Filtro fotocatalitico Inpigest KCS biotech

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