

# Wellness in Energy-Efficient Buildings

A Dream come true!



**PCN** nano  
*materials*

Member of



Hellenic Federation of Enterprises



**Prof. George Kiriakidis / CEO**

**Dr. Vasilis Binas / CTO**

# Indoor Building Environment

## Energy Efficient Buildings



## Headaches and loss of productivity

- Building optimization focuses on the humans that fill the buildings
- Building wellness' takes into account the human aspect,
- People become happier, healthier and more productive
- Poor air quality in their place of work is having a negative impact on their day-to-day productivity and well-being.



Standard  
62.2-2016

ANSI/ASHRAE Standard 62.2-2016  
(Supersedes ANSI/ASHRAE Standard 62.2-2013)  
Includes ANSI/ASHRAE addenda listed in Appendix D

## Ventilation and Acceptable Indoor Air Quality in Residential Buildings

See Appendix D for approval dates by the ASHRAE Standards Committee, the ASHRAE Board of Directors, and the American National Standards Institute.

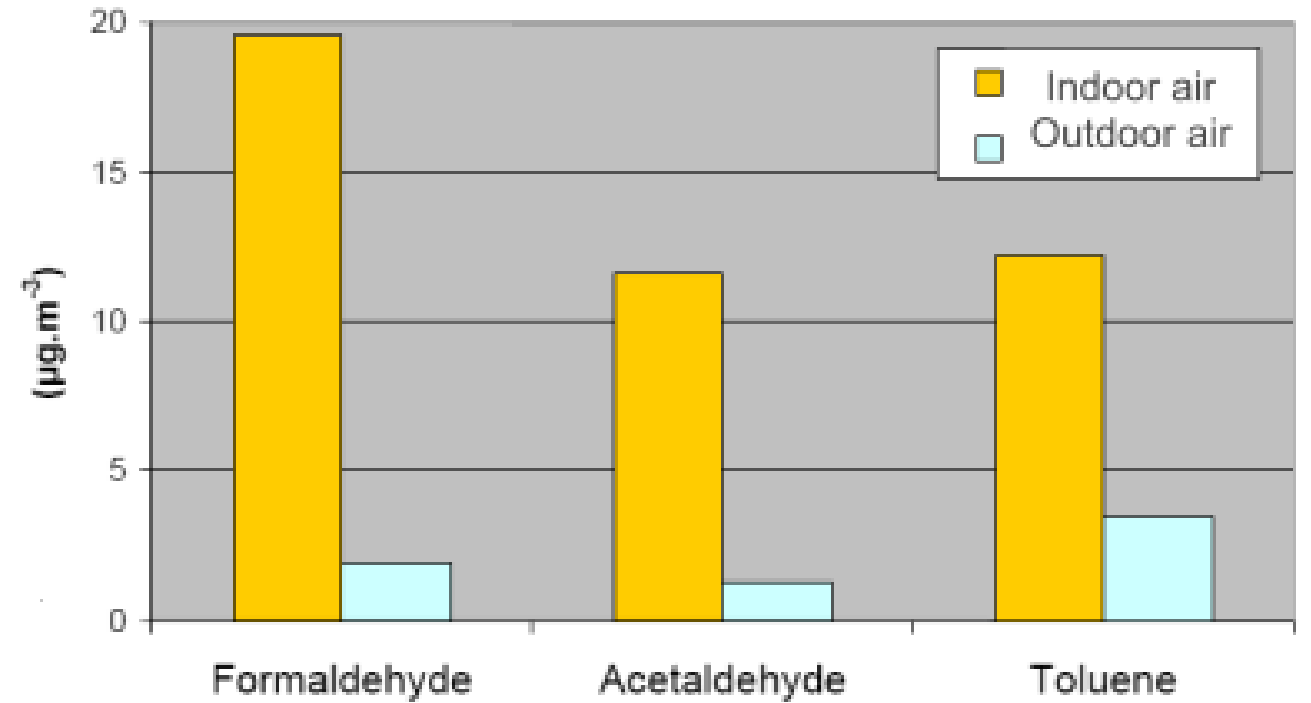
This Standard is under continuous maintenance by a Standing Standard Project Committee (SSPC) for which the Standards Committee has established a documented program for regular publication of addenda or revisions, including procedures for timely, documented, consensus action on requests for change to any part of the Standard. The change submittal form, instructions, and deadlines may be obtained in electronic form from the ASHRAE website ([www.ashrae.org](http://www.ashrae.org)) or in paper form from the Senior Manager of Standards. The latest edition of an ASHRAE Standard may be purchased from the ASHRAE website ([www.ashrae.org](http://www.ashrae.org)) or from ASHRAE Customer Services, 1791 Tullie Circle, NE, Atlanta, GA 30329-2305. E-mail: [orders@ashrae.org](mailto:orders@ashrae.org). Fax: 678-539-2129. Telephone: 404-636-8400 (worldwide), or toll free 1-800-527-4723 (for orders in US and Canada). For reprint permission, go to [www.ashrae.org/permissions](http://www.ashrae.org/permissions).

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# How important is the quality of air we breath



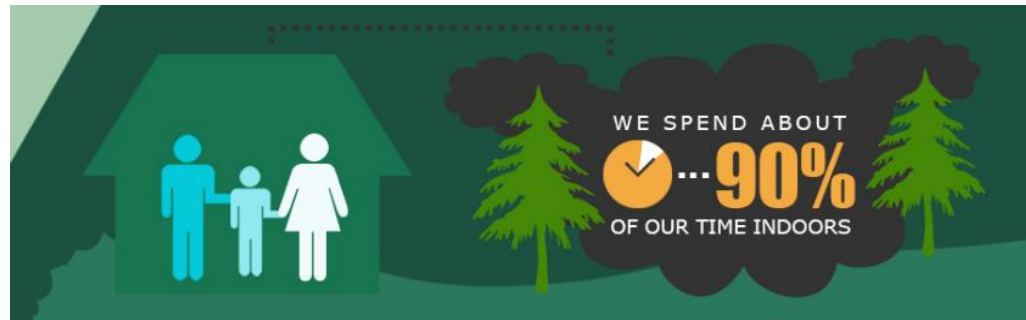
(www.oqai.fr)

- Amount of water we drink per day: 2-2.5 lit/~0.5 gallons
- Amount of air we breathe per day: 2000 gallons of air / 7.5 m<sup>3</sup>  
20000 breaths per day  
25 sextillion (25 followed by 21 zeros) molecules



# Global Problem

## Pollutants in the Indoor environment



**20%**

European population has **asthma** or **allergies**



**400,000**

premature deaths in EU each year due to air pollution

**160,000**

deaths due to **respiratory diseases** in US in 2019

**16 billion €**

in lost workdays

**4 billion €**

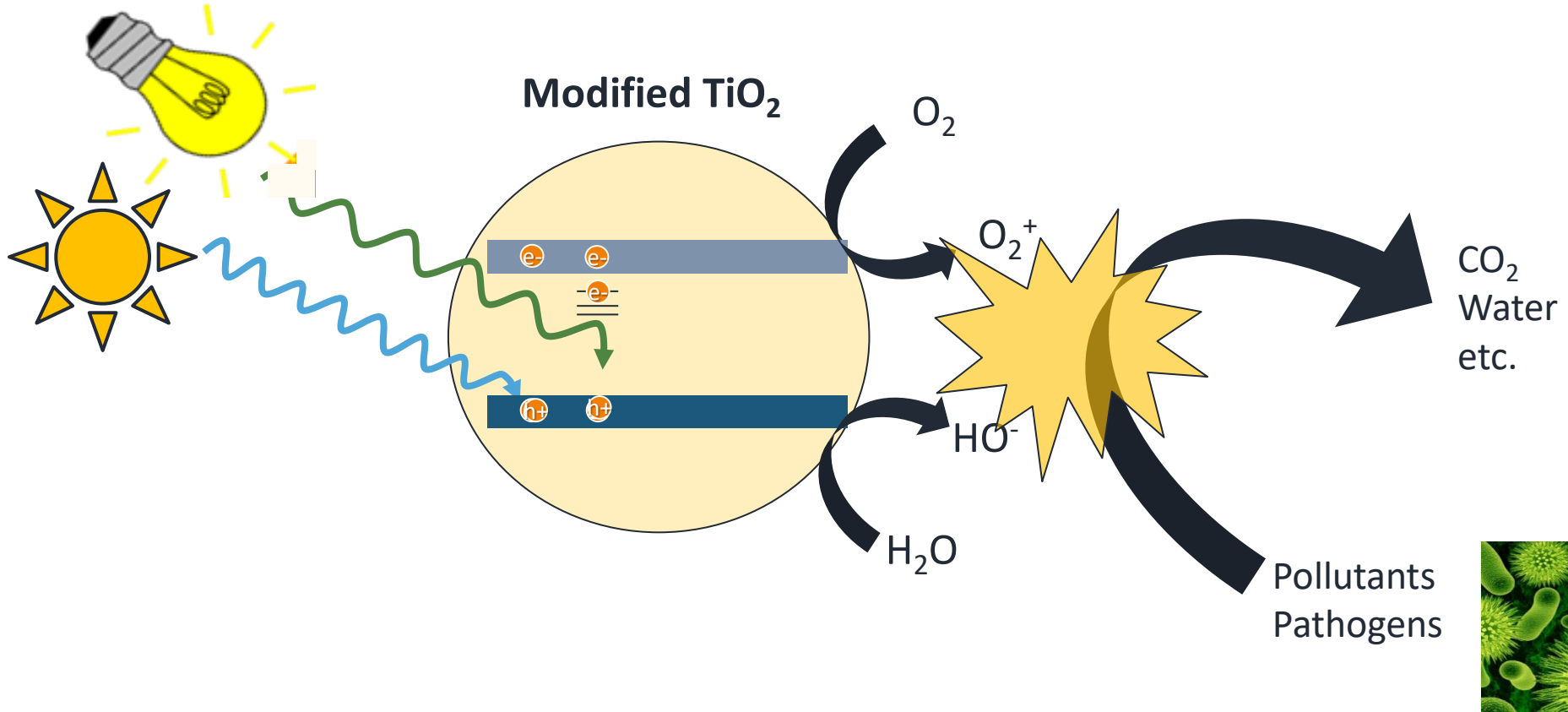
in healthcare

**Photocatalytic materials do light-induced reduction of pollutants & save energy!!**

- **> 85% NO removal** in 10 minutes with indoor lighting (NCSR "DEMOKRITOS" /Greece)
- **Energy saving** ( A/C power -50 % / CO<sub>2</sub> reduction ~ 70%) (AUTH / Greece)
- **No harmful by-products** makes our product much safer to use (JRC-ISPRA Italy)
- **Self-clean material / protective coating**

# Scientific base of PCN Technology

Patented Visible light-activated photocatalyst



**Decomposes VOCs, BTXs, Odors**

**Improves indoor/outdoor air quality**





Coverage of 100 m<sup>2</sup> photocatalytic surface



Is equivalent to planting

8 trees

Pollutants reduction rate  
(**>3000  $\mu\text{g NO}/\text{m}^2\text{h}$** )



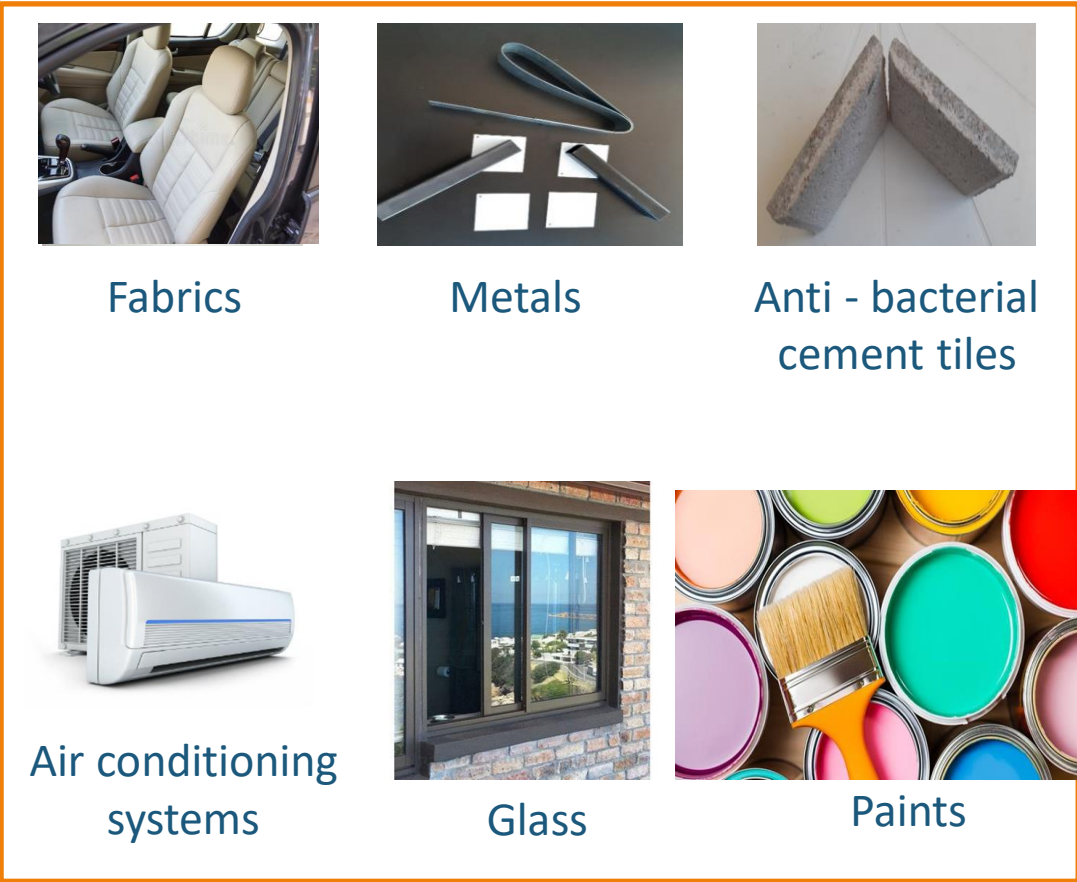
# Value proposition

## Products / Applications / Validations

*New technology producing modified TiO2 materials...*

*Enabler of a broad range of applications*

*Award winning materials*



*Tested at the large scale*

Tunnel of Stalida



Greek army medical center



*...with disinfection, depollution & self-cleaning features*



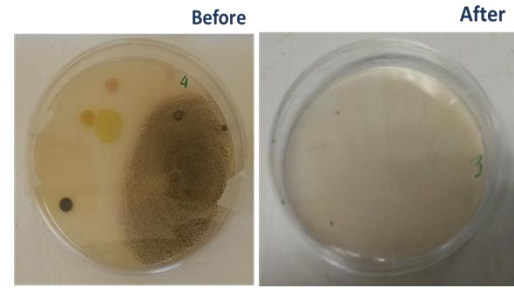
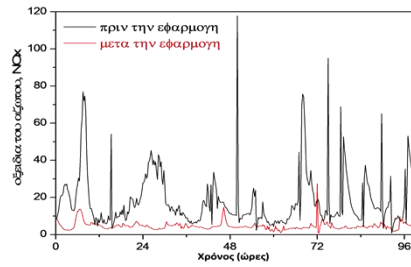
# Projects Portfolio

2014

## Road Tunnel Crete



## Join project / Greek Army Medical Centre, 2018



2022-27



Constructor of Athens Metro / Line 4

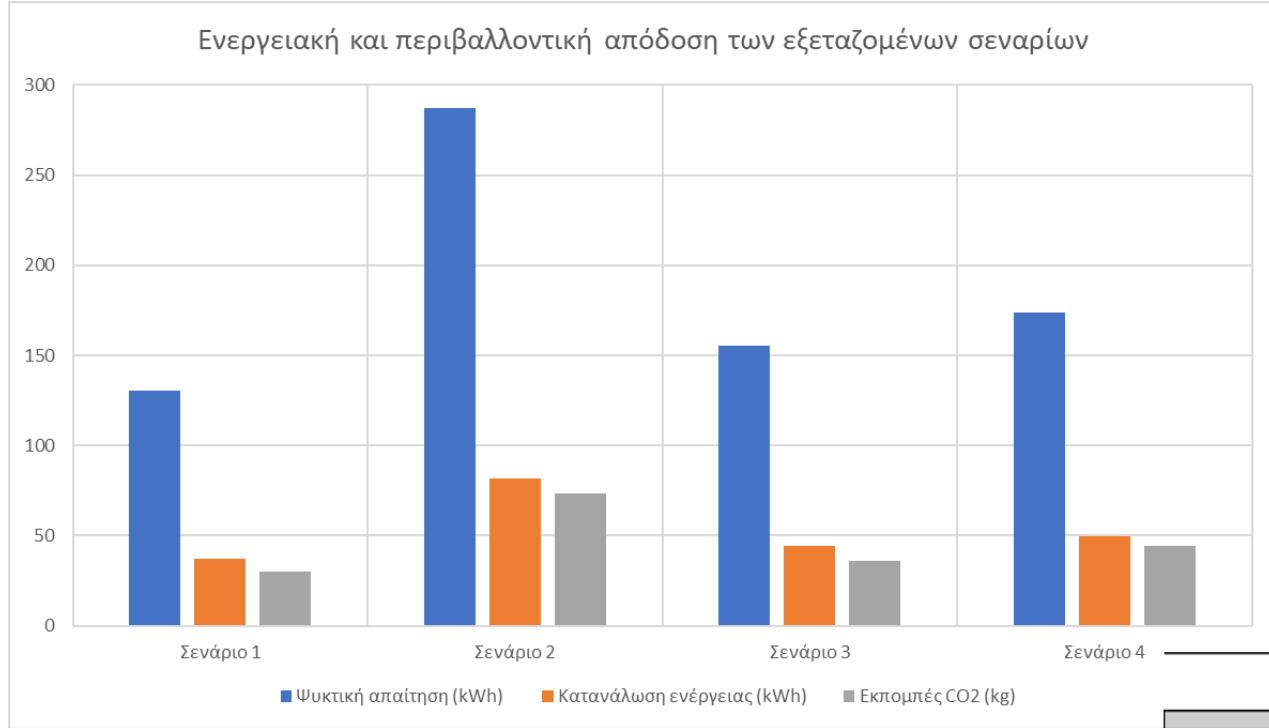
## Re-development of sidewalks Municipality Ag. Anargiron Attika. 2023





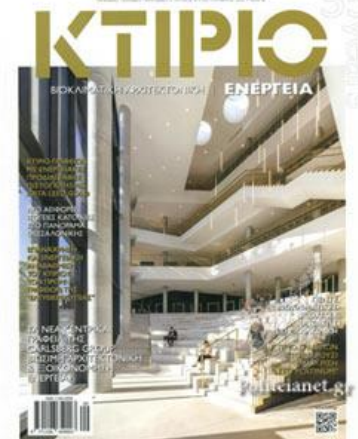
## LIFEVISIONS

InnoVative photocatalytic paintS  
for healthy enviroNment and eNergy Saving <https://lifevisions.gr/>



Ποσοστιαία Μεταβολή Συγκέντρωσης Ρύπων

	Σενάριο 1	Σενάριο 2	Σενάριο 3	Σενάριο 4
NO	-68.40%	-66.10%	-27.00%	-52.40%
NO <sub>2</sub>	-66.80%	-66.10%	-27.10%	-52.40%



## Anti-Bacterial: Fabrics & Metals

## Depollution / NO degradation



JRC.1.02 Form.CAT.032A – Edited: 27-11-09 - Version 0 | Chemical Assessment and Testing Unit

Customer Name	PCN Materials IKE		
Customer Address	VIOPAN Anopolis, Hersonissos 70008, Crete Greece		
Contact	Professor George Kiriakidis		
Test Requested	Determination of antibacterial activity of photocatalytic materials according to ISO 27447:2019		
Sample Description	Medical fabrics (PCN 007)	Treated	Number Received 1 (3 x 4 cm)
	Medical fabrics	Non-treated	1 (A4 size)
Date of Receipt	12 August 2020		
ASC Code	ASC004013		
Commencement Date	02 September 2020		
Report Number	B766		
Report Date	14 September 2020		

广东省微生物分析检测中心  
GUANGDONG DETECTION CENTER OF MICROBIOLOGY

### 分析检测报告

REPORT FOR ANALYSIS

报告编号  
Report No. 2021FM22466R01D

样品名称  
Name of Sample B-Gyros 空气消毒灯  
B-Gyros air disinfection lamp

委托单位  
Applicant 派尔可电机(东莞)有限公司  
PELKO Motors

检测类型  
Test Type 委托检测  
Entrusted Test

单位地址: 广州市先烈中路100号大院66号楼  
Address: Building 66, No.100, Xiaolie Middle Road, Guangzhou, China  
邮政编码: 510070  
Postcode:  
电话号码: (020)87137666  
Tel:  
传真号码: (020)87137668  
Fax:  
网址: www.gddcm.com  
Website:

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ΙΝΣΤΙΤΟΥΤΟ ΠΥΡΗΝΙΚΩΝ & ΡΑΔΙΟΛΟΓΙΚΩΝ ΕΠΙΣΤΗΜΩΝ & ΤΕΧΝΟΛΟΓΙΑΣ, ΕΝΕΡΓΕΙΑΣ & ΑΣΦΑΛΕΙΑΣ

ΕΡΓΑΣΤΗΡΙΟ ΠΕΡΙΒΑΛΛΟΝΤΙΚΩΝ ΕΡΕΥΝΩΝ  
Tηλ. 210 6503716, e-mail: tmaggos@ipta.demokritos.gr

ΔΕΛΤΙΟ ΑΝΑΛΥΣΕΩΝ  
(362/1)

Ημερομηνία Έκδοσης : 25/05/202

ΠΡΟΣ : ΙΤΕ/Ομάδα Διαφανών Αγώνιμων υλικών

Εκτελεσθείσα δοκιμή : Αποδόμηση μονοξειδίου του αζώτου (NO) από φωτοκatalytic υλικά

Μέθοδος δοκιμής : CEN/TS 16980.01:2018

Ημ. παραλαβής δειγμάτων: 28/4/2020

Ημ. εκτέλεσης δοκιμής: 6-7/05/2020

Παρατηρήσεις: Το PCN-BM-12 έχει υποστεί ελαφρύ ξύσιμο της επιφάνειας του (0.01cm)



ΑΠΟΤΕΛΕΣΜΑΤΑ

Δείγμα	Ποσοστό Φωτοκαταλυτικής Αποδόμησης NO (%)	Ρυθμός φωτοκαταλυτικής αποδόμησης (µg/m <sup>2</sup> s)
PCN-BM-11	39.7	1.76
PCN-BM-12	36.4	1.55

Δρ. Θ. Μάγγος

Κύριος ερευνητής ΕΚΕΦΕ «Δ

Δ-06-ΕΝ-2-ΡΗ Αρ έκδοσης 1.2 Ημ/νια έκδοσης 20/05/2020

- Τα ακόλουθα αποτελέσματα αφορούν αποκλειστικά τα εν λόγω δείγματα.
- Απαγορεύεται η μερική ή ολική αναπαραγωγή του παρόντος Δελτίου Αναλύσεων χωρίς την γραπτή άδεια τo Εργαστηρίου.

DELIVERABLE 3.13. ANNEX 1  
Studies on byproducts, intermediates and secondary emissions while using photocatalytic materials under indoor like illumination

Clean buildings along with resource efficiency enhancement using appropriate materials and technology (CLEAR-UP)

Input documents:

CPS 08/002 Reports 01/09-05/09 and 01/10-13/10  
CAT2010.P27 Reports 01/10-04/10 and 01/11

Ver.	Date	Written by	Reviewed by	Approved by CAT Unit Head
	27.06.2011	27.06.2011	27.07.2011	27.07.2011
1	Signature	C. Cacho	J. Barrero-Moreno Otmar Geiss	D. Kotzias
	Date	30.09.2011	06.10.2011	
2	Signature		J. Barrero-Moreno (comments from G. Kiriakidis)	D. Kotzias
	Date	20.10.2011	21.10.2011	
3	Signature		J. Barrero-Moreno (comments from G. Kiriakidis)	D. Kotzias

# The Team

with a strong **Academic** and **Business** background



**George Kiriakidis**  
Co – Founder  
& CEO

**PhD, MBA**

- Professor, University of Crete (1981-2018)
- Past-President of the European Materials Research Society (E-MRS) (2017-19)
- Founder and head of the Photonic and Electronic Materials lab, FORTH (1991- )



**Vasilios Binas**  
Co – Founder  
& CTO

**PhD**

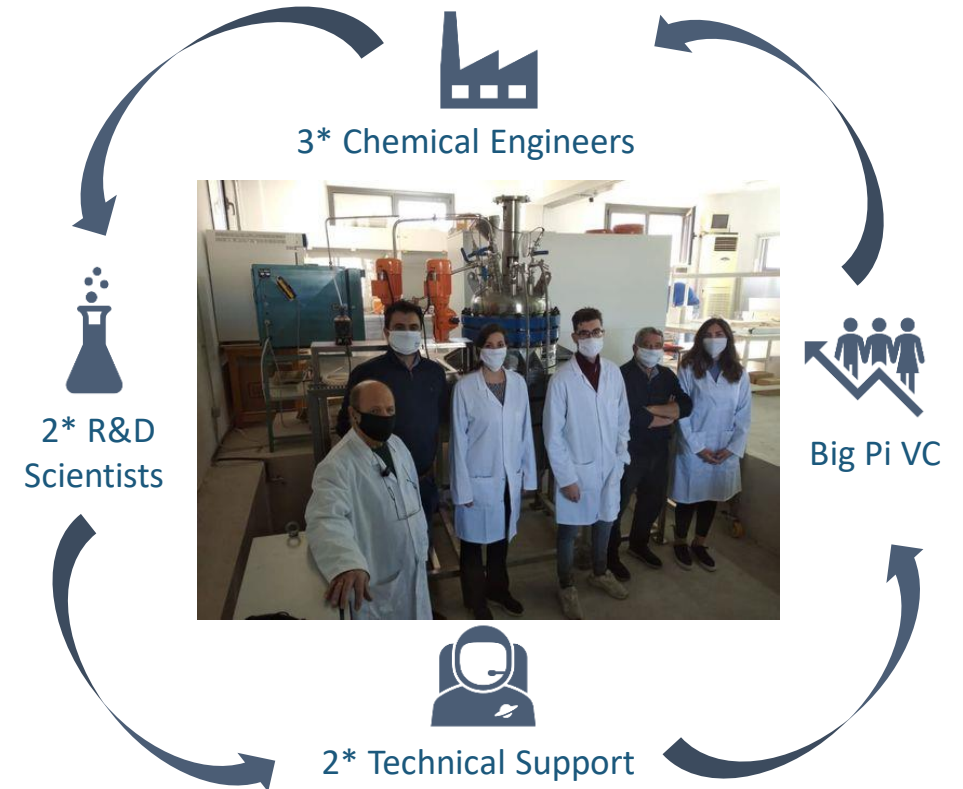
- Associate Researcher, FORTH
- Visiting Professor, University of Crete
- EU coordinator in Global Materials Network on Advanced Materials



**Anastasios Kladis**  
Strategy & Business  
Development

**MEng, MSc**

- Global Specialties Market Manager S&B Industrial Minerals S.A.
- Head of Sales and Marketing Eleusis Bauxite Mines S.A.







# PCN<sub>ano</sub> materials

PLUGANDPLAY

**MIT**  
Enterprise Forum  
Greece

Thank you

Prof. Dr. George Kiriakidis  
CEO  
[Kiriakid@pcnmaterials.com](mailto:Kiriakid@pcnmaterials.com)  
[www.pcnmaterials.com](http://www.pcnmaterials.com)

  
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**egg**  
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