

PHOTOCATALYSIS

Nowadays, quality of life is becoming a growing concern. Therefore, Indoor Air Quality (IAQ) has become a new branch of chemical and medical science. IAQ is directly linked to the presence of pollutants (Volatile Organic Compounds) in confined atmosphere.

Photocatalysis-based techniques are confirmed approaches for remediating VOC and odour problems. This indoor air purification system degrades pollutants although other technologies (filter, active coal) simply transfer these VOC on substrates.

Since 2000, Certechem has used its expertise and know-how in air quality and catalysis to **develop a new system of air purification by photocatalysis**. Today, Certechem's knowledge in that field is widely recognised.

Certechem has also developed standardised tests (ex: AFNOR XP B44-13, EN 16486-1) for devices and materials in order to **evaluate their efficiency on the elimination of odour and VOC mixture**.

RECOGNITION - PRIZE

- Prize winner of « Innovatives Techniques for Environnement », Pollutec Industries & ADEME Award, Benoit Kartheuser, «Epuraton de l'air: la photocatalyse pour lutter contre les odeurs », 2002.
- Prize winner of « Innovatives Techniques for Environnement », Info Chimie Magazine Award, Benoit Kartheuser, «Epuraton de l'air: la photocatalyse pour lutter contre les odeurs », 2002.

RECOGNITION – REFERENCE EXPERT

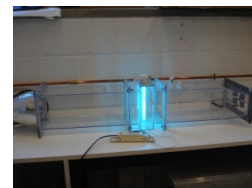
Certechem is recognized as a reference expert by AFNOR and CEN committees as a member of the following working group:

- CEN/TC 386: Photocatalysis
- AFNOR B44 : Photocatalysis

RECOGNITION – PARTICIPATION

Certechem was member of the following organisations:

- European COST Action 540 : Phonasum (PHOTOCATALYTIC TECHNOLOGIES AND NOVEL NANOSURFACES MATERIALS - CRITICAL ISSUES), B.Kartheuser, Belgian representative, 2006-2010.
- International conference on TiO₂ Photocatalysis, B.Kartheuser, international organising committee member, 2008-2009.



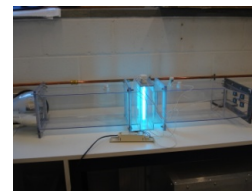
PHOTOCATALYSIS

RECOGNITION – PUBLICATIONS

- Efficiency and harmfulness of air-purifying photocatalytic commercial devices: From standardized chamber tests to nanoparticles release, N. Costarramone, B. Kartheuser, C. Pecheyran, T. Pigot, S. Lacombe, *Catalysis Today* 252, 35–40, 2015
- Normacat project: normalized closed chamber tests for evaluation of photocatalytic VOC treatment in indoor air. Formaldehyde determination; B. Kartheuser, N. Costrarramone, T. Pigot, S. Lacombe, *Environmental Science and Pollution Research*, 19, 3763–3771, 2012.
- La photocatalyse: dépollution de l'eau ou de l'air et matériaux autonettoyants; *Techniques de l'Ingénieur*; Ref J1270, C. Guillard, B. Kartheuser, S. Lacombe, 10 nov. 2011.
- Photocatalysis: a powerful technology for cold storage applications; B. Kartheuser, C. Boonaert; *J.Adv.Oxid.Technol*, 10 (1), 2007.
- Photocatalysis for improved cold storage of produce; C. Boonaert, B. Kartheuser, B.H. May, *Fruit World, China-South Asia special*, Agropress, Switzerland, December 2004.
- Air purification by photocatalysis: a new system of VOC degradation and odour removal developed by CERTECH; B. Kartheuser, C. Boonaert. *Air Information Review*, 23(3), 3-4, 2002.
- Epuration de l'air - La photocatalyse pour lutter contre les odeurs; B. Kartheuser; *Info Chimie Magazine*, 443, 96-98, 2002.
- Epuration de l'air par élimination photocatalytique des COV; B. Kartheuser; *Environnement et Technique*, 221, 80-81, 2002.
- Les composés organiques volatils (COV) et les odeurs: quel traitement, B. Kartheuser; *Surfaces*, 300, 38-41, 2000.
- Ayez du nez, prévenez les odeurs ..., *Ecomanager*, 64, 13-16, 2000.

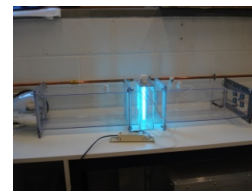
RECOGNITION – CONFERENCES

- Commercial photocatalytic air-purifiers: European standard and pilot room experiments, N. Costarramone, C. Cantau, V. Desauziers, C. Pecheyran, B. Kartheuser, T. Pigot, S. Lacombe, *The 20th International Conference on Semiconductor Photocatalysis & Solar Energy Conversion (SPASEC-20)*, San Diego, California, USA November 16 - 19, 2015
- Modification de la surface de microbilles de verre par dépôt d'oxyde en phase aqueuse (Liquid Phase Deposition - LPD) de TiO₂ photocatalytique, G. Bister, N. Nutal, M. Poelman, C. Motte, B. Kartheuser, V. Lardot, F. Cambier, *Matériaux 2014*, Montpellier, France, 24-28th novembre 2014
- Closed chamber tests for the comparison of photocatalytic devices and materials efficiency, N. Costarramone, B. Kartheuser, T. Pigot, S. Lacombe, 3^e European Symposium on Photocatalysis September 2013, Portoroz, Slovenia.
- Evolution in the upcoming CEN standard for measurement of the Performance for Photocatalytic Air Purification Devices, B. Kartheuser, N. Costarramone, T. Pigot, S. Lacombe, SP4, Fourth International Conference on Semiconductor Photochemistry, June 2013, Prague, Czech Republic.



PHOTOCATALYSIS

- Surface modification of glass microbeads by Liquid Phase Deposition of photocatalytic TiO₂, G. Bister, N. Nutal, M. Poelmans, C. Motte, B. Kartheuser, V. Lardot, F. Cambier, Proceeding SHAPING 5, Mons, Belgium, 29-31 janvier 2013
- La photocatalyse génère-t-elle du formaldéhyde lors du traitement d'air intérieur? / Does photocatalysis increase the formaldehyde during VOC degradation under indoor air conditions? B. Kartheuser, Atmos'Fair 2012 - 26 & 27 Septembre – Lyon
- Overview of the Afnor standard for air purifiers device, B. Kartheuser, COST Symposium “Recent achievements in photocatalysis: fundamentals, applications and standardised test methods”, La Plateforme, Grenoble, France 18-19 January 2010.
- HYBRIPROTECH project : Development of hybrids solutions for surfaces protection, B. Kartheuser; COST 540, Application of photocatalytic technologies for cultural heritages protection, NCSR Demokritos, Athens, Greece, 29-30 October 2009.
- Photocatalytic nanomaterials for air purification, B. Kartheuser; 1st International Conference NANOCON 2009, Roznov pod Radhostem, Czech Republic, 20th-22 October, 2009.
- Belgium's Activity on Photocatalysis Related to Application and Standardization , B. Kartheuser, R.Van Olmen, A.Beeldens, COST 540- Photocatalytic applications, standardization and testing methods – critical issues, Liblice ,Czech Republic, 25-26 May 2009.
- Are ISO methods sufficient for some existing photocatalytic technologies verification as eg. air purifiers? B. Kartheuser, COST540, Prague, Czech Republic, June 2008.
- Attempt of Titanium dioxide activation by a die to work under visible light, S. Beri, B. Kartheuser, COST540-WG, Dublin, Ireland, April 2008.
- Lamps influence on the photoreactor performance and design, B. KartheuserCOST540-WG1-Toulouse, 12 November 2007.
- Indoor Air Remediation by Photocatalysis, B. Kartheuser, Symposium Emissions and odours from materials, Bruxelles, 17 and 18 October 2007.
- Survey of Belgium's activity on photocatalysis; B. KartheuserCOST540-WG2- Praha, 19-20 April 2007.
- A photocatalysis device for air purification and standardization needs in this areaB. KartheuserCOST540-WG2, Hannover, Germany, November 13-14, 2006.
- Indoor Air Purification by Photocatalysis: Odour and Low Pollutant Concentration Concerned, B. Kartheuser, C. Boonaert, TiO₂-11: The 11th international conference on TiO₂ Photocatalysis: Fundamentals & Applications, Pittsburgh, Pennsylvania USA, September 25-28, 2006.
- Photocatalysis for fruit conservation, B. Kartheuser, COST540-WG1, New nanoarchitectures for better photocatalysis in Europe, Ecrin, Paris, France, June 15-16, 2006.
- Photocatalysis: a powerful technology for cold storage applications, B. Kartheuser, C. Boonaert, TiO₂-10: The 10th international conference on TiO₂ Photocatalysis: Fundamentals & Applications, Chicago, 23-27 October 2005.
- Relevance of photocatalysis for indoor air treatment – performance at sub ppm concentration; B. Kartheuser, C. Boonaert; Hygienic coatings and surfaces, Orlando, Florida, USA, 26-28 January 2004.



PHOTOCATALYSIS

- Experimental study of the time-dependent degradation of VOCs at low concentration by heterogeneous photo catalysis over a thin film of TiO₂ deposited on a stainless steel substrate, L. Geron, L. Dehbi, B. Kartheuser; TiO₂-8 : The Eighth International Conference on TiO₂ Photocatalysis : Fundamentals & Applications, Montreal, Canada, 26-29 October 2003.
- Pollution intérieure: Identification et remédiation; O. Noiset, C. Henneuse, T. Pacary; Eurodeur-Airodeur 2003, Evreux (France), 25-26 Juin 2003.
- Traitement de l'air intérieur par la photocatalyse: exemple de dégradation de polluants modèles, B. Kartheuser, Eurodeur/Airodeur, Paris, Juin 2001.
- Les composés organiques volatils (COV) et les odeurs: quel traitement, B. Kartheuser, Surplast 2000, Paris, 2-3 mars 2000.

RECOGNITION – POSTERS

- Surface modification of glass microbeads by Liquid Phase Deposition of photocatalytic TiO₂, G. Bister, N. Nutal, M. Poelmans, C. Motte, B. Kartheuser, V. Lardot, F. Cambier, ECerS 2013 - 13th ECERS International Conference, Limoges, France, June 23-27, 2013
- NORMACAT projet : normalized closed chamber tests and circulating loop tests for evaluation of photocatalytic VOC treatment in indoor air, L. Pepin, N Costarramone, B. Kartheuser, D. Vildoza, T. Pigot, S.Lacombe, C. Guillard, P. Kaluzny, 3^e European Symposium on Photocatalysis September 2013, Portoroz, Slovenia.
- Photocatalytic VOC removal by outdoor materials: laboratory test in close chamber, B. Kartheuser, PhotoPaq "PHOTOcatalytic remediation Processes on Air Quality" conference 2012, Proticcio, Corsica, 14-17 May 2012.
- NORMACAT Project: Normalized closed chamber tests for evaluation of photocatalytic VOC treatment in indoor air. Formaldehyde determination; B. Kartheuser, T. Pigot, N. Costarramone, S. Lacombe, JEP 2011, Bordeaux.