UNIVERSITÀ DEGLI STUDI DI MILANO
Dipartimento di Chimica
Laboratorio di Processi e Impianti chimici per la Chimica Industriale

Test Report N. GF/2.2019

GRANITI FIANDRE S.p.A.
Via Radici Nord, 112
42014 Castellarano (RE)
Italia

Test: odor reduction tests in the air on **Limestone Active™ 300x100 cm**

Milan, 26/10/2019

Date of receipt	28/09/2019
Analysis start date	29/09/2019
Analysis end date	09/110/2019
Material	Ceramic Materials
Product	Ceramic slabs in porcelain gres
Sample	**Limestone Active 300x100 cm**
Test information	• Degradation test of alpfa-pinene in air, chosen as model molecule for pollution caused by odours. • Tested sample: collected and cut in a 10x10 cm sample from an original slab, intact in all its parts, randomly chosen from a production batch. • Pre-treatment methods: in accordance with ISO 22197-2, the sample was UV-A irradiated for 6 hours and then immersion in deionized water for 2 hours in order to remove any residues present at the surface. • Light source: UV-A Jelosil 500, intensity 3.0 $mW/cm^{2.}$ • Exposure time: 6 h. • Initial concentration of alpha-pinene: 970 ± 10 ppb in a tailored cylinder containing a complex mixture of VOC (volatile organic compounds) including BTX (benzene, toluene, xylene), aldehydes and chlorinated organic compounds designed to simulate the real pollution of an air in a confined environment. • Type of reactor: for research purposes. Results

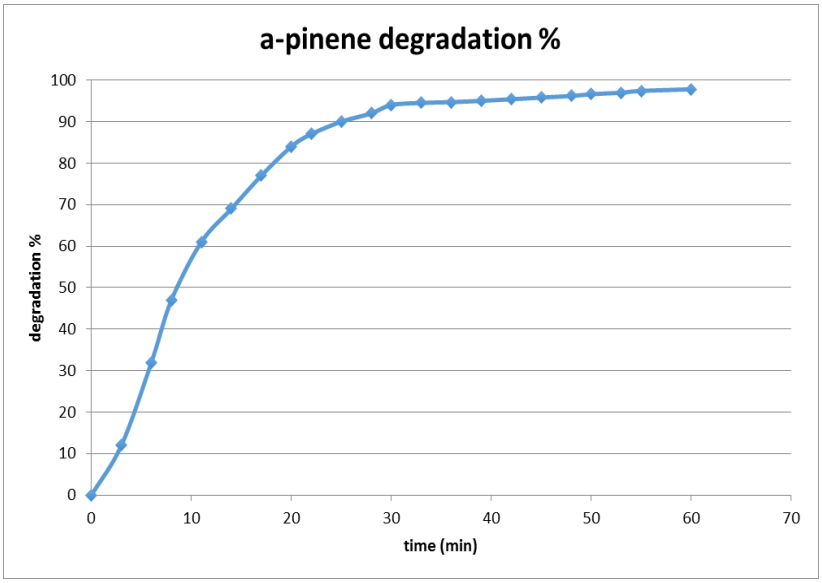
Prof. Claudia L. Bianchi
Tel 0250314253 -claudia.bianchi@unimi.it

	published in international scientific journals [1,2,3]. • Analytical method: Proton Transfer Reaction-Time of Flight-Mass Spectrometry (PTR-ToF-MS) • Reproducibility: the measurement was repeated on no. 5 samples, cut and randomly chosen from # 5 different slabs.

Risultati Ottenuti

The alpha-pinene molecule was chosen as a model molecule for pollution by odoriferous substances. Alpha-pinene, in fact, is an organic compound of the class of terpenes and is found naturally in the resin of many species of conifers, mainly in pines, and in many essential oils including rosemary oil and in the oil of eucalyptus. It is commonly used for the characteristic pine fragrance in the most common air fresheners, cars, etc., as well as a bronchodilator in the medical field.

The graph of degradation of alpha-pinene for the material under test is reported. It is recalled that the test was performed using a complex gaseous mixture comprising VOC including BTX, aldehydes and chlorinated organic compounds designed to simulate real air pollution in a confined environment.



[1] RSC Advances, 5 (2015) 53419-53425
[2] Energy and Environment Focus, 4 (2015) 226-231
[3] Applied Catalysis B: Env., 146 (2014) 123–130

Prof. Claudia L. Bianchi
Tel 0250314253 -claudia.bianchi@unimi.it

It is possible to observe how the photocatalytic ceramic is able to degrade the odour molecule very quickly with an almost total destruction of alpha-pinene in about 60 min. The concomitant presence of other pollutants does not affect the degradation of the odour molecule.

Conclusions

The **Limestone Active 300x100 cm porcelain stoneware slab** is active in the photocatalytic degradation of alpha-pinene, present in the polluted air typical of a closed environment.

The Lab Director

Prof. Claudia Letizia Bianchi

Prof. Claudia L. Bianchi
Tel 0250314253 -claudia.bianchi@unimi.it