ATMOSPHERIC PURIFICATION BY TiO_2-COATED FIRED CLAY TILES: PARAMETRIC STUDY AND COMPARISON WITH OTHER BUILDING MATERIALS

Mélanie Lebleu[1], Marielle Fassier[1], Félix Simonnet[1]

[1]CTMNC, 1 avenue d'Ester, 87069 Limoges, France

Abstract

Atmospheric pollution is a major environmental and health concern of the XXIst century. Yet, despite the countless international protocols aiming at reducing the emissions of air pollutants, the European regulatory thresholds are still too often exceeded.
When it comes to atmospheric purification, photocatalytic coatings are known to be efficient. Besides, in France, two thirds of the roofs are built with fired clay tiles. Hence, this study is focusing on the ability of fired clay tiles, functionalized with a photocatalytic coating, to degrade NOx. More specifically, the impact of environmental factors on the dispersion and degradation of nitrogen dioxide (NO_2), one of the main atmospheric pollutants, is evaluated.
To that end, the influence of the initial NO_2 concentration, light intensity, roof inclination and air circulation has been assessed, using TiO_2-coated fired clay tiles. The performance of fired clay coated and uncoated tiles has also been compared to that of other frequently used building materials: concrete tiles, zinc boards, bitumen boards, shingle, glass tiles and raw earth bricks. NO_2 degradation by the several tested materials has been determined, both under illumination and in the dark. All the experiments have been carried out in a dedicated sealed testing chamber.
While results did not highlight a significant influence of the pollutant concentration on NO_2 degradation rate, increasing light intensity led to greater degradation efficiency and allowing air circulation around the samples decreased the degradation rate. The comparative study emphasized the efficiency of coated fired clay tiles to photocatalytically degrade NO_2, whereas the other tested materials, except for raw earth bricks, only exhibited adsorption properties.

Keywords: atmospheric purification, fired clay products, nitrogen dioxide, photocatalysis