

11th World Congress and Expo on **Recycling**

June 13-14, 2019 | Edinburgh, Scotland

Photocatalytic recycled concrete as a measure of decontamination of cities

Auxi Barbudo, André Lapa, Jesús Ayuso, Adela P. Galvín and Manuel Cabrera
University of Córdoba, Spain

The growth and concentration of the population in the cities, as well as the way in which energy is consumed in them, entails the emission of large quantities of gases harmful to health. To minimize this effect, some administrations take measures such as the promotion of the use of electric vehicles, or the limitation of vehicles in areas of high pollution. However, there are other viable and proven solutions for the elimination of some of these compounds, such as the construction of photocatalytic pavements, which transform these pollutants into harmless compounds, thanks to the action of sunlight. The decontamination process is based on photocatalysis, which eliminates other common pollutants in the atmosphere, such as NO_x, SO_x (inorganic compounds), VOCs (volatile organic compounds), through an oxidation process activated by solar energy. The use of photocatalysts based on nanostructured titanium dioxide (TiO₂) combined with cement and other construction materials has been shown to be effective in eliminating air pollutant gases. If this fact is compounded by the growing scarcity of natural resources, the need for recycling and reuse of materials is clear. Specifically, this work aims to promote the manufacture of photocatalytic concrete recycled pavements using recycled aggregates from construction and demolition waste (CDW), which meet the technical needs (mechanical and durability) involved in the decontamination of cities. For this, two series of concrete mixes were carried out: one with traditional Portland cement and another with photocatalytic cement of similar requirements. In each series, 4 mixes were produced with different replacement rates of natural gravel for recycled gravel from CDW (0%, 20%, 40% and 100%). The results showed a small decontaminating effect of the recycled concretes due, mainly, to the greater porosity of these.

Recent Publications

1. A. Maury, N. de Belie (2010). State of the art of TiO₂ containing cementitious materials: self-cleaning properties. *Materiales de construcción* 60, 298, 33-50.
2. Ballari, M.M. and Brouwers, H.J.H. (2013) Full Scale Demonstration of Air-Purifying Pavement. *Journal of hazardous materials*, 254, 406-414.
3. Boonen, E., & Beeldens, A. (2013). Photocatalytic roads: from lab tests to real scale applications. *European Transport Research Review*, 1-11.
4. Maggos, T., Plassais, A., Bartzis, J. G., Vasilakos, C., Moussiopoulos, N., & Bonafous, L. (2008). Photocatalytic degradation of NO_x in a pilot street canyon configuration using TiO₂-mortar panels. *Environmental monitoring and assessment*, 136(1), 35-44.
5. Guerrini, G. L., & Peccati, E. (2015). Photocatalytic cementitious roads for depollution. *Newsletter*, 179-186.
6. Instituto Tecnológico de la Construcción (AIDICO) (2012). Pavimentos prefabricados de hormigón como solución a la contaminación atmosférica en ambientes urbanos. Informe Técnico IT 120227

Biography

Auxi Barbudo has extensive research experience, shown through 23 journal publications, with 493 total citations and an index h = 11 and index i10 = 13. She has participated in 16 conferences and she is co-author of 2 books and 1 book chapter. She has proven professional experience as a researcher in 5 research projects and 2 research contracts. Likewise, she has made a stay in a European research center. Her research experience has been recognized through the request of several international journals located in the first two quartiles (by category) to participate as a reviewer in the process of publishing scientific articles. Her research topic is the application of recycled materials in the construction sector. The last few years she has studied not only the mechanical and durability behavior of these applications, but she is also researching about environmental issues derived from their use.