

## Photocatalytic Eco-Active Ceramic Slabs to Abate Air Pollution under LED Light

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**Abstract :** At the beginning of the industrial productions, porcelain gres tiles were considered as just a technical material, aesthetically not very beautiful. Today thanks to new industrial production methods, both properties, and beauty of these materials completely fit the market requests. In particular, the possibility to prepare slabs of large sizes is the new frontier of building materials. Beside these noteworthy architectural features, new surface properties have been introduced in the last generation of these materials. In particular, deposition of  $TiO_2$  transforms the traditional ceramic into a photocatalytic eco-active material able to reduce polluting molecules present in air and water, to eliminate bacteria and to reduce the surface dirt thanks to the self-cleaning property. The problem of photocatalytic materials resides in the fact that it is necessary a UV light source to activate the oxidation processes on the surface of the material, processes that are turned off inexorably when the material is illuminated by LED lights and, even more so, when we are in darkness. First, it was necessary a thorough study change the existing plants to deposit the photocatalyst very evenly and this has been done thanks to the advent of digital printing and the development of an ink custom-made that stabilizes the powdered  $TiO_2$  in its formulation. In addition, the commercial  $TiO_2$ , which is used for the traditional photocatalytic coating, has been doped with metals in order to activate it even in the visible region and thus in the presence of sunlight or LED. Thanks to this active coating, ceramic slabs are able to purify air eliminating odors and VOCs, and also can be cleaned with very soft detergents due to the self-cleaning properties given by the  $TiO_2$  present at the ceramic surface. Moreover, the presence of dopant metals (patent WO2016157155) also allows the material to work as well as antibacterial in the dark, by eliminating one of the negative features of photocatalytic building materials that have so far limited its use on a large scale. Considering that we are constantly in contact with bacteria, some of which are dangerous for health. Active tiles are 99,99% efficient on all bacteria, from the most common such as *Escherichia coli* to the most dangerous such as *Staphylococcus aureus* Methicillin-resistant (MRSA). DIGITALIFE project LIFE13 ENV/IT/000140 - award for best project of October 2017.

**Keywords :** Ag-doped microsized  $TiO_2$ , eco-active ceramic, photocatalysis, digital coating

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