
Photocatalytic TiO₂: From Airless Jet Spray Technology to Digital Inkjet Printing

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<http://dx.doi.org/10.5772/intechopen.72790>

Abstract

TiO₂ powders can be employed as both photocatalytic and structural materials, leading to applications in external coatings or in interior furnishing devices, including cement mortar, tiles, floorings, and glass supports. The technology of photocatalytic building materials is connected with the widespread production of photocatalytic active tiles. All the techniques proposed in the study involve the employment of nanosized TiO₂: this represents a new problem to be dealt with, as inhaling nanoparticles exposes workers during industrial production and people in everyday locations to their dangerousness. Only very recently the employment of microsized TiO₂ has been proposed, and the authors in this manuscript report the use of micrometric titania materials, but employing a new deposition technique, which is digital inkjet printing. It represents an improvement of the classical spray coating methods, as it requires piezoelectric heads to precisely direct the deposition of the suspension with an electrostatic field. The mixture contains aqueous/organic components containing micrometric TiO₂: to form a suspension, which is printed onto the surface of porcelain grès, large slabs using a digital printer. Many advantages are immediately evident, namely rapid and precise deposition, (almost) no waste of raw materials, thereby highlighting the economy, environmental friendliness, and sustainability of the process. All the materials we obtained have been thoroughly characterized by means of several experimental physico-chemical techniques, such as Raman microspectroscopy and scanning electron microscopy coupled with elemental analysis. Two different model VOCs, ethanol and toluene, and NO_x have been selected to test the