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LOW TEMPERATURE DEPOSITION OF PHOTOCATALYTIC TIO2 THIN FILM WITH AN ATMOSPHERIC PRESSURE PLASMA TORCH

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TiO_2 is known to be the best photocatalyst compound through its chemical stability, low toxicity, corrosion resistance and low production cost, thus TiO_2 coatings have provided an attractive solution toward water and air purification technologies [1,2]. However, its deposition by CVD has implied, so far, high temperatures and/or low pressure. Therefore, there is a need for a novel process for the deposition of this compound on thermosensitive 3D surfaces. The low-temperature atmospheric pressure plasma deposition has become lately the most promising CVD technique in terms of in-line process capabilities, cost effectiveness and ability to coat large areas, complex shapes and wide range of substrates. Using a chopped atmospheric pressure plasma torch, ULS® from AcXys Technologies, we developed a promising technique to deposit TiO_2 photocatalytic thin films at atmospheric pressure and ambient temperature. The ULS® technology involves a blown arc discharge feed by a mixture of nitrogen and oxygen. The organotitanium precursor investigated, titanium bis(acetylacetonate) diisopropoxide (TIPO) which have been already deposited at low temperature by AA-MOCVD process [3], were introduced in the remote discharge.
FT-IR characterization of the degradation of stearic acid deposited by spin coating points out a photocatalytic activity comparable to a benchmark PVD coating, meanwhile elemental composition of the coatings, determined by EDX/WDX, shows an important amount of carbon, due to the long organic chains of the precursor. SEM studies reveal nano-aggregates of TiO_2, formed in the gas phase, on top of a thin film with a growth rate of 30 nm / min and formed by surface reactions. Raman and TEM studies are under investigation.

Keywords
Titanium dioxide
Photocatalysis
Remote discharge
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