Accepted Manuscript

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PII: S1385-8947(17)31970-8
DOI: https://doi.org/10.1016/j.cej.2017.11.057
Reference: CEJ 18028

To appear in: *Chemical Engineering Journal*

Received Date: 7 July 2017
Revised Date: 7 November 2017
Accepted Date: 11 November 2017

Please cite this article as: B. Jalvo, M. Faraldos, A. Bahamonde, R. Rosal, Antibacterial surfaces prepared by electrospray coating of photocatalytic nanoparticles, *Chemical Engineering Journal* (2017), doi: https://doi.org/10.1016/j.cej.2017.11.057

Antibacterial surfaces prepared by electrospray coating of photocatalytic nanoparticles

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Abstract

The aim of this work was to use electrospray to create photocatalytic TiO_2 coatings and to study their antibacterial and antibiofilm capacity. The electrospray used a sol of TiO_2 anatase nanoparticles prepared by a sol-gel method, which formed stable suspensions of positively charged particles (ζ-potential +22.3 ± 3.7 mV). The electrospray deposited TiO_2 on non-porous glass surfaces at two loading densities originating homogeneous coatings (3.2-4.3 μm) of particles the top layer of which displayed aggregates ranging from the micron scale to a few hundreds of nanometers, with lower size as TiO_2 loading increased. TiO_2-functionalized surfaces were tested for the inactivation of the Gram-positive bacterium *Staphylococcus aureus*. The electrosprayed surface was moderately hydrophilic turning highly hydrophilic upon irradiation (water contact angle 9.6° after 15 h under Xe-arc lamp). photocatalytic surfaces were put in contact with exponentially growing bacterial cultures in a flow system in which solar simulated irradiation followed two different 24 h dark-light arrangements with 9 or 18 h dark exposure followed by 15 or 6 h irradiation. The electrosprayed surfaces