

Photocatalytic inhibition of bacteria by TiO₂ nanotubes-doped polyethylene composites

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Polyethylene (PE) and polyethylene-octadecene (LLDPE) composites containing titanium dioxide nanotubes were synthesized and applied to the inhibition of selected bacteria. It was found that polymerization rate of the polymerizations increased with the incorporation of the octadecene compared with bare ethylene, while with modified nanotubes (O-TiO₂-Ntbs) the catalytic activity showed a slight decrease compared with the pure polymer. Regarding physical properties, the melting temperature and cristallinity of PE was higher than LLDPE. LLDPE presented lower rigidity than PE and thus lower Young's modulus. On the other hand, with the incorporation of nanotubes, Young's modulus did not change significantly with respect to PE. After 2h of contact, the PE/O-TiO₂-Ntbs composite showed a reduction of Escherichia coli of 36.7% under no UVA irradiations. In contrast, LLDPE/O-TiO₂-Ntbs showed 63.5%. The photocatalytic reduction (under UVA light) was much higher and after 60min the LLDPE/O-TiO₂-Ntbs composites showed a bacterial reduction of 99.9%, whereas the PE/O-TiO₂-Ntbs showed 42.6% of catalytic reduction. © 2014 Elsevier B.V. All rights reserved.

Nanocomposites

Photocatalytic inhibition

Polyethylene

TiO₂ nanotubes

Bacteria

Catalyst activity

Elastic moduli

Escherichia coli

Ethylene

Nanocomposites

Nanotubes

Polyethylenes

Polymerization

Polymers

Bacterial reduction

Catalytic reduction

Photo-catalytic

Photocatalytic reduction

Polyethylene composites

Polymerization rates

TiO

Titanium dioxide nanotubes

Yarn