Synthesis and Characterization of ZnO Nanorod Films on PET for Photocatalytic Disinfection of Water

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Abstract

ZnO nanorods (ZnO NRs) were grown on ZnO seeded polyethylene tert-phtalate (PET) substrates obtained from recycled soda bottles at low temperatures (90 °C) from Zn2+ precursors in alkaline aqueous solution. The ZnO seeds were deposited on the PET substrates by spray gel (SG) or dip coating (DC) from a ZnO methanol sol. In the case of SG, the PET substrate was heated at 90 °C during the spray process. By the other hand the ZnO seed layers obtained by dip coating were heated at 90 °C or 130 °C for 10 minutes among coatings. Before seeding two procedures were made on PET surface for improving seed adhesion: 1) PET surface was mechanically roughened with sand paper 1200. 2) PET surface was chemically treated with a solution of NaOH in ethanol. The relationship between the microstructure of the ZnO NRs films as function of the PET surface treatment and the photocatalytic antibacterial activity for E. Coli disinfection, was determined through a detailed characterization of the material. The highest photocatalytic antibacterial activity was performed by ZnO NRs films grown on seeds deposited by dip coating with 10 layers, 5 minutes of chemical treatment of PET surface and a thermal treatment at 130° C among coatings. With these films the population of viable E. Coli dropped more than seven orders, from 3x108 to 101 CFU.